Market Analysis & Business Plan for Nexus Farms

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1.0 Overview

1.1 Introduction

With growing public concern about our global environmental challenges, many people are turning towards more sustainable and environmentally friendly behaviour. One of the biggest problems is that in many areas, sustainable options related to food are quite limited. Fruits and vegetables offered in many markets aren't grown using sustainable methods, and are often grown in distant places, thus increasing the environmental impact through increased transportation.

Nexus Farms will bring the food-water-energy nexus concept into a physical urban environment and give customers the opportunity to support sustainable development and consumption in a local community setting.

1.2 Product

While the core goods sold will be fruits, vegetables, herbs and fish (or mollusks) sustainably grown within a closed aquaponic system, the product itself is the unique buying experience that Nexus farm will offer. This experience will be buying food directly on site in full view of where your produce was grown and raised.

1.3 Target Market

Environmentally conscious people, who care about sustainable consumption. healthy living, and locally sourced produce. This primarily includes high income young adults (18 - 35 years) but could also include married couples with children, as well as other demographics. We estimate the total market size using population statistics, supplemented by interest level/growth in sustainable/health food topics (ie. veganism, vegetarