

University of Economics, Prague
Business Administration



“Commercial system for soilless production of Pharmaceutical plants”

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Declaration of Authenticity

I hereby declare that I am the sole author of the thesis entitled “Commercial system for soilless production of Pharmaceutical plants”. I duly marked out all quotations. The used literature and sources are stated in the attached list of references. This work has not been published or submitted elsewhere for the requirement of a degree programme.

In Prague on
29/08/2020

Signature
Tome Iliev

Title of the bachelor's Thesis:

“Commercial system for soilless production of Pharmaceutical plants”

Abstract:

Begun in the 20th century, aeroponics was a developing project that mainly focused on planting without the use of soil. This innovation became more and more popular in the beginning of the 21st century and has been developing ever since. The main purpose of this thesis is to create a business plan for a star up that will implement the idea of aeroponics systems in the Czech Republic. The paper includes a theoretical part along with a practical part; where in the theoretical part an extensive explanation was conducted to explain all the different sections that will be deeply analyzed in the practical part. The practical part placed the theory into practice and this included an executive summary, business opportunities analysis, the business overview, market and competition analysis, VRIO analysis, SWOT analysis, scenario planning, marketing plan and the financial plan. After the extensive examination of the business plan the company is convinced that such a project can be implemented in the Czech Republic and will benefit the country in different ways.

Key words:

Business Plan, Start-up, Soilless Plant cultivation, Aeroponic Systems

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1. Introduction

Climate change is a big topic in today's world, and taking resources as granted is the first problem that the society does not comprehend. By acting fast and coming up with innovative ideas to preserve on the resources we have remaining it should be the key question for everyone. A lot of new technologies have come up to help this cause and a lot more are to be developed in the future.

The author of this thesis believes that throughout this innovative business idea he can make profit, help the environment and give an example to the world that everyone can help in some way that can affect our future.

The business idea is to implement a system for production of pharmaceutical and essential plants without using a soil. The reasons for using such systems lay in a few premises: avoiding a soil pollution which is extremely important in pharmaceutical plants production, control of all plant growing parameters which will guarantee the product quality (meaning the constant quantity of bioactive substances in the plant) and decreased quantity of irrigation water up to 95% and maybe one of the most important compared to traditional growing it cuts down the water consumption by 98% less. This is a promising concept that may change agriculture's future and will allow production of high-quality plants all year round, decreasing the energy and water consumption used in the process. With this technology high-quality products will be obtained without a toxic pollution from the soil including intrinsic presence of heavy metals and pesticides.

The word "aeroponics" derives from the Greek letters "*aer*" meaning air, and "*ponos*" meaning labour. The project purpose is to develop an "Aeroponic System" (a system for soilless plant cultivation) which will be used for the production of pharmaceutical plants where the main bioactive substances are in the plant rhizome and roots.

The most essential reason for using such system is the fact that in the aeroponic system the plant root grows in the air and can be used completely, unlike the traditional one, when rooting, the bulk (the slender root fibres) remains in the ground. The small root fibres contain the largest percentage of bioactive substances. The other advantages to be mentioned of having such a plant production system is the process of having a clean

root/rhizome mass with no earth impurities, no toxic pollution from the soil that can be absorbed and all the heavy metals and pesticides. Thus said, with this process can be assured that the plants will be with a much higher quality and will allow production of raw materials for the pharmaceutical industry all year round.

2. Theoretical Part

2.1 Business Plan

Before establishing up any new ventures, every entrepreneur should know that the first thing to come across when starting up new company must be the business plan. A business plan has two main functions.

Firstly, it provides us with an explanation and opportunities on the market by putting up a clear and profitable picture of solution to a certain problem the society has, it covers the capital needed and considers the risk factors.

Secondly, it helps us to understand the fields in which our business will operate and how there may be rivals on the market.

The more ideas and more people included in the making of the business plan is always better, it gives opportunity to merge the ideas of everyone involved in the making of the business or so called, brainstorming. Moreover, the business plan is the key to attracting new investors and lenders, thus helps to show the potential of the company, it gives a detailed structure of the plan with taking into consideration all the positive and negative aspects of the business. Lenders and investors are keen on knowing that the entrepreneur is well informed about the risks of the business, and that he knows how to address them. And finally, they want to see an evidence that this company will generate return in the near future. (*Beauregard, n.d 2008.*)

2.2 Business Plan Structure

When making a business plan the entrepreneur has to know that whatever he states in the business plan has to be unique for the business, the steps and the elements of the business plan are standard for every new business.

For a business plan to be robust we need to follow some of the elements that will be stated in the next chapter.

- **Title Page and Table of Content**

Title page is the information that the reader need; it shows the company's logo, name and the address, with all background of the founders of the company. The table of content is there to help the reader locate and find the sectors they are interested in, it usually contains all of the titles and pages with page numbers.

- **The Executive Summary**

It summarises all the relevant points, and it highlights the main aspects of the business plan. This element is also known as the "Elevator Pitch" (*Haden, 2015*) a short description of your idea that anyone can understand in a short period of time. After reading the "Executive Summary", the reader/investor should have an idea of what our business concept and what it makes it unique.

- **Company Goals and Objective**

Objectives are short term targets, which have to be controllable and measurable, objectives need time frame for achievements. Whilst achieving these objectives the entrepreneur is bringing his company closer to its goals.

- **Stakeholders Analysis**

As stakeholder analysis are counted all those who can affect the business or be affected by the business itself, under stakeholders we can include the shareholders, lenders, competitors, employees, suppliers, final consumers.

- **Business Strategy**

Business strategy should outline and explain the reader on how the company will differ on the market from the other competitors, and how the entrepreneur will gain competitive presence on the marketplace. Business strategy should outline on how the company will meet customers' expectations and business goals. It also should tell the reader on why this company will be unique in the eyes of the customer.

- **Financial Plan**

It summarises all the financial aspects for the company, taking into consideration; project founding budget, project sales forecast, project expenses, project cash flow plan, break even analysis.

- **Exit**

The exit is a plan for an entrepreneur is a way to sell their idea to investors or other companies. It also allows the owner to reduce his stake in a business and guarantee success and profit. On the other hand, if a business fails then the exit plan acts as a guarantee for a limited loss.

- **Appendix**

In the last section of the business plan appears the appendix, it helps in a way that it shows the investors or the reader of the business plan that you've got a great idea (*Basic Business Plan Structure* / *Chron.Com, n.d. 2016*)

2.3 Executive Summary

Executive summary in other words can be described as a “complete business plan” it always comes up first in the business plan. Some of the main parts for a perfect executive summary would be as it follows, firstly we want to show the reader/investor an overview about our company/business, where is our company/business headed to and also to guide us and show us how it will get there. Although the executive summary will always be on the front of plan, most of the times it is written at the end of the business plan, just so it can be provided with more specific information and data. If the company/business is seeking a funding, the executive summary should specify all the information that a lender/investor may seek for the plan, most of the main data that a lender/investor may seek is the business overview, goals that want to be met in the future, location of the business, name and age, and main one uniqueness of the business and what makes it to differ on the market (*6th Edition by Pinson, n.d 2006.*).

2.4 Opportunity

A firm needs to describe how it will be taking advantage of different market opportunities and drawbacks that might emerge throughout time. In order to do so, the firm must clarify its source of revenue, how it spends its time in operation and production, how the firm identifies its target market and reach its consumers, and how it will sell its products throughout the market. As what Roman philosopher Seneca (4BC-65AD) said "Luck is what happens when preparation meets opportunity" by this he meant that luck is not just being at the right place and right time, but that no matter what, firms have to be ready for new chances and opportunities every single day. (Popik, n.d. 2011)

2.4.1 Problem

Problems are basically drawback that emerge overtime while a business is creating its products. Companies tend to skip right into the product without figuring out the problems they might face during the first phases of production. That's why most of the companies tend to fail rather than succeed. A business must start by identifying all possible drawbacks and rather than focusing on the product they have in mind, they should focus on what the consumer actually needs and what the consumer will actually buy.

2.4.2 Solution

When it comes to business planning, solutions need to be thought out thoroughly. In order for a company to get this point right, they need to think of solutions for each and every drawback they might face through the production phases. A business also has to look at solutions from different perspectives including the point of view of the consumer towards different solutions and learn what the consumer needs.

2.4.3 Validation

Before launching the product or service the business should go over procedure to ensure that the products or services they will be offering are validated by their target group without actually showing them the final product. The validation process simply works like the basic research and development phase a business faces in the beginning stages of developing a product or service. In order to do so they need to gather information from the target market using different methods such as surveys on samples or face to face interviews to make sure that the product is

capable of being introduced and being able to compete in a market without any further adjustments. (*Why is Business Validation of an Idea a Must Before Starting up*, n.d. 2017)

2.5 Business Overview

This section shows the reader about the business overall and its strategic goals, this section can be also named as “Situation Analysis segment” (Woodard, 2016). Business overview contains business relevant background for the business itself and it also shows the pricing and distribution situations, not that it shows just for our business it shows also on our competitors. Entrepreneurs should define mission and vision statement for their company, which will show the reader a vision on the company and reasons of what this company is capable on the market.

2.5.1. Vision Mission & Goals

Vision -is a well painted picture of the future on the business, which allows the reader to understand what our business can offer in the future. It also allows the business to create a leading role on the market which the company strives to create.

Mission- It is an idea of how the company wants to be seen by the customers and the others on the market. The managers and the entrepreneur can use the mission as an extra tool to explain what the business purposes are for the future of the company.

Goals – A goal for an enterprise should be a specific milestone on the journey to success (Edwards, 2014). It ought to play the role of keeping the enterprise on the right path and help to make the desired decisions. For one enterprise to be successful, the manager should follow the SMART criteria and it stands for (...):

- Specific
- Measurable
- Achievable
- Realistic
- Timed

2.5.2. Product and Business Description

The product and business description are essentially being used to analyse what and how we want to implement onto the target market. For that we have to separate these two and describe their characteristics and factors of influence, which can be separated in external and internal. As for the external characteristics it includes operations which the firm has less control on such as suppliers, social, financial, political and competitive. On the other hand, talking about the internal characteristics which the company has somewhat control on it we can mention management, resources, location and products. (*Internal vs External Customers: How Are They Different? – BMC Blogs, n.d. 2020*)

As for the product, it is necessary to consider internal factors like costs, price, source of inputs, added value, as well as external factors like competition, subsidiary products. The goal is to convince the audience that the product has a marketable potential and an added value compared to product of the current market.

The business description should focus on the implementation of the product into the market. For example, it needs to be considered which is the most effective business form to maximize market penetration.

2.6 Market & Competition analysis

Market competition analyses the market for the company, it allows the business to do a clear research on the indirect and direct competitors on the market. By having this analysis, the company can clarify where the competitors are failing to succeed on satisfying the needs on the customer. After this analysis has been done, the company can focus on the customers that are seeking the product that the company is offering, and for last it will analyse the external factors for the business. (*Marketing, Strategy, and Competitive Analysis, n.d.*)

2.7.1 PESTEL analysis

It explains the external environment of the market and where does the company stand in terms of six different aspects, namely; political, economic, social, technological, environmental and legal. “Organisations that successfully monitor and respond to changes in the macro-environment are able to differentiate from the competition and create a competitive advantage” (*Oxford College of Marketing Blog, n.d. 2016*)

Political – it deals with all aspects related to governmental decisions that may potentially affect the company into the future. By controlling these aspects, the company has the ability to maintain a stable environment.

Economical – Taking into consideration the factors that may have an impact on the future profitability on the company, and keeps in mind the effects of interest rate, employment or unemployment rate, costs, raw material and foreign exchange rates.

Social – Social factors can play a critical role into the global markets, and the company success may depend on the research done in this area, taking into consideration education, lifestyle, demographics, historical issues.

Technological – Technological factors are factors that might or will affect the company in the future, either in a positive manner or in a negative manner. In addition, they analyse how different outcomes might influence the company as a whole along with the external environment.

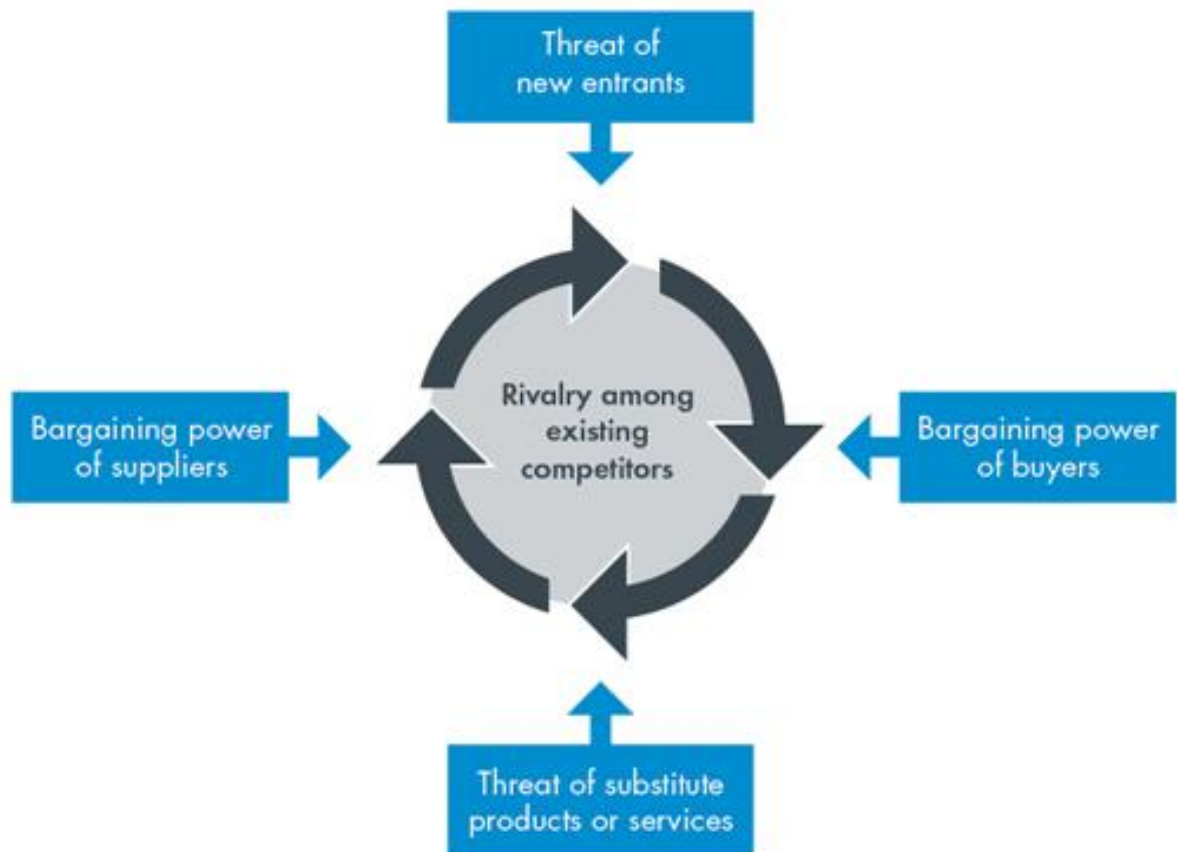
Environmental – Environmental factors are elements that influence the external environment of the company due to ecological aspects. In today's world the rise in the trend of corporate sustainable responsibility ought to change the way a market or an industry perform, and companies must be flexible to such changes and adapt.

Legal – Legal factors are elements that a company should follow and learn about when operating in a specific region or territory. Those elements are usually laws and regulation that all companies should comply with and make sure that they are within the scope of the law. (*Oxford College of Marketing Blog, n.d.2016*)

2.7.2 Porter's 5 forces analysis

An analysis covering five important aspects of competition on the market, for analysing industry attractiveness and profitability. First published in 1979, by Michael Porter, an associate professor at Harvard Business School. Porter believes that the profitability for one company can be demonstrated as consequence of these five forces and that one of these five aspects can shape the company success of the firm on the market. (*The Relevance of Porter's Five Forces in Today's Innovative and Changing Business Environment, n.d.2013*)

Picture: 1 Porter's five forces



Source: 1 (Porter's Five Forces of Competitive Position Analysis, n.d.)

Competition in the industry

The first of the five forces refer to the quantity of contenders and their capacity to undermine an organization. The bigger the quantity of competitors, alongside the quantity of similar product and administrations they offer, the lesser the intensity of an organization.

Potential of new entrants into the industry

An organization's capacity is likewise influenced by the power of new participants into its market. The less time and cash it cost for a contender to enter an organization's market and be a successful competitor, the more a set up organization's position could be essentially debilitated. An industry with solid boundaries to entry is perfect for existing inside that industry since the organization would have the option to charge more significant expenses and haggle better terms.

Power of suppliers

The following element in the five powers model tends to show how effectively providers can drive up the expense of sources of inputs. It is influenced by the quantity of providers of key contributions of a decent or administration, how one of a kind these sources of info are, and the amount it would cost an organization to change to another provider.

Power of customers

The capacity that clients need to drive costs lower or their degree of intensity is one of the five forces. It is influenced by what number of purchasers or clients an organization has, how huge every client is, and the amount it would cost an organization to discover new clients or markets for its yield.

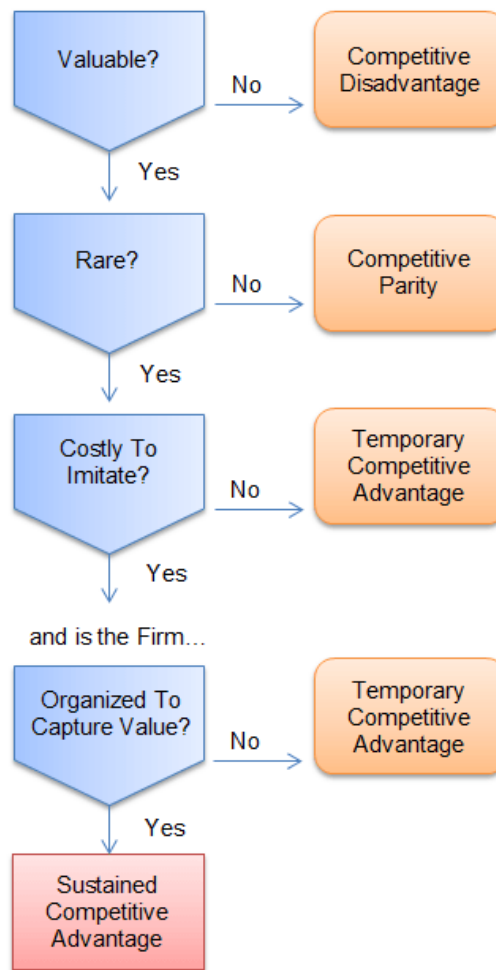
Threat of substitute products

The remainder of the five forces centres around substitutes. Substitute merchandise or administrations that can be utilized instead of an organization's items represent a risk. Organizations that produce merchandise for which there are no nearby substitutes will have more capacity to expand costs and lock in positive terms. At the point when close substitutes are accessible, clients will have the alternative to do without purchasing an organization's item, and an organization's capacity can be debilitated. (*Chappelow, n.d. 2020*)

2.7 VRIO analysis

The VRIO analysis is mostly used within the companies as a tool to analyse the company's internal and external environments. For a company to find its internal environment best tool that can be used is the VRIO analysis, this analysis looks into the companies' value, rarity, imitability and organization of a resource. According to (*Barney, J. B. 1991*) the resources must be valuable, rare, imperfectly imitable and non-substitutable.

Picture: 2 VRIO frame work



Source: 2 Rothaermel's (2013) 'Strategic Management', p.91

- **Value** – The first question of the framework describes if the company by selling its products adds value, if yes, the company succeeds on the opportunities and avoids the threats. Furthermore, the company should have the ability to be flexible when it comes to reviewing the value of the product to its customers and make sure that the constant change in internal and external environment does not affect how its consumers perceives its products.
- **Rarity** – Company's rarity is measured by its product, if the company offers a product that only few can achieve on the market, that is considered as a rare production. Rare resources on the market grants the company an advantage over other competitors on the market. On the other hand, if there are more companies on the market who offer same or similar product, the ability to have a unique product becomes rare.

- **Imitability** – If a company wants to achieve comfort on the market, their product must be expensive to copy. By having the comfort on the market, the company can attain a competitive edge and attract customers over their competitors.
- **Organization** – A well-structured company leads to a successful competitive advantage. If the company it's not organised well, the resources it gains does not benefit or help the company to further expand or grow throughout the market.

2.8 SWOT Analysis

SWOT analysis reveals the company's strengths, weaknesses, opportunities and threats on the market. Often the SWOT analysis is presented as a 2x2 matrix whereas strengths and weaknesses are in the upper row representing the attributes of the firm, and where opportunities and threats are in the lower part representing attributes of the environment of the firm.

Strength outlines the advantages that our company has compared to other companies on the market it can be; loyal customer base, strong balance sheet, unique technology or a strong brand name. By having these perks, the firm can display to the investors why the company stands out on the market.

Weaknesses are the drawbacks that halt the company to carry out at greatest level. To remain on the top position on the market, the company needs to eliminate the weaknesses such as; lack of capital, high level of debt and weak brand.

Opportunities on the market can affect the business in two ways, if the company takes advantage of the opportunities that may be somewhat noticeable or memorable one, either way gives the company a competitive advantage on the market. But also, if the company does not act on time, the opportunity can be grasped by other company seeking the same advantage.

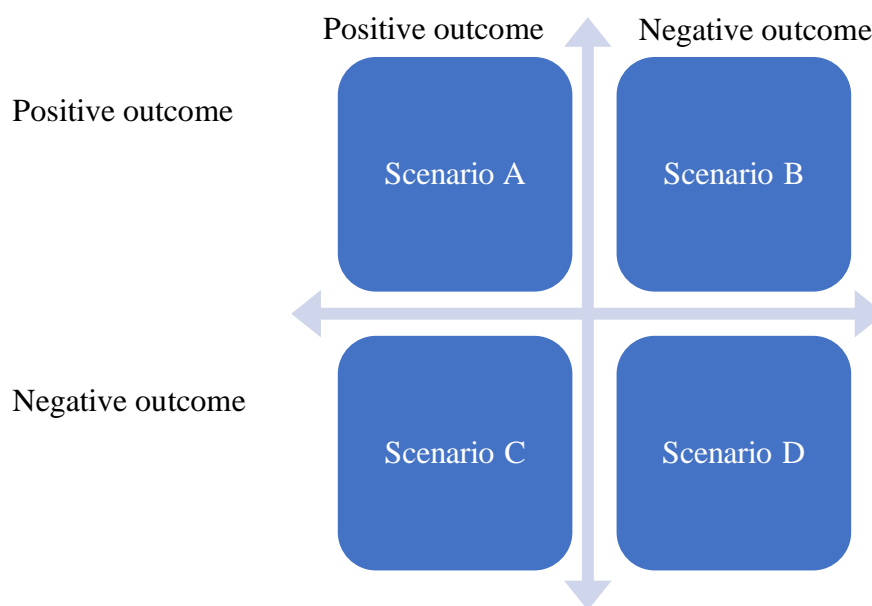
Threats are the negative outcomes that may cause damage to the company's profit or even affect the way it operates on the market. If threats are effectively recognised, a company might be able to change those threats into potential opportunities. (*Grant, n.d. 2019*)

2.9 Scenario planning

Scenario planning can be defined as planning the business's future uncertain 'realities', more precisely described it is coming up with assumptions on how the business future will be and how to prevent if something goes unexpected. Scenario planning helps business owners to organize their business in long term, the matrix contains four different scenarios starting from

the best case to the worst-case scenario. For example, the positive outcome for most businesses and for this business is technological advancements. Those advancements will allow companies to operate more efficiently and companies should consider technology as a scenario while implementing a business plan. On the other hand, a company must also consider the negative outcomes while implementing a business plan. A company should consider scenarios where technological advancements might have a negative impact on the company in many different ways. (*Large Group Scenario Planning, n.d. 2005*)

Figure 1 Scenario planning



Source: 3 Author

3. Marketing plan

The marketing plan is probably one of the main parts of the business plan, a well-structured marketing plan will lead the company to success and will help the firm on the market. The company's abilities can be managed by controlling the four main elements of the business operations, the four main elements are also known as 'four Ps'. With the use of the four elements allows the company with a policy that will satisfy the needs of the customers and in same time to be profitable: (*Westwood, 2013*)

- Product sold (Product)
- Pricing policy (Price)
- Product promotion (Promotion)

- Product distribution (Place)

3.1 Strategic marketing

Strategic marketing can be explained as a long-term approach, it is a process of developing, implementing and planning that can give an advantage to the company on the market. With strategic marketing, the business is setting up objectives that wants to achieve and satisfy customers' needs on the market. In order to beat the competition on the market, the business needs to be dominating, and become the best in the industry. The most efficient way to implement the marketing plan would be to follow the STP process (segmentation, targeting, positioning). (*Strategic Marketing, Tactical Marketing, 2018*)

Segmentation – Market segmentation is a big role when it comes to competitive advantages. By understanding the market segmentation, the company can focus on the needs of a specific customer groups, it helps the business in a way that creates a market mix allowing the company to target customer groups that are more likely to purchase their product. There are four types of customer groups, and they are: (*Segmentation, Targeting and Positioning Model—STP Marketing from MindTools.com, n.d.2018*)

- Geographic segmentation
- Demographic segmentation
- Psychographic segmentation
- Behavioural segmentation

Targeting – With targeting process the business is able to select a specific product or service and efficiently direct its marketing efforts at those specified products. Simply, it is the process of making sure that the business is specifying the right people that in the future would like to buy its products and services. In order for a business to effectively deal with targeting it needs to deeply understand the concept of a target market. By definition, it is a group of people to whom the business directs its efforts to sell a product or a service. On the other hand, targeting itself is the procedures a company or business take to pick a target market and successfully reaching those audience with various methods such as marketing and advertising.

Positioning –By definition position is “the process of differentiating certain products and services from your competitors.” (*Entrepreneur Small Business Encyclopaedia, n.d.2020*)

In order for a business to effectively position their products they have to answer specific questions starting with, what is the business actually offering to its consumers? And how do those products and services have actual unique features than those of the competitors. After answering those strategic questions, a business has the ability to build an actual positioning statement within its business plan, where it elaborates and manifests its ability to operate efficiently in a specified market alongside its competitors.

3.2 Tactical marketing

Whilst strategic marketing is focused on achieving the goals for the firm, following maximizing competitiveness on the market and revenues for the firm, tactical marketing deals with the operations in detail for achieving set goals. The activities used in order to do so can vary in their details, but in general the tactics used can be separated into following categories **product tactics, price tactics, promotion tactics**. (*Tactical Marketing Tools, n.d.2019*)

Product tactics focuses on firm's product design. Product tactical marketing can be defined as the additional unique feature that differentiates a company's product from its competitors within the market. For example, the company offers unique features that can be used within tactical marketing, such as production of high-quality plants without using soil. This takes the product toxins and bacteria free.

Price tactics is coming up with a plan for our firm's price settings, including psychological pricing, quantity discounts and implementing desired price perception. Including shipping costs to the cost of the product itself is one of the best methods to be used by companies. On the other hand, other methods of tactical pricing that have proven to be more effective in having a good relationship with the buyer is reaching an agreement about different methods of payment when buying in big batches. Such agreement may include, flexible payments; for example, paying half of the batch order in advance and the other half throughout a specified time period that was agreed on through a contract.

Promotion tactics can be defined as ability for the firm to advertise its products and reach its target market. Such tactics can be used throughout advertising, loyalty programs and product samples. One of the best methods to promote your product is through being transparent with

your customers; transparency allows the company to build an honest and clear relationship with all its consumers. This grants the firm a good reputation on the market.

3.1 Financial plan

Financial plan is the most crucial part of the business plan, it sums up all the numbers and investments that may be needed for the business to be managed more efficiently. The financial report includes a theory of statements which clarifies and conclude that financial situation of the company. Such statements include the income statement, balance sheet, and cash flow statement.

3.1.1 Funding Budget

It is the process of accumulating funds in order to get a business functioning. In order to do so, a start-up has to accumulate money using different methods such as, personal money, money from family and friends, angel investors or a bank loan. Personal funding is always the best options because it causes less complications with other parties, on the other hand, bank loans may be an advantage in the short run, but in the long run it may be a burden because the company will have to pay the money back with interest. (*Reuvid, 2011*)

3.1.2 Sales forecast

It is the expected revenue of the firm's future, it can be monthly, quarterly or annually. Without managing the sales forecast, the firm cannot create an idea on how the future sales are going to advance. For example, if the firm is making profit it can start thinking of ideas to take a more strategic grip on the market and start expanding to different regions and investing more in research and development.

3.1.3 Expenses

The expenses can be fixed and variable, the firm needs to establish a statement where it can identify all expenses and calculate the budget for all fixed costs and all variable costs. Expenses may vary starting from utilities such as electricity and rent to unexpected costs such as an increase in transportation cost or an unplanned event such as a natural disaster.

3.1.4 Cash flow plan

Cash flow can simply be defined as the amount of cash available to the company at a specific time period. It is the amount of money leaving or entering a business on a given date. For example, when a business buys raw material from suppliers, it pays them off with cash in order to get the materials, this is basically seen as money leaving from the company and going to the suppliers. On the other hand, cash inflows are when a business sells its products and expects its consumers to pay for the products.

3.1.5 Break-even analysis

Break-even point is when a business reaches the point where its loss meets the starting point of profit. This happens when there is no profit and there is no loss within a business; theoretically, it is when total costs and total sales are equal.

4. Practical Part

In the practical part of this business plan I will give a more detailed overview of my business plan of developing an aeroponic system for production of pharmaceutical herbs. It includes executive summary, opportunity, business overview, market SWOT analysis, scenario planning, marketing plan and financial plan.

4.1 Executive Summary

After an in-depth research and analysis of the market and the project; the business plan for the company for soilless production of pharmaceutical plants that ought to be based in the Czech Republic, was conducted. The project purpose is to develop an aeroponic system which will be used to produce pharmaceutical plants where main bioactive substances are in the plant rhizome and roots. The project involves the development of a range of processes and technologies that will enable an efficient, soilless production of pharmaceutical plants with less usage of water that will not just protect the plants, but also protect the environment which is the main goal of the company. As stated by Robert Pokluda, (2018) the Dean of the Faculty of Horticulture at the Mendel University in Brno confirmed by an experienced farmer Mr. Zvolánek, “Knowing the fact that the world is lacking water supplies, and that the Czech Republic is endangered of this current situation in the future, as the situation is getting more and more serious each and every year. There is less, and less groundwater and it is not replenished by natural precipitation. Warmer weather means that there are now pests here that

were not common and thus, the new conditions suit them”. The main reason for using such innovative idea is the fact that in the aeroponics system the plant root grows in the air and can be used completely, unlike the traditional one, when rooting, the bulk (the slender root fibbers) remains in the ground. The small root fibbers contain the largest percentage of bioactive substances. Besides this, the other advantages of such plant production systems are also:

- Genetic and phenotype stability of the obtained product
- A much higher percentage of active substances
- Clean plant product with no earth impurities, no toxic pollution from the atmosphere, without the intrinsic presence of heavy metals and pesticides from the soil.
- Use of the clean leaf, flowers and fruits of plants with much higher quality.
- Production of raw materials for the pharmaceutical industry all year round

The system is most suitable for the cultivation of pharmaceutical plants where the main product is the root or rhizome because the entire root system is growing in air and is available for use. A typical example is (*Taraxacum officinal* L.) whose root contains flavonoids, terpenoids, triterpenes and saponins with proven anti-inflammatory, anticancer and antioxidant properties, the list of plants suitable for such production is given in *Appendix 1*.

It should be emphasized the difference in the quality of cultivated pharmaceutical herbs compared to wild ones, due to the possibility of choosing best subspecies with highest percentage of bioactive substances. This is especially important for further industrial processing in order to obtain final product according to the international quality standards for pharmaceutical, cosmetic or food products. Cultivated subspecies and hybrids are with incomparable higher content of biologically active substances such as; plant phenols, alkaloids, essential oils, enzymes, resins and balsams.

The project implementation envisions the development of the overall technology and appropriate protocols in order to be implemented at the industrial scale during the commercialization phase. This includes the following activities:

- Implementation of a complete aeroponic system at laboratory scale;
- Implementation of a few plant production life cycles for different types of pharmaceutical plants in order to optimize process parameters;

- Quantitative analysis of the produces plant dry mass and comparative analysis with results from traditional cultivation, as well as qualitative analysis of the bioactive substances from the produced crops by an authorized laboratory;
- Complete technical documentation for system implementation at industrial scale.

To further understand the implementation of the project and the company into the market, an intensive analysis was conducted to examine the external and internal environments for the company. This was made possible through a PESTEL analysis and the Porter Five Forces analysis. After doing so the company came up with numerous results and was able to orchestrate a full-on SWOT analysis for the company. The SWOT analysis summed up all the strength, weakness, threats, and opportunities the company has or might come across in the future. To begin with the strengths, it includes a variety of elements including high quality product, whole year production, less water consumption, less toxin and pesticides, a controlled environment, and environmentally independent. All those elements' express competitive advantages over current producers and are regarded as guarantees for the success of the company. Secondly, the weaknesses expressed in the SWOT analysis include three different aspects that act as disadvantages for the company; they include, expensive equipment, low reputation on the market, and the biological food trend. Those three elements act as competitive disadvantages for the company and the company might have a hard time getting over them. Thirdly, the opportunities presented for the company, in that specific market and industry, vary. They include the foreseen growth in the pharmaceutical industry, the expanding market for aeroponic system, global climate change, the certification of aeroponic as organic, and the trend of healthier lifestyles. All the elements stated act as a new opportunity for the company to expand, grow, and succeed. In addition, if all the elements are taken into consideration and implemented efficiently, they should act as strength in the future for the company. Finally, the threats expressed in the SWOT analysis are three different aspects, they include, price over quality, market limit, and diminishing quality for the products. Those different elements threaten the success and growth of the company because they affect the market and the way people perceive products in the long run.

In summation, the company analysed and research the market as a whole; and concluded all the advantages and benefits it will have alongside will all the disadvantages and threats they might face. This was specifically concluded through a variety of different analysis as

mentioned above and adding to that a VRIO analysis, Scenario planning, and the Financial analysis.

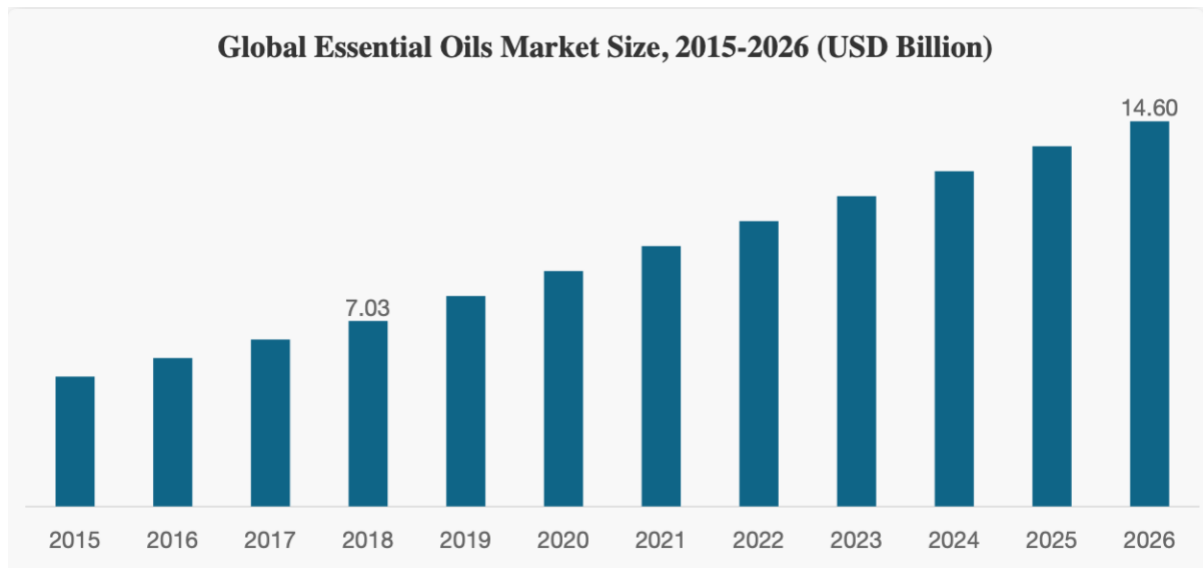
4.2 Opportunity

“By knowing the fact that the world is lacking water supplies, and that the Czech Republic is endangered of this current situation in the future, as the situation is getting more and more serious each and every year. There is less, and less groundwater and it is not replenished by natural precipitation. Warmer weather means that there are now pests here that were not common and thus, the new conditions suit them”. Robert Pokluda (2018) the Dean of the Faculty of Horticulture at the Mendel University in Brno confirmed by an experienced farmer Mr. Zvolánek, (2018).

The pharmaceutical market is rapidly growing every year and competing for customers and position it is not an easy task, but the company is expecting to enter the market with an innovative plan and produce pharmaceutical plants with the highest quality on the most efficient way possible all year round, giving the company a possibility to increase its market shares. The production of a high-quality product also proves to be an opportunity because there are not a lot of high-quality products within the pharmaceutical industry, thus giving us a competitive advantage over others.

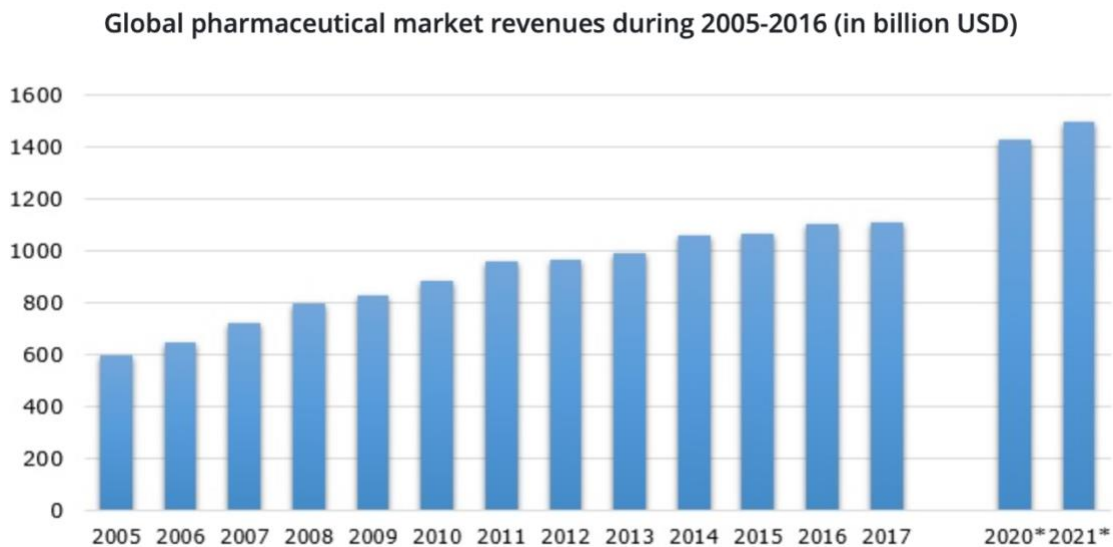
As seen below on the table, the world market of pharmaceutical plants and essential oil in the global essential oil market size was USD 7.03 billion (equals around EUR 6 billion) in 2018 and is projected to reach USD 14.6 billion (equals around EUR 12 billion) by the end of 2026, exhibiting a CAGR of 9.65% in the forecast period 2019-2026. The trend is steady upward, both in terms of total turnover and the traded quantities. (*Essential Oils Market Size, Growth, Share / Global Report 2026, n.d.*). In addition, picture 3 shows the gradual increase in the global pharmaceutical market revenues through 2021 and this concludes the increase in the demand of pharmaceutical plants as well.

Picture: 3 Global Essential oil market 2015-2026



Source: 4 (Essential Oils Market Size, Growth, Share | Global Report 2026, n.d.)

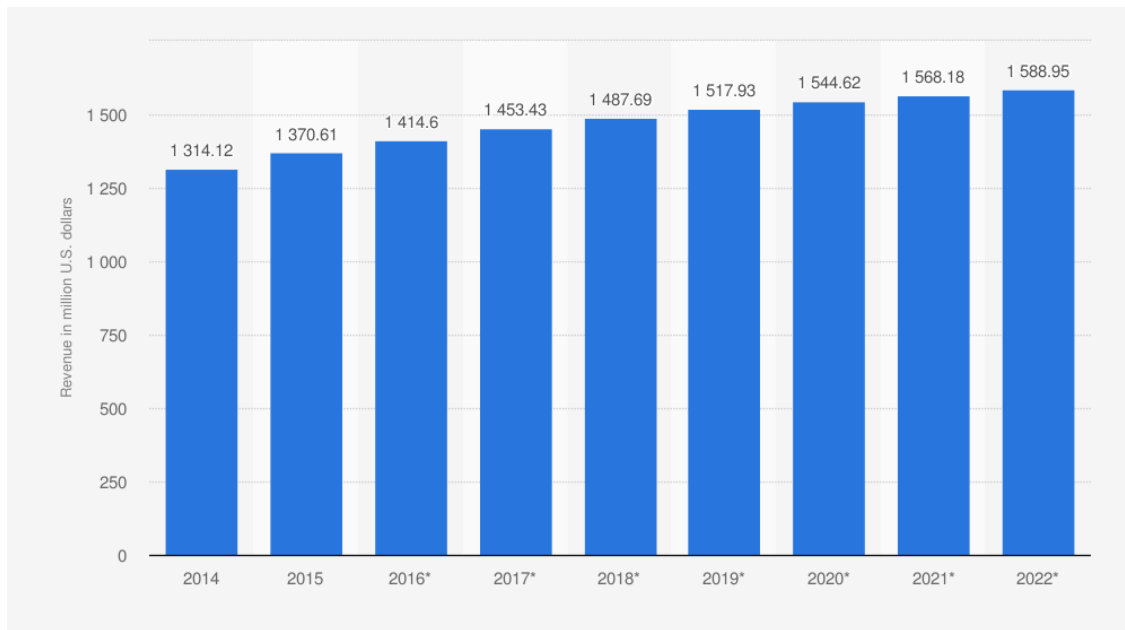
Picture: 4 Global pharmaceutical market revenue



Source: 5 (Pharmaceuticals Market, 2018)

Furthermore, the manufacture of pharmaceutical preparations revenue in the Czech Republic from 2014 to 2022 have been gradually increasing as seen on the table below:

Picture: 5 Manufacture of pharmaceutical preparation revenue (Czechia)



Source: 6 (* Forecast: Manufacture of Pharmaceutical Preparations Revenue in Czechia 2014-2022 / Statista, n.d.)

As seen above there is a gradual increase, in 2014 the revenues were USD 1214.12 million (EUR 1029 million) and it is expected to reach a value of USD 1588.95 million (EUR 1346 million) by the end of 2022. This shows a growth in the manufacturing preparations within the pharmaceutical industries.

4.2.1 Problem

The Company is planning to develop an Aeroponic system for pharmaceutical plant production. Using this system, the company wants to use the method of protected cultivation which enables multiple production per unit area per year. For example, full crop production life cycle for (*Taraxacum officinale* L) is less than 60 days, so it can be produced 6 crops per year. Also, the density of plants per m² is incomparable higher. According to (*Hayden A. L. 2006*), Aeroponics systems have a 23-fold yield per m² compared to the conventional approach. Thus said, the normal traditional way of growing plants uses way more water which compared with Aeroponic system the roots of the plants are just being sprayed with water containing minerals and vitamins for the plant. The second argument in favour for this type of cultivation is that the glasshouses can be built on non-arable soil which can't be used for traditional agricultural activities.

Exceptionally important is to mention that after collecting the plants, they are dried and can be stored in an appropriate way for a longer period, thus avoiding a very acute problem of seasonal depending prices. As the next step, the process of extraction of essential oils and bioactive substances from the plants is foreseen, which will lead to a higher degree of finalization, and will reduce the volume of raw materials.

According to the same research, the amount of bioactive substances in cultivated plants is significantly higher, which is another argument in favour of the project's economic feasibility. Last but certainly not least important is the environmental aspect; namely, uncontrolled collection of wild herbs threatens a huge number of pharmaceutical and medical herbs, especially endemic species in the Czech Republic. Such production will also significantly contribute to preserving the flora biodiversity in the country.

The raw material for the pharmaceutical industry in the Czech Republic is obtained by collecting the wild plants. This approach has number of disadvantages due to:

- Wrong plant identification;
- Genetic and phenotypic variability;
- Variability of the bioactive substances;
- Mixing with weeds;
- Presence of soil (especially in root and rhizome cultures);
- Presence of toxins from the environment.

4.2.2 Solution

Protected cultivation of pharmaceutical plants can overcome these problems, and recent studies have shown that both quantity and concentration of bioactive substances is increasing (*Hayden A. L. 2006*). For this reason, the Aeroponic systems in which the root system grows in an isolated atmosphere avoids all previously mentioned problems. Basically, it is a system that rigorously controls all vital growth parameters:

- Temperature of the atmosphere
- Temperature of the substrate
- Relative humidity
- Irradiation
- Irrigation

- Fertilization
- Concentration of CO₂¹ in the atmosphere
- Concentration of liquid O₂² in substrate

As a result, higher growth is achieved with excellent quality of culture, high level of bioactive substance, uniform yield and opportunity for production throughout the year. It is necessary to mention an ecologically important aspect. Namely, uncontrolled collecting of pharmaceutical plants can lead to jeopardizing of some species and especially endemic types. In the Czech Republic 118 plant species are recognized as endemic and most of them are medical and pharmaceutical herbs. So, protected cultivation will be helpful in keeping local biodiversity. *(Kaplan, 2017)*

4.2.3 Validation

Before launching the final product, the company will validate the product through its target market by using different methods. Firstly, the company will send prototypes to potential investors or big pharmaceutical companies. Secondly, the company will conduct face to face interviews with a specific target group and handout surveys to make sure that the final product is what the consumer expects. The surveys and face to face interviews will contain a list of specifies questions such as; If the consumer is aware of such a technology? If the consumer prefers a healthier product? And if the consumer cares about environmental sustainability? This will allow the company to have enough data to confirm and validate what the consumer actually needs and make sure that its product meets all costumers' expectations.

4.3 Business Overview

4.3.1 Project Vision, Mission & Goals

Vision – “The vison of this company is to preserve the rare floral available on the land of the Czech Republic”.

The company believes with the usage of aeroponic system it can preserve the plants and produce plants with the highest quality possible. The fact that the water reserves in the Czech

¹ Carbon Dioxide

² Oxygen

Republic and the EU are low such a system will guarantee the same or higher production than normal traditional root to ground growth with 98% reduction usage of water.

Mission – “The company’s mission is to produce cleanest pharmaceutical plant products on the market”.

With the innovative idea “Aeroponic system” the company aims to become leader in research and development on special pharmaceutical plants on the market. The fact is that aeroponic systems are technologically most advanced system for soilless plant cultivation and there is a range of technological solutions that need to be developed, implemented and tested. The company is convinced that the successful realization of this project will be a strong impulse for the further development of the company and the development of new products and technologies.

Goals – “The biggest goal that can be set for a pharmaceutical plants production company must be to make a balance between customer satisfaction and cost efficiency”.

Thus said, the company goal will be to manufacture large batches of high-quality products and still maintain low cost-efficiency. Aeroponic production of pharmaceutical plants will have a direct positive environmental impact, through reduced exploitation of natural biodiversity, and reducing the risk of disappearing of certain types of plants in nature. As the next step, it is planned to build a system for protected industrial production (2 hectares) that will directly imply new employments. At the same time, the construction of this facility is planned to be on non-arable land in a rural environment and will not affect the arable land.

4.3.2 Product and Implementation of the Business

Our company is a start-up business whose main activity is the production of high quality non-toxic pharmaceutical plants, the primary activity of the company will be development, testing and implementation of latest technologies into agribusiness, through an interdisciplinary approach, using the experience of information-communication technologies, automation and system theory, energy efficiency and machine industry. This innovative project grants our company confidence that there is a broad range of opportunities for execution of the products that we are planning to develop in this company that will allow us to develop new qualities in the control of protected cultivation processes.

Picture: 6 Aeroponic System



Source: 7 Courtesy of The Laboratory for Protected Plant Cultivation, FON University, Skopje, Republic of Macedonia

Some of these prototypes where already produced and tested in small batches in a laboratory located in the Republic of Macedonia. And here are some of the prototypes that have already been produced, in the following pictures we will see plants of the type like; melissa, valerian officinalis and basil.

Picture: 7 Aeroponics system vertical



Source: 8 Courtesy of The Laboratory for Protected Plant Cultivation, FON University, Skopje, Republic of Macedonia

Picture: 8 Laboratory Prototype (Melissa Aeroponic root system)



Source: 9 Courtesy of The Laboratory for Protected Plant Cultivation, FON University, Skopje, Republic of Macedonia

Picture: 9 Laboratory Prototype (Valeriana Officinalis Aeroponic system)



Source: 10 Courtesy of The Laboratory for Protected Plant Cultivation, FON University, Skopje, Republic of Macedonia

Picture: 10 Laboratory Prototype (Basil Ocimum Basilicum)



Source: 11 Courtesy of The Laboratory for Protected Plant Cultivation, FON University, Skopje, Republic of Macedonia

The purpose is to design, develop, implement and test all technological elements of an aeroponic system along with an appropriate number of protocols that will bring the system to the implementation phase at the industrial scale. With the implementation of these three system variants and testing on adequate number of different pharmaceutical plants, an appropriate techno-economic analysis will be performed for the optimal system solution.

The realization of the project includes:

1. Implementation of a complete Aeroponics system at laboratory scale
2. Purchase of an industrial controller with an appropriate set of sensors, actuators and other necessary equipment for control of the system;
3. Development of a software for integrated control of Aeroponic system with the following modules:

- Control of temperature of inner atmosphere
- Control of temperature of growing medium
- Control of Relative Humidity
- Fertilization control
- Irradiation control
- CO₂ dosing system control
- Liquid oxygen dosing system control

4. Development of software for the preparation of fertilizers depending on the available fertilization salts and initial parameters of irrigation water;



Picture: 11 Integrated Control of an Aeroponic System

Source: 12 Courtesy of The Laboratory for Protected Plant Cultivation, FON University, Skopje, Republic of Macedonia

5. Development of protocols for efficient seed material germination through stratification and / or scarification procedures;
6. Development of protocols for safe seedlings cloning;
7. Development of biological protection protocols;

8. Implementation of full production life cycles for different types of pharmaceutical plant, with monitoring and gathering of all variables important for the process;
9. Quantitative and qualitative analysis of the bioactive substances from the produced crops by an authorized laboratory;
10. Complete techno economic analysis of the results for a particular culture and its payment;
11. Technical documentation for implementation of the system at industrial scale.

In order to further understand the project and how it differs from traditional rooting systems an analysis was conducted between the ratio of dry root mass in aeroponic systems comparing them with one traditionally cultivated and the ratio of dry leaf mass in aeroponic systems comparing them with traditional cultivation.

Table 1 Comparative Analysis

Name of plant	Ratio of dry root mass in Aeroponic system compared with one traditionally cultivated	Ratio of dry leaf mass in Aeroponic system compared with one traditionally cultivated
Achillea millefolium	11.4	22.9
Artemisia vulgaris	1.8	3.6
Inulahelenium	7.8	12.7
Stellaria media	6.6	1.9
Taraxacum officinalis	3.3	13.7
Valeriana officinalis	4.4	15.2

Source: 13 Oliver Iliev

The results show an obvious advantage of the proposed solution in terms of the amount of dry root mass, leaf or rhizome.

4.4 Market & Competition analysis

4.4.1 PESTEL Analysis

The company's PESTEL analysis will take a look into the current standing of the company's effects and driving elements. The key elements that we will examine will be, political, economic, socio-culture, technological, legal and environmental. By doing this we will analyse the macro environment of the company. The changes into the macro environmental elements have influence on all the other players on the market and it can have also influence on the Porter's five forces that form the strategy and the business environment.

4.4.1.1 Political

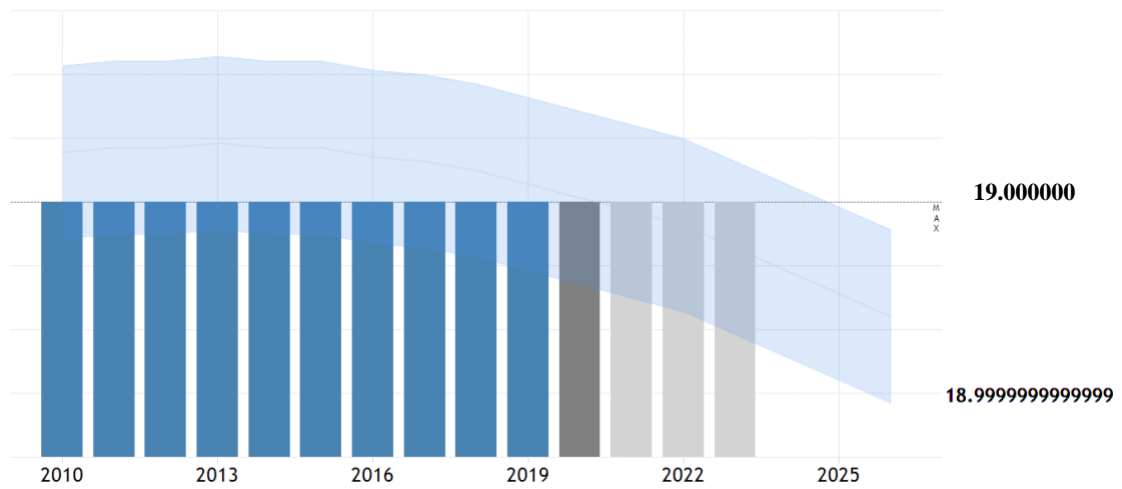
Price regulations

- Price regulation has a great effect on the company and its future because if political figures agree that the type of product we sell is counted as a pharmaceutical unit, this will not favour the company and it will have significant consequences on future profit.
- In the EU, pharmaceutical products are subjected to regulations in prices and are not subject to free market forces, which makes them unable to act based on supply and demand. By regulation it is banned to sell pharmaceutical units until the government fixes the price. Furthermore, the resulting price differences among Member States have allowed for parallel trade, in which medical products are placed into circulation in one market and then imported into a second market at a mark-up, without the permission of the local owner of the intellectual property rights. (*Pricing, Payments and Price Discrimination in the EU, n.d.2020*)

Taxation

- Having the ability to operate in a market where taxes are at a minimal will benefit the company.
- The chart below explains the Corporate Tax Rate in the Czech Republic. The vertical axe represents the tax rate and the horizontal axe represents the years (2010 - 2025). From this chart, we can see how the corporate tax rate in the Czech Republic has been steady since 2010 and it is projected to remain at 19% rate until 2023. Furthermore, it is excepted to start decreasing at a very slow pace below 19% by 2025. (*Corporate Income Tax, n.d.2020*)

Figure 2 Tax rate forecast in the Czech Republic



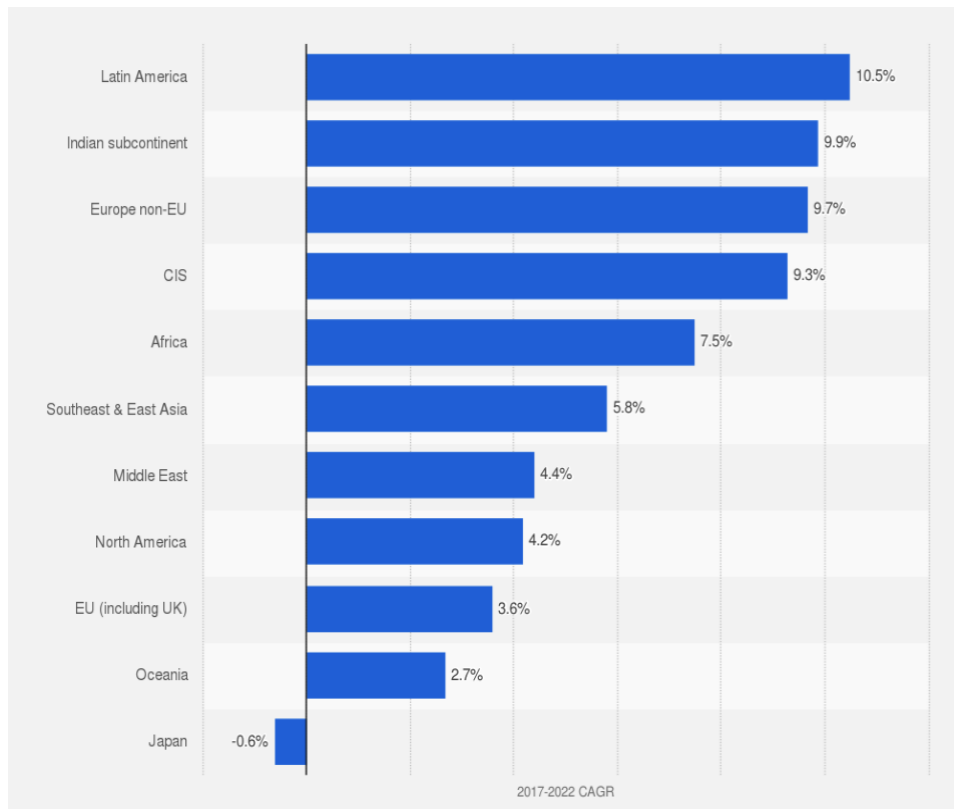
Source: 14 Financial administration of the Czech Republic

4.4.1.2 Economic

Global market growth

- As seen on the graph below, and as mentioned before, the pharmaceutical market on global scale is increasing every year and it is expected to increase in future. The forecasted data shows a 3.6 % growth throughout the market in Europe overall and a positive global growth around the globe. This does support our company plans for investing and researching for better quality products, a better future, and an increase amount of opportunities in research and development because the forecasted growth will gradual attract investors into the market.

Figure 3 Forecast Pharma Global Market Growth by Region 2018-2023



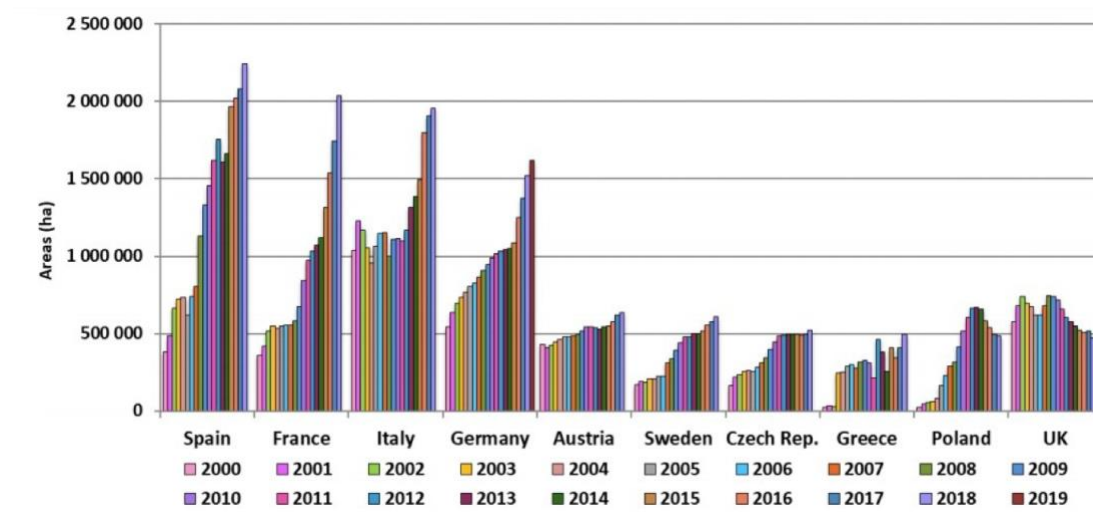
Source: 15 (Forecast Pharma Global Market Growth by Region 2018-2023, n.d.)

Certify aeroponics as organic

- In order for plants to be labelled organic they must be grown in soil-based climate. “Although 100% natural, minerals cannot be classified as “organic” from a chemistry’s perspective. However, like with organic farming, our aeroponic technology produces vegetables, fruits, herbs and flowers grown without pesticides nor chemicals! We refer to our crop as “Beyond Organic” since our aeroponic technology uses up to 98% less water than conventional farming while requiring 75% to 90% less space” (*Is Aeroponics Organic? n.d.2014*)
- On Jan. 25, 2018, United States Department of Agriculture (USDA)’s Agricultural Marketing Service (AMS) officially confirmed that the Aeroponics are definitely certified as organic: “Certification of hydroponic, aquaponic, and aeroponic operations is allowed under the USDA organic regulations and has been since the National Organic Program began. For these products to be labelled as organic, the operation must be certified by a USDA-accredited certifying agent, and maintain compliance with the USDA organic regulation” (*Market-Brief-Organic-Farming-in-the-Eu n.d.2019*)

- The following chart represents the evolution of areas grown organically (certified organic areas and in conversion) in the top 10 producing countries of the European Union since 2000 until 2019. The vertical axe shows the areas ranges in hectares (ha) and the horizontal axe shows the 10 EU Countries. As it can be seen below, there is a positive trend in almost all countries incl. the Czech Republic, meaning that the size of area for growing an organic food is increasing which means there will be more demand on the market for healthier and high-quality plants. Only Poland and UK are having decline in the areas' usage.

Figure 4 Evaluation of areas grown organically (certified organic areas and in-conversion)



Source: 16 (Organic farming market EU-2019 n.d.)

Skill level of workforce

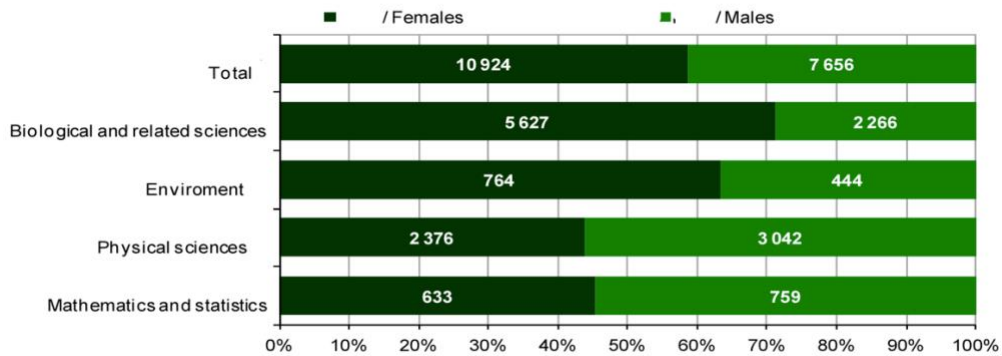
- A skilful team is one of the crucial aspects of the company, without a trained team the company cannot function and cannot attain the full potential that is required to become successful in the market. As seen on the table below, life sciences which covers chemistry, pharmacy and medicine education which in total consists of 52,497 new students and 10,645 graduates on this branch; showing a high interest in this field within the Czech Republic.
- On the following figure we can see comparing the years before 2018/2019 that students' level of this science was lower than the upcoming years.

Figure 5 University students from science fields of education 2018

SCIENCE, RESEARCH AND INNOVATION

Students from science fields of education at universities by gender in 2018

Source: Ministry of Education, Youth and Sports



Source: 17 Czech Statistical Office

Figure 6 University students & graduates in the Czech Republic by field of study 2018/2019

TOTAL UNIVERSITY STUDENTS AND GRADUATES IN THE CZECH REPUBLIC BY FIELD OF STUDY Academic year 2018/2019

Study Program	Students	Graduates
ICT	27,341	5,832
BUSINESS ADMINISTRATION (HR included)	62,391	15,953
ELECTRICAL ENGINEERING	14,025	3,130
AUTOMOTIVE	23,676	5,897
MECHANICAL ENGINEERING	20,614	4,811
TECHNICAL PROGRAMS, TOTAL (Total for technical faculties, not only technical programs)	81,913	19,704
NANOTECHNOLOGY AND MATERIALS	12,724	3,412
CHEMISTRY/BIOCHEMISTRY	18,083	4,222
PHARMACY	5,053	1,062
MEDICINE	29,361	5,361
LIFE SCIENCES, TOTAL (chemistry, pharmacy, medicine)	52,497	10,645
MEDICAL DEVICES	1,364	404
INFORMATICS	10,097	1,801
AEROSPACE	1,181	293
AEROSPACE - related study programs	17,830	4,971
LAW	10,450	1,790

Source: 18 (Educated Workforce, n.d.)

Exchange rate and stability

- Company may face some problems in future trades outside the Czech Republic borders that if the Czech national currency, CZK depreciates it may affect the company's profit. As we can see on the graph, the Czech koruna has been stable between 2015 and beginning of 2020, with exchange rate (EUR/CZK) ranging between 25 and 26. However, as of August 2020 it is expected that the exchange rate (EUR/CZK) will increase at around 28 and in 2020 it will range between 26 and 27. Vertically is shown the CZK/EUR exchange, horizontally are the represented the years.

Figure 7 Exchange rate CZK/EUR



Source: 19 (Forecast EUR/CZK na rok 2019 / FXstreet.cz, n.d.)

4.4.1.3 Socio-Culture

Educational level and education standards the company accepts

- Aeroponics system is a fairly new project on the market, thus said, it requires a lot of knowledge on how to use this system, the team needs to know how to control it, how to dose the perfect level of nutrition for the plant and which vitamins, minerals to use. The company will focus on recruiting a skilled personal and with required standards just, so the company can properly function and compete on the top level. As seen above in figure 4

people are interested in pharmaceutical field and biological science as more graduates are emerging yearly.

Attitudes

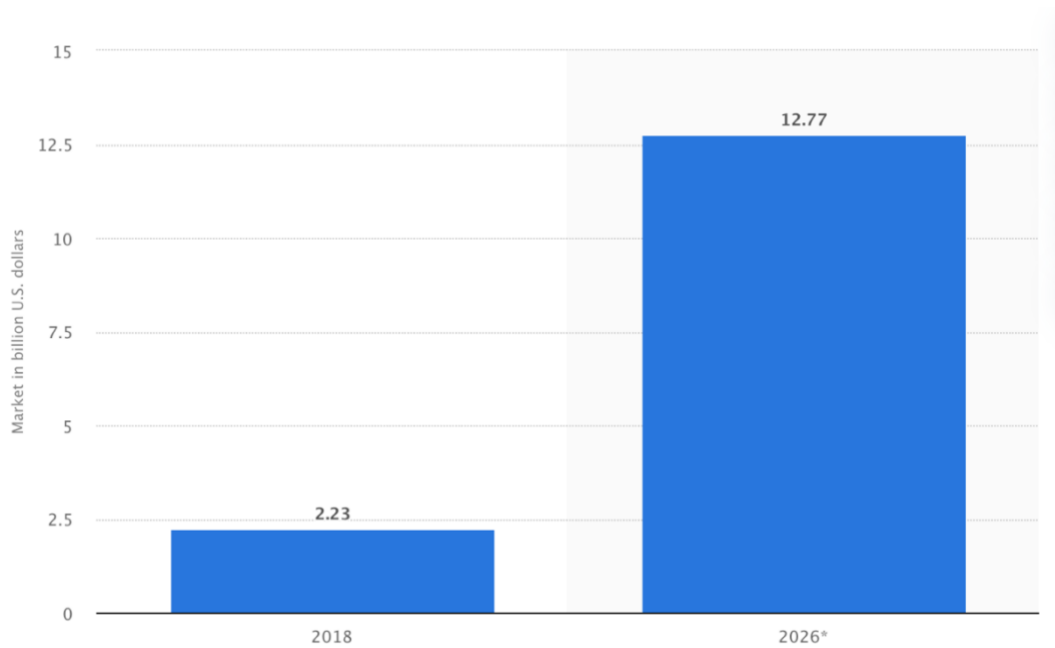
- Attitude of the people towards healthy lifestyle has been gradually increasing throughout the last four years and this can be examined through the analysis of the increase of the health and wellness food market value worldwide as it can be seen bellow on figure 6. As for the vertical farming, which includes aeroponics, it can be seen in the figure 7 below, that has also been gradually increasing in the market value and it is even expected to further increase from 2018 till 2026 by more than 10 billion US dollars (EUR 8.5 billion) which opens up more opportunities for the future of our company. As expected for both markets to grow this is a really good trend for the company, as we mentioned before the company is producing pharmaceutical plants, but the system can be expanded and used for production of any types of high-quality plants in the future.

Figure 8 Organic (BIO) - Market worldwide growth



Source: 20 (Organic Food Market Size, Share & Global Forecast 2022 | TechSci Research, n.d.)

Figure 9 Vertical farming Forecast

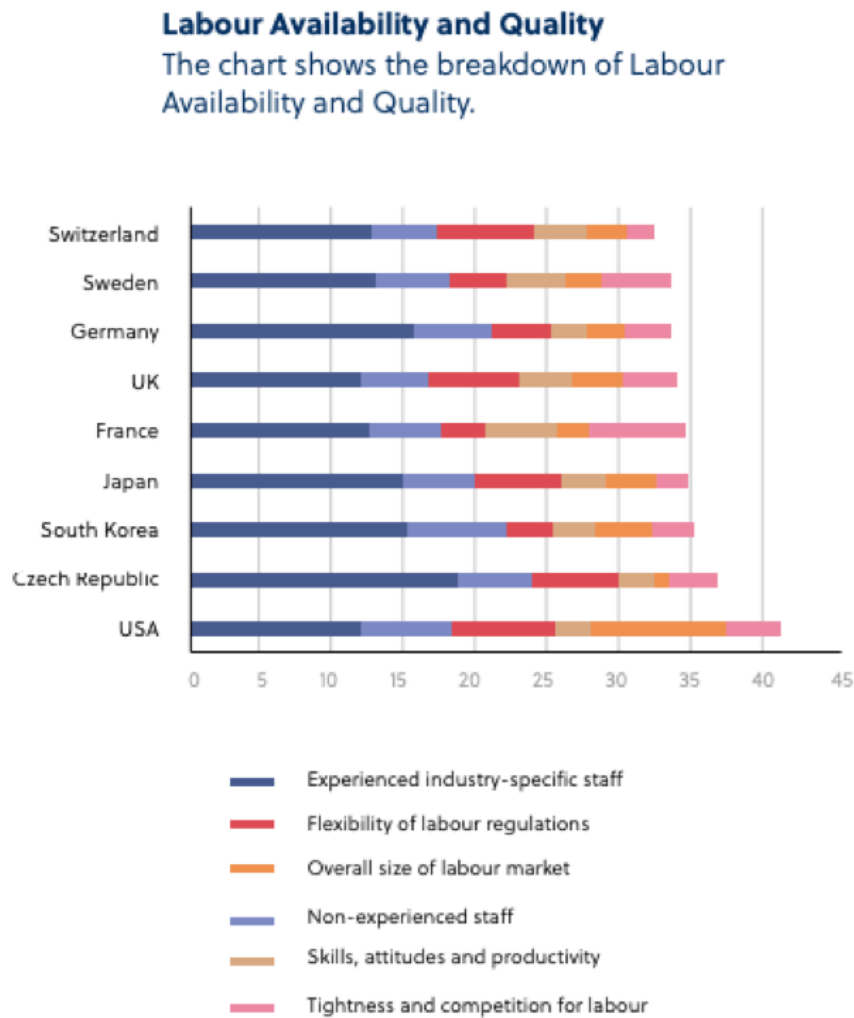


Source: 21 (Forecast for Vertical Farming Market Global 2026, n.d.)

Availability of labour and their quality

- From the figure below, we can see that the Czech Republic for its population can provide more experienced industry-specific staff than some other big countries like UK, France, Germany etc. That means when seeking for an experienced team, the company will have no problem identifying and attracting people with the proper skills, attitude and productivity towards the industry.

Figure 10 Labour Availability and Quality



Source: 22 (Benchmarks the EU Member States on the Framework Conditions..., n.d.)

4.4.1.4 Technological

Technological advancements in the field

- As current global climate change is expected to ascent, the risk of drought is as well increasing. Agriculture is also in advancement and improving to fight this change, it is said that in the future it may come to a time that it will be hard to provide a fresh water for the fast-expanding population, so for the farmers who use traditional way of growing plants will be even harder to produce plants in dry lands. Thus said, thanks to the technological advancement and the innovative projects that may change agriculture future, under such conditions the aeroponics project or also known as soil-less cultivation can easily adjust to such conditions and help to prevent scarcity of water until some extent. (*Modern Plant*

Impact of technology on the cost structure

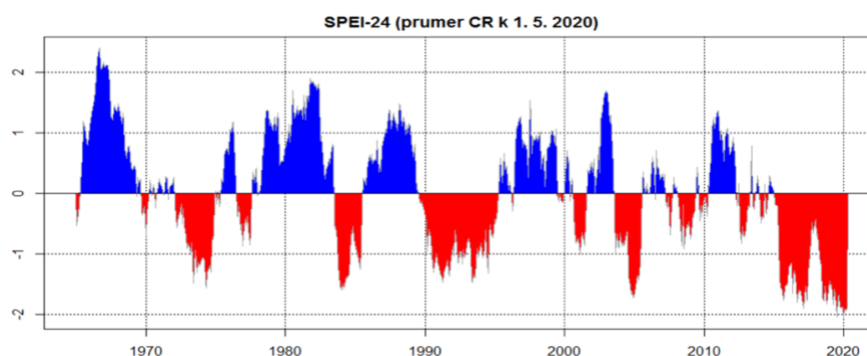
- If the price regulation applies for our products, then the impact of technology on our cost structure will be affected because we will have an obligation to meet certain price tags when it comes to selling our products at the expected customer quality. (Lewin, 2019)

4.4.1.5 Environmental

Scarcity of water

- Scarcity of water is one of the main issues in the Czech Republic since 2003, and this is a serious situation. There are safe resources for drinking water, but for two or three consecutive dry years, but this won't be in any favour for the farmers who will be using the traditional rooting system. But with the usage of the aeroponics system the percentage of using water is decreased by 98% which is a major percent. (*Czech Republic Faces Drought Conditions but Crisis Still Distant, n.d.*).
- The graph below shows the course of the Standardized Precipitation Evapotranspiration Index (SPEI) index for 24 months for the Czech Republic for the period from 1963 to the present. The dry periods are marked in red and the negative values indicate a lack of precipitation. The lower the index values, the greater the drought. As it can be seen on the table below, the Czech Republic since 2003 has had some serious drought and this trend persists even more in the last 5 years.

Figure 11 Drought forecast in the Czech Republic



Source: 23 (Portál ČHMÚ : Aktuální Situace : Monitoring Sucha, n.d.)

4.4.1.6 Legal

Anti-trust laws

- “The anti-trust issues that have emerged in the pharmaceutical industry reflect the intersection of the industry’s underlying economic characteristics with the patent, regulatory and insurance institutions. The law is always a concern to any start-up company that will start operating on a specific market. The company must take such laws into consideration, understand how they might affect the way it operates, and how they might potentially impact the market itself in the future.” (*Danzon, n.d., 2017*)

Law regulating environmental pollution

- “Water protection is a complex sphere of activity consisting in conserving the quantity and quality of surface water and groundwater in compliance with the requirements of national and EU legislation. Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000, establishing a framework for community action in the field of water policy, is the fundamental legal regulation in water protection. Water protection, water use, and water rights are covered by Act no. 254/2001 Coll., on Waters and Amendments to some acts (the Water Act). Some of its provisions are specified and/or elaborated in sub-legal regulations (*Government Ordinances, Regulations ČR, 2008*)
- These acts and regulations, benefit and support the idea the company is built on. The use of aeroponic systems diminish the use of water by 98 %, which helps in reserving the water for other important necessities and diminish the chance of having a scarcity in the water supply.

4.4.2 Porter’s 5 forces

Bargaining power of buyers – Medium

Main buyers for our product will be specifically big pharmaceutical companies with the knowledge of the aeroponic system production. As seen on the table below the main 5 players in the pharmaceutical industry in the Czech Republic include: Novartis, Sanofi, Pfizer, Merck & Co, Roche. Customers will always have the bargaining power as they demand a great deal and most of the customers are seeking the best product on the market with the lowest price to pay. By knowing this fact, it puts pressure on the high-quality producing companies for the revenue in the remote future. Until the clientele for this market grows, the company will

struggle with making profitable revenue. On the other hand, this type of product is not offered from a huge pool of suppliers; so, the company holds a bargaining card which makes the consumer have high switching costs, thus making them stick with one supplier. In addition, the quality aeroponics systems produce cannot be matched by normal rooting systems due to the variables aeroponic systems add, that are not available in traditional rotting. (*Top Five Pharma Companies in Czech Republic Ranking, n.d. 2020*)

Table 2 Top 5 Pharmaceuticals in Czech Republic

TOP 5 CORPORATIONS IN CZECH MARKET				
#	COMPANY NAME (BY VALUE)	% MARKET SHARE	COMPANY NAME (BY VOLUME)	% MARKET SHARE
1	NOVARTIS	9.46	SANOFI	19.33
2	SANOFI	8.38	NOVARTIS	6.44
3	PFIZER	5.24	TEVA	5.57
4	MERCK & CO.	4.92	KRKA	5.42
5	ROCHE	3.13	MENARINI	3.25

Source: 24 (*Top Five Pharma Companies in Czech Republic Ranking – Pharma Boardroom, n.d.*)

Bargaining power of suppliers – Low

Since it is a matter of plant production, the only supplier that is really important is the supplier of seeds and/or seedlings. For supplier we chose Herb Cottage an Australian company that has a high-quality seed. For each types of pharmaceutical plant, there are a number of varieties with different pharmacological properties, and it is crucial to choose a variety with an optimal pharmacological property. Suppliers who are in dominant position of raw materials can decrease the prices when buying in bulks, which will boost the company's revenue on the market. There are a lot of seed suppliers in the Czech Republic, making them available at all time. This allows the company to have a very low switching cost, that is close to zero, thus making the power of supplier, when it comes to bargaining, very low. The company has the ability to switch between different suppliers at any time and without any problems or losses.

Threat of new entrance – Low

The market developed barriers to entry include the learning curve needed in the industry, economies of scale, research and development, and innovation. The company can tackle this

threat of new entrant and by increasing its economics of scale, which will lead to a lower fixed cost per unit, allowing the company to produce without sustaining high costs. Moreover, the company will have already expanded its investing capacity into research and development which will make it hard for new companies to enter an established industry where its players define the standards regularly. In addition, the knowledge that is already in the industry will make it hard for new companies to catch up with that knowledge and start competing on the market alongside the existing companies.

Threat of substitute products or services – *Low*

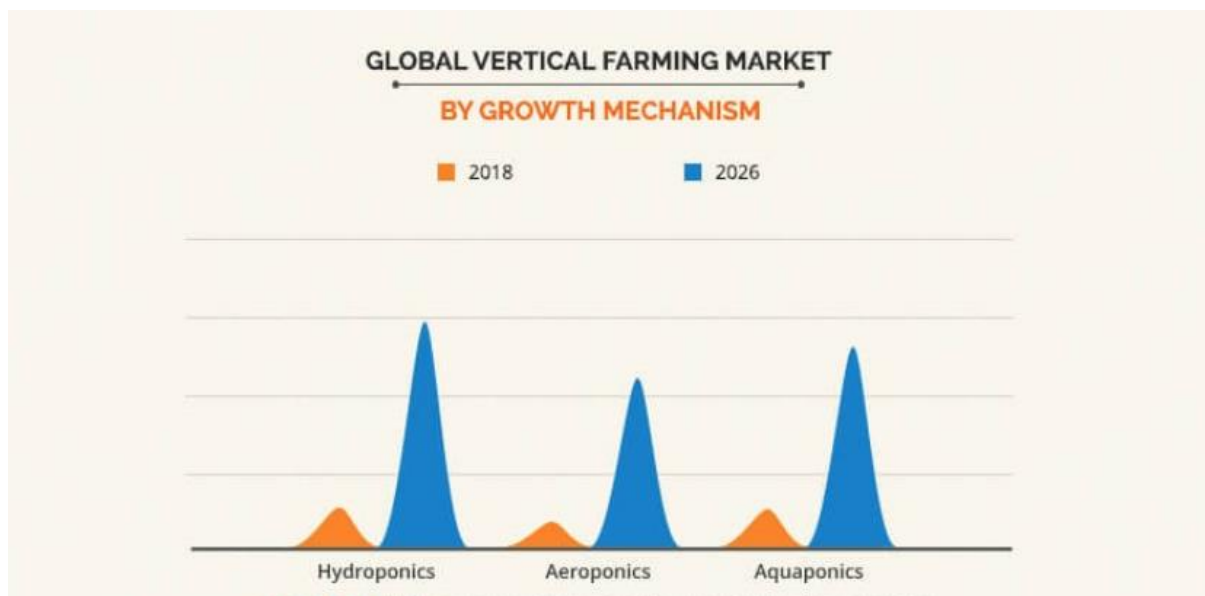
The main threat the company might have is if a new product emerges that have the same qualities as our product will have but uses cheaper and different methods. This means that a substitute product can be the same plants we offer with the same idea of less toxin and healthier to consume. But the company will be able to tackle the threats of substitute products by maintaining high quality products and services and try avoiding any usage of chemicals and stick to its values and use aeroponics systems for all its production. Furthermore, chemicals cannot be used to develop substitute products that can threaten the company because one of the main ideas behind aeroponics system is not using any type of chemicals to produce a high-quality product. In addition, the company aims to provide products that are totally unique compared other competitors and have the following qualities mentioned below, keeping in mind that the use of aeroponic systems allows for the use of less water and a more sustainable method of production which helps the environment as a whole and the emerging threat of abundant amounts of water.

- 100% utilization of the root/rhizome mass of the plant
- Genetic and phenotypic stability of the obtained dry mass,
- A much higher percentage of bioactive substances,
- Clean root mass without soil impurities, no toxic pollution from the atmosphere, without the intrinsic presence of heavy metals and pesticides from the soil
- Use of the leaves, flowers and fruits of plants of much higher quality is additional value
- Production of raw materials for the pharmaceutical industry all year round

Rivalry among the existing competitors – *Low*

The rivalry in the aeroponics farming industry within the Czech Republic is close to not even existing. After a close research on the Czech market, there are couple of farms, but they are focused on hydroponics which is a different sphere than aeroponics. For a hydroponics farm to change to aeroponics will cost the firm to invest into new technology and change the infrastructure of the farm, thus making it so easy for new companies to emerge and enter the market at the moment, and this will cause fierce competition at first until a significant outline of the market share emerges and this will allow the competition to fade. On the other hand, the aeroponics farming market is big globally and is expected to grow even more throughout the next five years as seen in the forecasted graph bellow. This makes the completion high at a global level at the current moment because of the new opportunities that are emerging.

Figure 12 Forecasted growth in Aeroponics farming market



Source: 25 (Vertical Farming Market Size, Share / Industry Trends and Analysis 2026, n.d.)

4.5 VRIO Analysis

As mentioned before, the VRIO analysis is mostly used within the companies as a tool to analyse the company's internal and external environment. This analysis looks into the companies' value, rarity, imitability and organization of a resource.

In fact, each resource is analysed separately from the below described four perspectives and thus can imply one of the following five possible competitive outcomes. It (i) offers sustained

competitive advantage, (ii) has an unused competitive advantage, (iii) has a temporary competitive advantage, (iv) has a competitive neutral or (v) has a competitive disadvantage. The VRIO analysis tries also to mention whether these resources could be improved to provide a greater competitive advantage. (B. Barney S. Hesterly. n.d, 2018). The company will be analysing three different resources including (i) Research and Development, (ii) Finance, (iii) Skilful workforce.

Skilful Workforce

V – This resource is one of the main aspects for a company to efficiently operate an aeroponic system. A skilful workforce is valuable to the firm because it enables them to grasp all potential opportunities and avoid all threats that may emerge in the future.

R – Aeroponic systems is a complicated system that needs a well-trained and knowledgeable individual to operate thus making the availability of the skilful workforce rare.

I – If the firm does not have a skilful workforce then it will face a cost disadvantage because it will not be able to obtain new technologies to develop its products. As mentioned before seeking for a skilful workforce in that field is hard to find making this specific industry hard to implement without having an experienced team.

O – In order to maintain a skilful workforce, the company have policies that are organised to support and exploit the value of an experienced team and show that it is hard to grow and expand into the market without a well-trained, oriented and experienced team.

Research and Development

V - This resource is valuable for the company because it exploits an environmental opportunity and helps the company develop its products and maintain a stream of high-quality innovation and surplus the customers' expectations.

R – This resource is currently in the hands of many competitors that have the ability to invest money in research and development. This implicates that this resource is not rare to obtain, thus accessible to us and to our competitors.

I – If a firm has no access to research and development it will face cost disadvantages and will have a hard time obtaining and developing new technologies. Thus, making it hard to reach economies of scale which will increase the production costs.

O – The company has an organised management system that allows it to process and structure all its resources and capabilities, thus allowing it to achieve the ultimate goal to sustain competitive advantage.

Finance

V – This resource is valuable because it might act as an opportunity but also might act as a threat. If the company has sufficient finance this will allow it to invest and expand on a fast pace thus allowing it to gain a market share. On the other hand, if finances are unattainable the company will not be able to operate efficiently in the beginning and this might make the company lag behind its competitors.

R – This resource can be controlled and attained by any company within the industry due to the availability of investors and the forecasted growth within the pharmaceutical industry as seen in *Figure 3*.

I – As mentioned before this resource is valuable because if the company has sufficient finance it will be able to expand and invest more. This makes it imitable because without this resource the company will face a huge cost disadvantage and will have a hard time developing its products and obtaining profits throughout the process.

O – The company has a well organised policy that allows it to organise its procedures to support and exploit the value, rareness and imitability of finance as a resource to the company.

Table 3 VRIO Analysis

	Research & development, financial & skillful workforce				
	Valuable?	Rare?	Hardly imitable?	Supported by organization?	Competitive implications
Skillful Workforce	YES	YES	YES	YES	Sustained competitive advantage
R&D	YES	NO			Competitive Parity
Financials	YES	NO			Competitive Parity

Source: 26 Author

4.6 SWOT Analysis

The following paragraph will illustrate the SWOT Analysis of the company. It will give a clear vision on the company's strengths and potential threats that may occur and how the company will react to minimising them and turning them into opportunities.

Figure 13 SWOT Analysis "Aeroponic System"



Source: Author

Firstly, we will start with the strengths, describing all the possible outcomes that our company can benefit from. Secondly, we will continue with the weaknesses and show all the imperfections that the company will need to solve in future. Thirdly, the company's opportunities, with them the company can work hard on achieving and transforming the opportunities into strengths. And finally, we have the threats and those are potential elements that might affect how the company operates in the future and harm its existence. All of those aspects are specified and explained bellow.

Strengths:

- High quality product

Having a product that differs from the customer by quality is a big advantage on the market and within the customers, as everyone is striving for a quality product every day.

- Whole year production

By having this advantage, the company can produce plants without having to worry about the seasonal factors as cold, heat or humidity, as with the usage of aeroponic system it allows the company to control the growth of the plants.

- Less water consumption

The company is set to use 98 % less water for production of high-quality plants. By doing so it helps the climate change and environment for lowering down the irrigation of water, and follow new trends related to sustainability.

- Less toxins and pastilles

By having a product that is clean from toxins and pastilles, the company will attract bigger pharmaceutical companies in the Czech Republic and in the region.

- Controlled environment

The aim of the controlled environment allows the company to produce a product protected and maintain optimal growing conditions from beginning to the end of the grow cycle.

- Environment Independent

Aeroponic system does not depend on the environment, this mean that the project can be installed on any area, which allows the company to produce any type of plant on any type of environment.

Weaknesses:

- High Investment on equipment

In order to produce our products on industry scale quantity it is connected to high initial investments for assets like equipment, machinery, land. This can slow down the early expansion as it relies on financing.

- Low reputation on the market

As aeroponic system is fairly new project idea, this may affect the company reputation by limiting the consumers on the market. But as the pharmaceutical market is growing and healthy life-style is becoming a trend, the company sees this as potential opportunity and a strength for the future.

Opportunities:

- Growing pharmaceutical industry

With the pharmaceutical industry growing, it gives the company an advantage for further expanding and advertising the products out of the region it operates in, and after this is applied, it will be counted as a strength for the company.

- Biological food trend

The world is yet into acknowledgement of the bio products, the market is slowly adopting to the new trends, people still choose price over quality, but not for long. The global organic food market is rapidly growing every year, and people are adopting slowly, and we can see that on the table below;

Figure 14 Bio-Market worldwide



Source: 27 (Organic Food Market Size, Share & Global Forecast 2022 | TechSci Research, n.d.)

- Expanding market for aeroponics system

Aeroponics is still new topic on the market and is expected to gradually increase in size thought the next decade as seen on the forecast labelled figure 7. The graph shows the forecast of vertical farming (aeroponics, hydroponics, etc) in 2018 and 2026. The global vertical farming market has been steadily growing over the last years as population sizes increase and living in urban cities become more popular. In 2018, the vertical farming market reached some 2.23 billion U.S. dollars, but the

market value is expected to increase to 12.77 billion U.S. dollars by 2026. The vertical farming will increase mainly due to the following factors:

- Reduction the need for additional space
- Increase of the popularity of organic food
- Global Climate change
As global climate change is expected to accelerate, the risk of agriculture production rises, as most of the farmers use big amounts of water to grow their products, the company counts this as an opportunity because with the aeroponic system that it uses it decreases the water consumption.
- Certification of aeroponics as organic
Aeroponic system is not yet labelled as organic, but in near future it is expected to be certified as organic, which will allow the company to boost up the price of their products and plants. This guarantee profits for the company in the future and potential for expansion.
- Trend of healthier lifestyles
Healthy lifestyle is becoming a trend as seen in figure 12. This acts as an opportunity for the company because one of its main qualities is producing healthier products for its consumers. Having a trend in this sphere could potentially mean more sales for the company in the future.

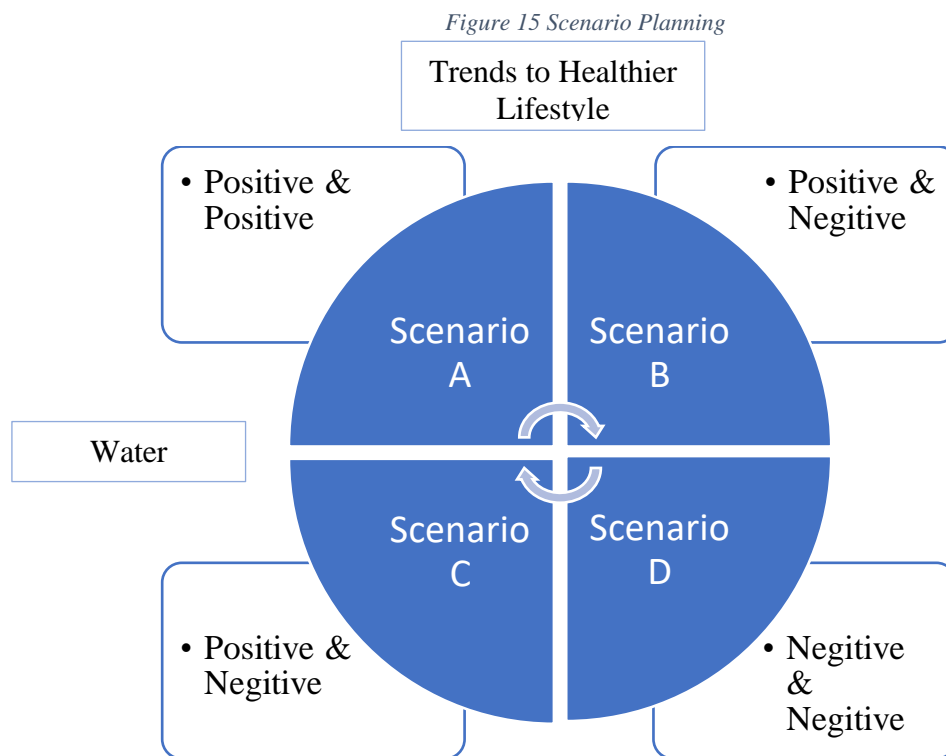
Threats:

- Price over quality
One of the biggest drawbacks on the market is and will be that certain types of market groups will always choose lower price for the product rather than choosing a quality product and pay bit more.
- Market Limit
By market limit we can say that, as soon as the farmers and bigger companies realise the revenue they can make in annual calendar with the usage of aeroponics system, the market will become crowded for an expansion.
- Diminishing quality
When the company is certified as pharmaceutical production industry, the quality of the products must be maintained at high standards to ensure the strength of the active

ingredients, quality and purity of the final product. The company cannot diminish the quality of the product to lower the price on the market.

4.7 Scenario Planning

In order to identify and achieve a relevant scenario planning analysis that will help the company see how it might be affected in the future; the business identified two driving forces to guide the analysis. To begin with, as a start-up, the company have researched and understand the market condition in the Czech Republic. The company identified the first uncertain aspect to be the availability of water in the region and secondly, the trends of healthier lifestyles leading to the trend in purchase in bio products.



In each scenario plan there are four different outcomes making up four different scenarios. Firstly, **scenario A** will consider the best-case scenario with two positive outcomes. The company will consider the abundance of water and that farmers are suffering to gain the right amount of water to be able to operate and produce. It will also consider that consumers are turning to more bio-friendly and healthier products thus allowing for the expansion in this specific market. Secondly, **scenario D** will assume the worst-case scenario with two negative outcomes on both driving forces. The company will assume that there is enough water for the

farmers and it is not abundant anymore in the future. It will also consider that the trend in bio-friendly products and a healthier lifestyle is not increasing, thus making this specific market decrease in size. Thirdly, **Scenario B** will assume one positive outcome for one driving force and one negative outcome for the other driving force. The company will assume that the amount of water will gradually decrease and in the future, there will be an abundance in the water supply, but on the other hand, the trend in bio-friendly and healthier products will be non-existent or decreasing thus, acting as a negative for the company. Finally, **scenario C** will also assume one positive outcome for one driving force and one negative outcome for the other driving force, but it will be the opposites of scenario B. In this scenario, the company will assume that the amount of water in the future did not decrease but actually became available for normal traditional production with the use of large amount of water, this will act as a negative for the company, but on the other a hand, the company will assume the trend in bio-friendly and healthier products increases, allowing for an increase in the size of that specific market.

4.8 Marketing Plan

4.8.1 Project Strategic marketing

Segmentation, targeting, positioning

As mentioned before, the global aeroponics market and pharmaceutical market is rapidly growing and it will grow in the future, and by knowing this the company has the ability to further research and gradually start targeting different markets and different regions.

The company will focus on two main segmentation market groups. Firstly, with large pharmaceutical companies in the Czech Republic and the region. This is a priority group because it provides a higher level of product finalization. Considering the fact that the product will have superior quality compared with competition, the company will undoubtedly be interesting for this market segment. For the first market segment, the company's idea is to interact with pharmaceutical companies registered for the purchase and export of medicinal herbs in the Czech Republic. Companies legal for this market in the country counts 59, and for the future period all other companies from the region. As for the customers who implement other, same or similar systems can all be potential investors who would like to invest in the company production facilities, or to invest in their own where the company would be their

contractor. (*Biotechnology Pharmacy Info: List of Pharma Companies in Czech Republic, n.d 2020.*)

Secondly, if the first segment market group as we mention big pharmaceutical companies in the Czech Republic is harder to enter in the beginning, the company will focus on smaller companies registered for purchase and export of pharmaceutical plants in the Czech Republic. The aim for the second market group would be mostly used to promote the company's high-quality products on the regional market and wider in the markets of EU, to attract the big pharmaceutical companies' attention.

Furthermore, the company will target two different market segmentation to further examine the market and make sure that it reaches the intended consumer and the right market. These segments include those criteria: demographic and geographical elements only because the company operates at a B2B scale and does not require the use of any other criteria.

Demographic – this market segment is the most popular type of market segment criteria used. Our company is operating at a B2B capacity, so it will look at two different elements when it comes to this criterion. Firstly, the company size, the company will be targeting big pharmaceutical companies along with big food supplier with its idea. The main reason for this is that one of the main objectives is to reach a big number of people and start raising awareness about the environmental issues occurring along with the lack of water that currently exists in the Czech Republic. In addition, the company aims to show others that they use of aeroponic systems will allow it to produce the products in a healthier and more sustainable manner. Secondly, the industry, as mentioned before, the company is mainly targeting the big pharmaceutical companies to sell its products and reach the final consumer. Which means the main target is the pharmaceutical industry. Moreover, the company will focus on attitudes, which is one of the main aspects the company will look at when identifying an enterprise marketing manager to target a specific market. The manager should meet specific attributes like the same values and goals that the company has, along with the same motivation to reach a specific lifestyle and priorities the important aspects Aeroponics system will offer to the market.

Geographic – when dealing in B2B capacity and only focusing on big pharmaceutical companies, geography is not a big problem because it is easy to reach the company due to its

size and availability in different areas. The company will start its operation in the Czech Republic and it will analyze the pharmaceutical market within the region. This will help in identifying the most important and big companies and gradually help in reaching a bigger audience within the EU. In addition, the company will target the biggest pharmaceutical companies in terms of high purchasing habits and high spending habits. This will ensure the ability to survive and guarantee gradual profit in the future.

4.8.2 Project Tactic marketing

4.8.2.1 Product

By having this innovative idea, not only the company is environmentally friendly, but it also decreases the usage of water. “According to AgriHouse (leading agrobiological company united with NASA), growers choosing to employ the aeroponics method can reduce water usage by 98 percent” Richard Stoner (1997), in addition, the company delivers high quality products that differ from normal traditional rooting. With the usage of the aeroponic system, the company’s product can be used 100% from root to rhizome, the product will contain a much higher percentage of bioactive substances with no soil impurities and no toxic pollution from the atmosphere, and all pesticides from the soil are being avoided. Last but not least with the usage of glasshouses the production of raw materials for pharmaceutical industry will be all year round. By having these benefits, our products will have a competitive edge over our competitors on the market.

4.8.2.2 Price

In order to attract more consumers and big pharmaceutical companies, the company is flexible when it comes to pricing and offers a wide variety of payment methods such as small down payments or instalments. When a consumer or a big pharmaceutical company orders a big batch of pharmaceutical plants the company has a pricing tactic that will allow the customer to pay a down payment and the rest in instalments. Another pricing tactic will be offering lower prices for a bigger batch and the availability to pay in instalments without paying down payment. All of the mentioned payment methods will be organised to make revenue, but still to respect to other competitors on the market.

4.8.2.3 Promotion

Promotions is the part of marketing that specifically involves communicating company or product information to targeted customers. The three methods of promoting are advertising, public relations and personal selling plus the digital/interactive method as a new technique, that emerged in 21st century. Firstly, advertising, by advertising the company is planning to put advertisements and reports in the agriculture and pharmaceutical magazines. Secondly personal selling, the company wants to organize workshops and personal meetings with farmers and pharmaceutical experts to present them the firms' products and also sign the company to participate in agriculture and pharmaceutical fairs. Finally, digital interactive, as final approach will be using and creating social channels such as Facebook and YouTube to present our company with joining to existing pharmaceutical and agriculture groups.

4.9 Financial Plan

4.9.1 Project Founding budget

The financial sources with which the budget will be created originate from the two primary sources. Firstly, a complete technological solution for the implementation of the aeroponic system for the protected cultivation of pharmaceutical plants at industrial scale. After successful completion of the project, the company will seek financing for the implementation of this system. These finances will be mainly generated from personal savings, accounting to 10.000EUR and a bank loan. The company will request a loan from the bank in amount of 150.000EUR for a duration of 5 years with an interest rate of 3.5% (*Czech Republic - Lending Interest Rate - 1993-2019 Data / 2020 Forecast, n.d.*). This is also represented accordingly in the cash flow, and the loan plan can be seen in the appendix 7.5.

The second goal is after 5 years, the company will extend the services and additionally start with the sale of the technology know how) to potential customers. The realization of this goal will be after the system implementation, when potential investors will be able to see the fully operation system and how it works in full scale. The "Know-How" program will act as a second buffer for the company to make sure that in any case if the first plan fails the company can still maintain operation on the market without losing its market share.

4.9.2 Project Sales forecast

For this project we chose the plant Valeriana as it has the biggest demand on the market. Valeriana plant is used in the pharmaceutical industry for relaxation and stress relief. The current price of Valeriana (*Valeriana officinalis*) and Dandelion (*Taraxacum officinale* L.) is about 30 EUR per kilogram dry mass. The prices for the plants and seedlings were obtained by doing a research on the internet and thus comparing various *sources* (*Valerian Root 1kg (Buy Whole Foods Online Ltd.): Amazon.Co.Uk: Grocery, n.d.*); (*Order Organic Valerian Root Cut Online / Naturteyl ®, n.d.*); (*Organic Herb Trading Company - Price List, n.d.*). Additionally, the author did a consultation with an expert on aeroponics Prof. Dr Oliver Iliev. It was decided on the average price of 30 EUR per kilogram dry mass of Valeriana, considering the fact that the company will buy large quantities starting from 7000kg for the first year and increasing the quantities in the following years. However, it is very important to note that the price of Valeriana varies due to different factors, and this is something of high importance for the business and its future operations. For this business plan and its time period of 5 years, we take the average and minimum price of Valeriana which is 30 EUR, so that in a worst-case scenario the minimum profit is obtained. With expected 4 kilograms of Valeriana dry root mass per 1 m² per year and 7kg of dry mass per m² in the area of 1 decare (as predicted to be in the first stage of industrial production), the revenues in the first year can reach 210,000 euros. It should be emphasized that this is a conservative price estimate due to the following reasons. The obtained dry root mass will be of uniform quality, environmentally clean, and with a higher percentage of bioactive substances per unit mass. For both, the Valeriana and the dandelion leaf are also usable, which is an added value. There is also a range of other pharmaceutical plants that are more expensive on the market and switching from one culture to another is without additional costs.

The production of Valeriana Officinalis has 4 phases before it is ready to be sold, phase 1 (day 1 to 12) is where the seeds are planted into rockwool cubes 3x3 cm and can be grown up to 900 plants per m², phase 2 (day 13 to 25) plants are rearranged with bigger distance and you can grow 400 plants per m², phase 3 (day 26 to 35) 100 plants per m², and last phase 4 (day 36 to 60) is the last phase where the plant is ready to be sold.

These phases are important part of the project sales forecast, because it helps the firm to arrange production to be time shifted so during last 35 days of final production the firm can already prepare next cycle for production, which means the company will have profit starting on from first month.

With the parallel improvement of the system's performances and additional investment in increasing capacity, the number of units sold is projected to increase between 10% and 15%, and it is expected in the end of the fifth-year production of 10,000 kg dry mass. The company plans in the beginning to start with a greenhouse of 1000m².

Furthermore, the company plans to employ 11 people, of which 1 ICT expert, 1 Sales Manager and 7 Agriculture field workers. The company will also acquire two contracts labour professional pharmaceutical specialists who will check the water quality and make sure that the system is always ready for production of highest quality plants. The amount of wages on a monthly basis is represented in table 4 below.

Table 4 Wages

Position	Monthly salary (EUR)	# of Workers	Total (EUR)
ICT Expert	2,900	1	2900
Sales Manager	3,000	1	3000
Agriculture Field Worker	530	7	3710
Contract Labour - Specialist 1	1,000	1	1000
Contract Labour - Specialist 2	500	1	500
Total	7,930	11	11,110

Source: 29 (Salaries, Czech Republic - Platy.Cz, n.d.)

Table 5 5 Year Income Statement by Function Financial Forecast

Years		Year 1	Year 2	Year 3	Year 4	Year 5
Total Revenue		210,000	240,000	270,000	300,000	360,000
kg of dry mass sold		7,000	8,000	9,000	10,000	12,000
Price per unit		30	30	30	30	30
List of Expenses						
Manufacturing Expenses	COGS	11,700	13,455	15,473	17,794	20,463
	Field workers & Contract Labour Wages	59,520	64,282	70,067	77,074	84,781
	Utilities (65%)	5,000	5,500	6,000	6,500	7,500
	Rent (70%)	1,820	2,300	2,600	3,000	3,500
	Maintenance	4,800	5,500	6,000	7,000	9,000
	Depreciation	13,035	26,070	26,070	26,070	26,070
Gross Profit		114,125	122,893	143,790	162,562	208,686
Distribution Expenses	Sales Management Wages	36,000	39,600	43,560	47,916	52,708
	Marketing Expenses	5,000	8,000	10,000	13,000	15,000
	Rent (15%)	390	480	550	650	800
	Utilities (5%)	400	480	550	600	700
	Office Equipment & Supplies (50%)	3,250	1,500	1,500	1,500	1,500
Total Distribution Expenses		45,040	50,060	56,160	63,666	70,708
Administrative Expenses	ICT Expert Wages	34,800	38,280	42,108	46,319	50,951
	Notarization of Documents & Legal expenses	1,100	500	500	500	500
	Utilities (30%)	2,400	2,400	2,400	2,400	2,400
	Rent (15%)	390	480	555	720	720
	Office Equipment & Supplies (50%)	3,250	1,500	1,500	1,500	1,500
Total Administrative expenses		41,940	43,160	47,063	51,439	56,071
Operating Profit		27,145	29,673	40,567	47,457	81,907
Loan & Interest Expense*		24,310	26,145	26,142	26,138	28,312
EBT - Earnings Before tax		2,835	3,528	14,425	21,319	53,595
Income Tax Expense (19%)		539	670	2,741	4,051	10,183
Net Income/Profit after taxation*		2,296	2,858	11,684	17,269	43,412

Source: 30 Author

The purpose of the financial forecast is to obtain additional information about the business model of the company, but also to get an insight into the expected revenue/profit in the mid and the long term. Main things to mention about the forecast is that for the calculations a greenhouse of 1000m² is taken into consideration. The average dry mass per m² of Valeriana is 7kg per year and the Valeriana price on the market is 30 EUR per kg of dry mass. In the appendix 7.3 and 7.4 can be found the optimistic and pessimistic scenarios as well, on how the company will act in worst case and best-case scenarios. The optimistic scenario was calculated as 15% growth of the total yearly production of Valeriana as calculated in the sales forecast. For the pessimistic scenario an increase rate of 0.95% was considered. Also, the wages for the employees are expected to have annual growth of 10%, starting from the second year

For the project purposes the income in the business is separated in two parts:

- **"Total Revenue"** - The way that the total revenue is calculated is by multiplying the price for Valeriana which is 30 EUR, with the expected sale for the first year of 7000kg of dry mass. The number of units sold every year is increasing between 10% and 15% per year. This is because of improving the know-how (e.g. usage of better vitamins and minerals), better variety of plants (different types of Valeriana) and better process optimization.
- **"Gross Profit"** – The Gross Profit is calculated as a difference between the total revenues and COGS (Cost of goods sold).

On the second section the expenses are divided into three categories, to start with the **"Manufacturing Expenses"**, the second category is the **"Distribution Expenses"** and the third one is the **"Administrative Expenses"**. The **"Manufacturing Expenses"** is calculated as an expense the business incurs through its normal business operations. Whereas the **"Administrative Expenses"** are more of expenses that the organisation incurs, which are not directly tied to a specific function, e.g. manufacturing, production or sales.

The **"Manufacturing Expenses"** includes the following:

- **"COGS"** - Cost of goods sold are calculated as all of the raw materials and supplies used to create the final product, such as; seeds, nutrition commercial (minerals), disease diagnosis (Phytosanitary Control), water quality diagnosis, water treatment, cold storage. For the total value of COGS for the first year is calculated as follows; for seeds calculated as **6250 EUR**, for nutrition commercial (minerals for the water) **1250 EUR**, disease diagnosis (Phytosanitary Control) **1500 EUR**, water quality diagnosis **400 EUR**, water treatment **800 EUR**, and for some plants that need to be placed in cold storage, the expenses are **1500 EUR**. For further detailed explanation please refer to (table 6) variable costs forecast.
- **"Wages - Agriculture field workers"** – The labour that is directly involved in production of the product. The company will employ 7 field agriculture workers in total. The monthly salary for a worker is **530 EUR**.
- **"Rent & Utilities"** – The rent and utilities for the manufacturing expenses account for the highest percentage in comparison to the other two categories and this is because the business is using the system for production including the most use of electricity and

land for the greenhouse. Under rent, it was calculated the land for placement of the greenhouse. For the future, as the business grows it is planned that the company buys its own storage place. Due to the constant usage of the pumps which is required to maintain moisture for the system the utilities expenses are higher. Furthermore, the water level is also high because the water needs to be regularly changed in order to maintain perfect balance of nutrition solution. Here is an overview of the calculations made for the utilities more precisely water and electricity for the greenhouse:

- **Electricity:** In total for the greenhouse, 4 pumps of 1kwh are required, accounting to a total of 96 (4x24) kwh on a daily basis. For the first year this leads to a total electricity consumption of 35,040 kwh. Additionally, the average electricity price for business in the Czech Republic for 2019 is EUR 0.08. To sum up, the total expenses for electricity for the first year are EUR 2,800 (96kwh x 365 days x EUR 0.08). (*Czech Republic Electricity Prices, December 2019 / GlobalPetrolPrices.Com, n.d.*)
- **Water:** In total for the greenhouse the water expenses are calculated at EUR 2200. This calculation was based on the following details, water consumption on a daily basis of 3t (=3m³) and average price of water for business in 2019 in the Czech Republic of EUR 2,00. (*Water Price for Year 2019 - Severočeská Vodárenská Společnost a.s., n.d.*)
- **“Maintenance”** – The maintenance expenses are included as well. These expenses are mainly calculated for the greenhouse and the system maintenance. These are required to ensure a proper functioning of the system and it considers repairs as well on pumps and filters if necessary.
- **“Depreciation”** – Depreciation is calculated on the initial investment seen in the fixed costs table, and it is included in the income statement. For the first year the depreciation is calculated as 0.11% of the total fixed costs, starting from the second year the depreciation is calculated with 0.22%. (*2020-02-18-Tax newsletter Czech republic, pdf, n.d.*)

Under **“Distribution Expenses”** the business included the following;

- **“Wages - Sales Management”**- The employee who is responsible for designing and implementing a strategic sales plan that expands company's customer base and ensure its

strong presence. The company will employ one sales manager and his/her salary will be **3000 EUR** on a monthly basis.

- **“Marketing Expenses”** - Under marketing expenses are calculated all of the expenses in regard to the advertising and promotion of the firm. After the first year, an increase of these costs is predicted as the company is planning to expand and grow further within the EU.
- **“Office Equipment & Supplies”** - For the office equipment the company is planning to invest in couple of computers to setup and control the system itself alongside with some printers, desks and materials like uniforms, scissors and all of the handheld tools that are mentioned in the table 7.
- **“Rent (15%)”** – Here the rent accounts only for 15% of the total rent expenses as it is only calculated for the rent of storage room with products ready for distribution and sale.
- **“Utilities (5%)”** – The utilities in this expense group are accounted only for 5% as here it is only taken into consideration the costs for electricity and water for the storage room.

For the **“Administrative Expenses”** the business included the following;

- **“Wages - ICT Expert”** - Specialists are defined as persons who have the ability to develop, operate and maintain ICT systems and for whom ICTs constitute the main part of their job. The plan is to hire one ICT (Information and Communication Technology) Expert with a monthly salary of **2,900 EUR**
- **“Legal Expenses”** - In terms of legal expenses, the following expenses are considered for the first year. **Notarization of documents**, when setting up a company, the company’s documents will have to be notarized at a public notary, which imposes a fee in accordance with the value of the capital. For this business plan the initial capital is 130.000 EUR to which a fee of 0.6% applies, leading to an expense of **780 EUR**. Additionally, the company name has to be registered in the Registrar of Companies and this costs **250 EUR**. And last of the legal expenses is the **Notarization - Articles of Association** which are written rules about running a company that rules are agreed with the shareholders, directors and company secretary which costs **75 EUR**. In total the legal expenses for the first year, when setting up the company are **1.100 EUR**. These expenses are the legal expenses which the law requires in the Czech Republic to have for the company to be functional and certified as legal. For the next four years, an expense of 500EUR is calculated for the legal fees i.e. costs that may occur for the standard legal procedures and fees for running a company.

- **“Utilities (30%)”** – In this utility group the following expenses are calculated: electricity, water, internet, phone i.e. all of costs related to the office. A monthly price of EUR 200 in total was taken into account.
- **“Rent (15%)”** – Here the 15 % are calculated as a rent for the office for the sales management, where the meetings will take place with the customers.

4.9.3 Project Expenses

The project expenses are calculated as fixed and variable costs, starting with the fixed costs that include the following: initial infrastructure, aeroponics module, equipment and materials. As for the variable costs the company will include: inputs, diagnosis, maintenance and cold storage. A detailed explanation of how the expenses were calculated and what was taken into consideration follows below.

Regarding the expenses, the author did a few consultations with Prof. Dr Oliver Iliev who already has created an Aeroponics system in Skopje, Republic of Macedonia, and who already has an extensive knowledge in this area. Furthermore, a research paper on technical and economic analysis of aeroponics in Latin America (*Mateus et al., 2013*) was taken as a blueprint for the fixed and variable costs. Summarizing this and taking into consideration prices and other factors in the Czech Republic, the following expenses were created and described in the tables below.

Table 6 illustrates the variable costs in detail that may emerge throughout the process of implementing the aeroponic systems and making them go into operation. The forecasted inputs are relevant for a greenhouse of the size of 1000m² and are the most important inputs to get the system operational. Those are costs that are changing according to the production level and for our aeroponics system following costs were taken into consideration;

- **“Plants Seedlings”** – Quality seeds ready for production.
- **“Heating/Cooling”** – As the plants are sensitive to so called “plants stress” the temperature is a crucial part to growing the proper healthy plant. With this heating and cooling systems, an industrial air conditioner will be provided which is powerful enough to heat up the whole greenhouse and produce the needed temperature for the plants and cool the air in summer if needed.

- **“Commercial nutrient solution”**- These are all of the minerals and nutrients who will be added to the water. The minerals and nutrient amount depend on the quality of the water.
- **“Phytosanitary treatment”** – Phytosanitary is a procedure that uses ionizing radiation that cleans the pests and insects from the plants and water.
- **“Disease diagnosis”** – Identification of a nature of an illness or problem in the plants.
- **“Cold Storage”** – Some types of plants need cold storage to keep the rhizome and the dry root to the quality needed.
- **“Wages - Contract Labour”** – In this category contract labour, the company will hire 2 pharmaceutical specialists who will come once a month to check the system. One of them will be with the company for 9 months with a monthly salary of 1000 EUR and the second one will be with the company for 12 months and will be paid 500 EUR per month.

Table 6 Variable cost forecast

Inputs	Value per season (Euros)
Plants seedlings	6,250.00
Heating/Cooling	4,200.00
Commercial nutrient solution	1,250.00
Miscellaneous elements	700.00
Water treatment	800.00
Phytosanitary treatment	500.00
Disinfectants	300.00
<u>Sub-Total</u>	14,000.00
Diagnosis	
Diseases diagnosis	1,500.00
Water quality diagnosis	400.00
<u>Sub-Total</u>	1,900.00
Maintenance	
Maintenance of equipment	3,000.00
Maintenance of infrastructure	1,800.00
<u>Sub-Total</u>	4,800.00
Cold Storage	1,500.00
<u>Sub-Total</u>	1,500.00
<u>Contract Labour</u>	
Contract Labour wages	15,000.00
<u>Total</u>	37,200.00

Source: 31 (Variable Costs for One Season of Aeroponics Production, n.d.)

As seen below on table 7, these are the fixed cost forecasts that will emerge in the beginning phases. Those fixed costs include the most relevant items that any start-up needs to start its

operation; along with some essential items needed specifically for the implementation of a high quality aeroponic system.

The fixed costs (table 7) are the costs that are fixed, and these costs do not change with an increase or decrease in the amount of goods or services produced;

- **“Greenhouse”** – The greenhouse is the infrastructure in which the aeroponic system will be placed and it is counted in the cash flow as “capital purchase” including all of the initial infrastructure related to it. Those are costs that incur in the beginning of the business.
- **“Nutrient mixing subsystem”** – Every other plant has its own requirements of nutrition base. As the plant is young and in early process it needs more minerals for a proper and healthy growth, when the plant is in late process it needs less minerals, this system is called “uptake capability”.
- **“Irrigation subsystem”** — Also a system which needs to be super precise in the amount of water needed for the plant. The plants are sensitive to the amount of water needed for growth, as mentioned before it creates a stress for the plant which slows the process of growth. The amount of water needed depends on the; temperature in the air, RH in the air, type of the plant and the strength of the PAR (Photosynthesis active radiation).
- **“Automation”** – Automatic equipment that will be used for production in the greenhouse, mostly filters, pumps and tools to help fasten the process.
- **“Aeroponic pots”** – Also known as rockwool cubes. These are specific cubes for aeroponics plants that help the root to grow in between them, as seen on picture 10.
- **“Handheld pH meter, EC meter, Temp/RH meter, O₂ meter and CO₂ sensor”** – These are all handheld meter tools that will help the company to have the perfect substance of minerals, nutrition, temperature in the air and etc. It follows a brief description of these tools.
 - **Handheld pH meter** – It is a scientific instrument that measures the hydrogen-ion activity in water-based solutions. It indicates the level of acidity/basicity in pH. One of the main uses of this instrument is for quality control.
 - **EC meter** – Electrical conductivity meter is a tool that measures the electrical conductivity. This tool is mainly used in systems such as hydroponics,

aeroponics, aquaculture and aquaponics with its aim of monitoring the level of nutrients, salts or impurities in the water.

- **Temp/RH meter** – These tools measures the level of relative humidity (RH), which is the amount of water relative to the maximum at a particular temperature.
- **O₂ meter** – Or also oxygen sensor is a tool which measures the level of oxygen O₂ in the analysed gas/liquid.
- **CO₂ sensor** – Carbon dioxide sensor is a tool which measures the level of carbon dioxide. This is important to measure and monitor the air quality indoors.

Table 7 Fixed costs forecast

Item	Unit Value (Eu)	Units	Total Value (Eu)
Initial infrastructure			
Greenhouse	30,000.00	1.00	30,000.00
Heating/Cooling subsystem	18,000.00	1.00	18,000.00
Nutrient mixing subsystem	9,000.00	1.00	9,000.00
Irrigation subsystem	12,000.00	1.00	12,000.00
Automation	25,000.00	1.00	25,000.00
Sub-Total			94,000.00
Aeroponics module			
Aeroponic tubes (m)	2.50	4,000.00	10,000.00
Aeroponic pots	0.25	20,000.00	5,000.00
Line pumps	20.00	150.00	3,000.00
Reservoirs	20.00	100.00	2,000.00
Sub-Total			20,000.00
Equipment			
Handheld pH meter	80.00	2.00	160.00
Handheld EC meter	80.00	2.00	160.00
Handheld Temp/RH meter	150.00	2.00	300.00
O ₂ meter	600.00	1.00	600.00
CO ₂ sensor	450.00	1.00	450.00
Sub-Total			1,670.00
Materials			
Uniforms	25.00	10.00	250.00
Ozone disinfection	4,500.00	1.00	4,500.00
Plastic bags	0.50	1,000.00	500.00
Plastic applicator	8.00	100.00	800.00
Plastic recipients	25.00	5.00	125.00
Buckets	5.00	20.00	100.00
Scissors	5.00	10.00	50.00
Sub-Total			6,325.00
Utilities			
Water (Greenhouse, m3)	2.00	1,095	2,200
Electricity (Greenhouse, kwh)	0.08	35,040	2,800
Remaining utilities*			2,800
Sub-Total			7,800.00
Legal Expenses			
Notarization of Documents & Legal expenses	1,100	1	1,100
Sub-Total			1,100.00
Wages			
Field Workers	3702	7.00	44,400
ICT Expert	2931	1.00	34,800
Sales Management	3043	1.00	36,000
Sub-Total			115,200.00
Total			246,095.00

*Remaining utilities include; water, electricity, internet for the office and storage.

Source: 32 Author

4.9.4 Project Cash flow plan

As seen in appendix 2, the cash flow statement has been conducted and all of the cash flowing in and out of the business have been included and forecasted for the next 5 years.

Keeping in mind that the “Cash on hand” at the beginning of the first month consists of 150,00-euro loan granted to the company along with a 10,000-euro owner contribution

The cash flow is divided into three different sections including; cash receives, cash paid out and other operating data.

The first section is sub-divided into; cash sales, loan proceeds and owner contributions. When added up, those aspects sum up to total cash receipts and the total cash receives when added to cash on hand at the beginning of each month gives the company a clear idea on how much cash is available in total.

The second section is sub-divided into; marketing, contract labour, interest expense, materials and supplies (in COGS), office expense, rent or lease: (land, vehicles, equipment), maintenance, legal expenses, utilities, wages, loan principal payment, capital purchases, and other start-up costs.

To begin with advertising, this sum up to 500 euros for the first two months but then gradually decrease to 400 euros for the rest of the year because at the beginning the company will spend more on advertising its product and then gradually decrease its spending after the first two months. Secondly, the element pointed out as “Contract labour” is defined as workers that specialise in specific technical work or are workers that work part time for the company. Thirdly, the section “Wages” differ than the section “Contract labour” because those are specifically full-time workers rather than part time specialist. The number of workers the company is planning to hire is 11 from which whom 7 will be field workers and will be paid the minimum wage, there will be one ICT expert and one sales management. Fourthly, the section “Interest expense” is the interest that we have to pay back to the bank. Fifthly, the section “Materials and supplies (in COGS)” is all of the raw materials that will be used to produce the final product. Sixthly, under the section “Office expense” are all of the materials that will be needed in the offices in the company. Seventhly, the section “Rent or lease” is the land that the company will rent for the placement of the greenhouse including the rent of the office and storages. Eighthly, under section “Maintenance” are all the costs that will occur for maintaining the system. Ninthly, the section “Legal Expenses” under this section its all of the

expenses for the legal documents that we might need. Tenthly, the section “Utilities” are all of the utilities such as water and electricity. Finally, the section “Capital purchases” is connected to the costs in table 7, these costs are essential for the company to start operating. Seventhly, the section “Other start-up costs” are the remaining costs that the company will incur throughout its first three-month operation.

All the sub-sections mention in section two sum-up the total cash paid out and finalise the cash flow balance at the end of each month and at the end of each year.

4.9.5 Payback Period

To calculate the amount of time the company will need to recover the initial investment (capital purchase) of 118,500EUR for the system is found by the payback formula. The payback period is found by dividing the initial investment by the company, the cash flow annually, in the company’s case is a time period of 5 years and at discount rate 10%. The shorter the period of the payback the more desirable the investment will be. More detailed information about the company’s annual cash flow and total initial investment can be seen on the Appendix on 7.2.5. On the table below, we can see that in the second year the initial investment of the owner will be paid back. The calculation for the DCF (Discounted cash flow) the following formula was used:

$$DCF = CF * PVF$$

Table 8 Payback Period Analysis

Year	CF	NCF	PV Factor	DCF	CCF
0	€-118,500	€-118,500	1	€-118,500	€-118,500
1	€46,484	€-72,016	0.91	€42,258.18	€-76,241.82
2	€73,010	€994	0.83	€60,338.84	€-15,902.98
3	€110,440	€111,434	0.75	€82,975.21	€67,072.23
4	€153,977	€265,411	0.68	€105,168.36	€172,240.59
5	€232,835	€498,246	0.62	€144,572.22	€316,812.81

Source: 33 Author

It follows an explanation of the abbreviations in the table;

- **CF** - Cash flow (The values are taken from the appendix 7.2.5)
- **NCF** - Net cash flow
- **PV factor** – Present value

- **DCF** – Discount cash flow
- **CCF** – Cumulative discounted cash flow

5. Conclusion

The main goal of this thesis is to pursue the knowledge and create a start-up idea on how to write a business plan and to validate a business idea. The business plan in this thesis will illustrate the start-up of a pharmaceutical plant farm which will use the aeroponics system in the Czech Republic that will produce high quality products and in the same time help the environmental problems by reducing the usage of water by (98%).

In the theoretical part a research was conducted using many resources about business strategy planning, marketing and financial planning and analysed the most important and relevant ideas. The thesis explains the modern approach towards farming by the use of different methods such as soilless farming that can be implemented by the use of aeroponic systems. The thesis discusses the design principles and describe a various frameworks and tools that should be used to build a business strategy for a start-up company.

Based on the practical part that was placed together and in which the business was closely analysed from many angles. Findings have been concluded throughout the study of the external and internal analysis of the environment and the results formed a SWOT analysis in which different outcomes were used to finalise different scenarios by conducting a scenario planning diagram.

Through the SWOT analysis the company was able to understand that its biggest threat is “Price over quality” which can affect the profits and the success of the company. Secondly, the main weakness of the company is “High investment on the equipment” meaning that for high quality products it is needed high quality equipment and an experienced team. Thirdly, talking about the most major opportunity the company can use is the ongoing “Growth in the pharmaceutical industry” with this the company will be able to expand and find more investors on the market. Finally, the most important strength the company possess it is “Less water consumption” by this the company cuts 98% usage of water compared to a traditional way of production of plants without the usage of aeroponics system.

The financial part helped to understand the business as much is possible using precise analytical perspective and to discover some important facts about the convenience of developing a system for soilless production of pharmaceutical plants. In reality is difficult to predict all future events and parameters fluctuations, so the author used previous knowledge regarding this technology and current trends. By developing this business plan,

it was able to prove that this advanced cultivation technology can help in many different ways and especially in production of pharmaceutical plant on ecological way. The author is satisfied with all the findings and will continue to work on developing and innovating further plans to implement the whole project in the future.

By developing a business plan for this project, it was able to prove that the concept of this modern farming method will help in so many different ways and most importantly shed light on the global issue of water scarcity. The author is satisfied with all the findings and will continue to work on developing and innovating further plans to implement the whole project in the future.

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7. APPENDICES

7.1 List of Pharmaceutical herbs used in Pharmaceutical Industry

Latin name	Common Name	Parts used in pharmaceutical industry
<i>Actaeoracemosa</i>	Blackcohosh	Root and Rhizome
<i>Anemopsis californica</i>	Yerbamansa	Root and Rhizome
<i>Angelica archangelica</i>	Angelica	Root and Herb
<i>Angelica atropurpurea</i>	Angelic	Root and Herb
<i>Angelica sinensis</i>	Angelica	Root and Herb
<i>Arctium lappa</i>	Burdock	Root
<i>Arctium minus</i>	Burdock	Root
<i>Astragalus membranaceus</i>	Astragalus	Root
<i>Dioscorea quaternata</i>	Wildyam	Rhizome
<i>Dioscorea villosa</i>	Wildyam	Rhizome
<i>Echinacea angustifolium</i>	Echinacea	Root
<i>Echinacea purpurea</i>	Echinacea	Root
<i>Echinacea pallida</i>	Echinacea	Root
<i>Glycyrrhiza glabra</i>	Licorice	Root
<i>Hydrastis canadensis</i>	Goldenseal	Rhizome
<i>Ligusticum porteri</i>	Oshá	Root
<i>Lomatium dissectum</i>	Lomatium	Root
<i>Panax ginseng</i>	Ginseng	Root
<i>Panax quinquefolium</i>	Ginseng	Root
<i>Piper methysticum</i>	Kava	Root and Rhizome
<i>Podophyllum peltatum</i>	Mayapple	Root and Rhizome
<i>Sanguinaria canadensis</i>	Bloodroot	Rhizome
<i>Symphytum officinale</i>	Comfrey	Root
<i>Trillium erectum</i>	Trillium	Root and Rhizome
<i>Taraxacum officinale</i> L.	Dandelion	Root and Herb
<i>Urtica dioica</i>	Stinging nettles	Root and Herb
<i>Valeriana officinalis</i>	Valerian	Root
<i>Zingiber officinale</i>	Ginger	Rhizome

7.2 5-year Cash Flow statement

IN EUR	Beginning	Year 1	Jan	Feb	March	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec	Year 2	Year 3	Year 4	Year 5
Cash on hand (beginning of month)		160,000													46,484	73,019	110,449	153,986
CASH RECEIPTS (INFLOW)																		
Cash sales		210,000	0	18,000	18,000	18,000	19,500	19,500	19,500	19,500	19,500	19,500	19,500	19,500	240,000	270,000	300,000	360,000
Loan proceeds		150,000	150,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Owner contributions		10,000	10,000	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH RECEIPTS		370,000	160,000	18,000	18,000	18,000	19,500	19,500	19,500	19,500	19,500	19,500	19,500	19,500	240,000	270,000	300,000	360,000
Total cash available		370,000	160,000	38,490	36,581	17,490	20,990	22,490	22,490	22,490	22,490	22,490	23,490	23,490	286,484	343,019	410,449	513,986
CASH PAID OUT (OUTFLOW)																		
Marketing		5,000	500	500	400	400	400	400	400	400	400	400	400	400	8,000	10,000	13,000	15,000
Contract labor		15,000	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	1,500	500	500	16,500	18,150	19,965	21,962
Wages		115,320	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	9,610	125,662	137,585	152,064	166,478
Interest expense		4,276	390	384	378	372	366	360	354	348	342	336	330	323	3,402	2,478	1,525	541
Materials and supplies (in COGS)		11,700	975	975	975	975	975	975	975	975	975	975	975	975	13,455	15,473	17,794	20,463
Office expense		6,500	542	542	542	542	542	542	542	542	542	542	542	542	3,000	3,000	3,000	3,000
Rent or lease (land, vehicles, equipment)		2,600	1,300	1,300	0	0	0	0	0	0	0	0	0	0	3,260	3,710	4,440	4,940
Maintenance		4,800	400	400	400	400	400	400	400	400	400	400	400	400	5,500	6,000	7,000	9,000
Legal expenses		1,100	1,100	0	0	0	0	0	0	0	0	0	0	0	500	500	500	500
Utilities		7,800	650	650	650	650	650	650	650	650	650	650	650	650	8,380	8,950	9,500	10,600
SUBTOTAL		174,096	16,967	15,861	14,455	14,449	14,443	14,437	14,431	14,425	14,419	13,413	13,407	13,400	187,659	205,846	228,788	252,484
Loan principal payment		24,920	2,043	2,049	2,055	2,061	2,067	2,073	2,079	2,085	2,091	2,097	2,103	2110	25,806	26,724	27,675	28,659
Capital Purchases		118,500	118,500	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Other startup costs		6,000	2,000	2,000	2,000	0	0	0	0	0	0	0	0	0	0	0	0	0
TOTAL CASH PAID OUT		323,516	139,510	19,910	18,510	16,510	16,510	16,510	16,510	16,510	16,510	15,510	15,510	15,510	213,465	232,570	256,463	281,143
Cash flow balance (montly/yearly)		46,484	20,490	-1,910	-510	1,490	2,990	2,990	2,990	2,990	2,990	3,990	3,990	3,990	73,019	110,449	153,986	232,844
Available cash on hand		46,484	20,490	18,581	18,071	19,561	22,552	25,542	28,532	31,523	34,513	38,503	42,494	46,484	73,019	110,449	153,986	232,844

7.3 Pessimistic Scenario Income Statement

Years		Year 1	Year 2	Year 3	Year 4	Year 5
Total Revenue		199,500	228,000	256,500	285,000	342,000
kg of dry mass sold		6,650	7,600	8,550	9,500	11,400
Price per unit		30	30	30	30	30
List of Expenses						
Manufacturing Expenses	COGS	11,700	13,455	15,473	17,794	20,463
	Field workers&Contract Labour Wages	59,520	64,282	70,067	77,074	84,781
	Utilities (65%)	5,000	5,500	6,000	6,500	7,500
	Rent (70%)	1,820	2,300	2,600	3,000	3,500
	Maintenance	4,800	5,500	6,000	7,000	9,000
	Depreciation	13,035	26,070	26,070	26,070	26,070
Gross Profit		103,625	110,893	130,290	147,562	190,686
Distribution Expenses	Sales Management Wages	36,000	39,600	43,560	47,916	52,708
	Marketing Expenses	5,000	8,000	10,000	13,000	15,000
	Rent (15%)	390	480	555	720	720
	Utilities (5%)	400	480	550	600	700
	Office Equipment & Supplies (50%)	3,250	1,500	1,500	1,500	1,500
Total Distribution Expenses		45,040	50,060	56,165	63,736	70,628
Administrative Expenses	ICT Expert Wages	34,800	38,280	42,108	46,319	50,951
	Notarization of Documents & Legal expenses	1,100	500	500	500	500
	Utilities (30%)	2,400	2,400	2,400	2,400	2,400
	Rent (15%)	390	480	555	720	720
	Office Equipment & Supplies (50%)	3,250	1,500	1,500	1,500	1,500
Total Administrative expenses		41,940	43,160	47,063	51,439	56,071
Operating Profit		16,645	17,673	27,062	32,387	63,987
Loan & Interest Expense*		24,310	26,145	26,142	26,138	28,312
EBT - Earnings Before tax		-7,665	-8,472	920	6,249	35,675
Income Tax Expense (19%)		-1,456	-1,610	175	1,187	6,778
Net Income/Profit after taxation*		-6,209	-6,862	745	5,062	28,897

7.4 Optimistic Scenario Income Statement

Years		Year 1	Year 2	Year 3	Year 4	Year 5
Total Revenue		241,500	276,000	310,500	345,000	414,000
kg of dry mass sold		8,050	9,200	10,350	11,500	13,800
Price per unit		30	30	30	30	30
List of Expenses						
Manufacturing Expenses	COGS	11,700	13,455	15,473	17,794	20,463
	Field workers&Contract Labour Wages	59,520	65,472	72,019	79,221	87,143
	Utilities (65%)	5,000	5,500	6,000	6,500	7,500
	Rent (70%)	1,820	2,240	2,590	3,360	3,360
	Maintenance	4,800	9,000	13,000	15,000	15,000
	Depreciation	13,035	26,070	26,070	26,070	26,070
Gross Profit		145,625	154,263	175,348	197,055	254,463
Distribution Expenses	Sales Management Wages	36,000	39,600	43,560	47,916	52,708
	Marketing Expenses	5,000	8,000	10,000	13,000	15,000
	Rent (15%)	390	480	555	720	720
	Utilities (5%)	400	480	550	600	700
	Office Equipment & Supplies (50%)	3,250	1,500	1,500	1,500	1,500
Total Distribution Expenses		45,040	50,060	56,165	63,736	70,628
Administrative Expenses	ICT Expert Wages	34,800	38,280	42,108	46,319	50,951
	Notarization of Documents & Legal expenses	1,100	500	500	500	500
	Utilities (30%)	2,400	2,400	2,400	2,400	2,400
	Rent (15%)	390	480	555	720	720
	Office Equipment & Supplies (50%)	3,250	1,500	1,500	1,500	1,500
Total Administrative expenses		41,940	43,160	47,063	51,439	56,071
Operating Profit		58,645	61,043	72,120	81,880	127,765
Loan & Interest Expense*		24,310	26,145	26,142	26,138	28,312
EBT - Earnings Before tax		34,335	34,898	45,978	55,742	99,453
Income Tax Expense (19%)		6,524	6,631	8,736	10,591	18,896
Net Income/Profit after taxation*		27,811	28,267	37,242	45,151	80,557

7.5 Loan Plan

The loan plan is as seen on the table below, the loan period is over 5 years with amount of 150.000 EUR and interest rate of 3.50%. (*Czech Republic - Lending Interest Rate - 1993-2019 Data / 2020 Forecast, n.d.*)

Payment Date	Payment (EUR)	Principal (EUR)	Interest (EUR)	Total Interest (EUR)	Balance (EUR)
Jul-20	2184.148029	1833.968681	350.1793485	350.1793485	118229
Aug-20	2184.156948	1839.320105	344.8368435	695.016192	116390
Sep-20	2184.148029	1844.680448	339.4675814	1034.483773	114545
Oct-20	2184.148029	1850.058629	334.0894003	1368.573174	112695
Nov-20	2184.148029	1855.454648	328.6933811	1697.266555	110839
Dec-20	2184.148029	1860.868506	323.2795238	2020.546079	108978
Jan-21	2184.156948	1866.300201	317.8567475	2338.402826	107112
Feb-21	2184.148029	1871.740815	312.4072141	2650.81004	105240
Mar-21	2184.148029	1877.199268	306.9487616	2957.758802	103363
Apr-21	2184.148029	1882.675558	301.472471	3259.231273	101481
May-21	2184.156948	1888.169687	295.9872614	3555.218534	99592.3
Jun-21	2184.148029	1893.672735	290.4752947	3845.693829	97698.7
Jul-21	2184.148029	1899.19362	284.954409	4130.648238	95799.5
Aug-21	2184.148029	1904.732344	279.4156851	4410.063923	93894.7
Sep-21	2184.148029	1910.288906	273.8591232	4683.923046	91984.4
Oct-21	2184.148029	1915.863306	268.2847232	4952.20777	90068.6
Nov-21	2184.156948	1921.455544	262.7014042	5214.909174	88147.1
Dec-21	2184.156948	1927.056701	257.100247	5472.009421	86220.1
Jan-22	2184.148029	1932.675697	251.4723328	5723.481754	84287.4
Feb-22	2184.148029	1938.31253	245.8354995	5969.317253	82349.1
Mar-22	2184.148029	1943.967201	240.1808282	6209.498081	80405.1
Apr-22	2184.156948	1949.639711	234.5172378	6444.015319	78455.5
May-22	2184.148029	1955.321139	228.8268902	6672.842209	76500.2
Jun-22	2184.156948	1961.029325	223.1276237	6895.969833	74539.1
Jul-22	2184.148029	1966.746429	217.4016	7113.371433	72572.4
Aug-22	2184.148029	1972.481372	211.6666573	7325.03809	70599.9
Sep-22	2184.148029	1978.234153	205.9138765	7530.951967	68621.7
Oct-22	2184.148029	1984.004772	200.1432576	7731.095224	66637.7
Nov-22	2184.156948	1989.793229	194.3637197	7925.458944	64647.9
Dec-22	2184.156948	1995.599524	188.5574246	8114.016369	62652.3
Jan-23	2184.148029	2001.414738	182.7332915	8296.74966	60650.9
Feb-23	2184.156948	2007.256709	176.9002394	8473.6499	58643.6
Mar-23	2184.148029	2013.107599	171.0404301	8644.69033	56630.5
Apr-23	2184.148029	2018.976328	165.1717018	8809.862031	54611.5
May-23	2184.156948	2024.871813	159.2851354	8969.147167	52586.7
Jun-23	2184.156948	2030.776218	153.3807309	9122.527898	50555.9
Jul-23	2184.156948	2036.69846	147.4584883	9269.986386	48519.2
Aug-23	2184.156948	2042.638541	141.5184077	9411.504794	46476.5
Sep-23	2184.156948	2048.59646	135.560489	9547.065283	44428
Oct-23	2184.156948	2054.572216	129.5847322	9676.650015	42373.4
Nov-23	2184.156948	2060.565811	123.5911373	9800.241152	40312.8
Dec-23	2184.148029	2066.568325	117.5797043	9917.820856	38246.2
Jan-24	2184.148029	2072.597596	111.5504333	10029.37129	36173.6
Feb-24	2184.148029	2078.644705	105.5033242	10134.87461	34095
Mar-24	2184.156948	2084.709652	99.447296	10234.32191	32010.3
Apr-24	2184.156948	2090.792438	93.36451072	10327.68642	29919.5
May-24	2184.148029	2096.884142	87.26388736	10414.95031	27822.6
Jun-24	2184.148029	2103.002604	81.14542592	10496.09573	25719.6
Jul-24	2184.156948	2109.138903	75.01804544	10571.11378	23610.5
Aug-24	2184.148029	2115.284122	68.86390784	10639.97769	21495.2
Sep-24	2184.148029	2121.456097	62.69193216	10702.66962	19373.7
Oct-24	2184.156948	2127.645911	56.51103744	10759.18066	17246.1
Nov-24	2184.156948	2133.853563	50.3033856	10809.48404	15112.2
Dec-24	2184.148029	2140.070134	44.07789568	10853.56194	12972.2
Jan-25	2184.148029	2146.313462	37.83456768	10891.39651	10825.9
Feb-25	2184.148029	2152.574628	31.5734016	10922.96991	8673.28
Mar-25	2184.148029	2158.853632	25.29439744	10948.2643	6514.41
Apr-25	2184.148029	2165.150474	18.9975552	10967.26186	4349.26
May-25	2184.148029	2171.465155	12.68287488	10979.94473	2177.8
Jun-25	2184.148029	2177.797673	6.35035648	10986.29509	0

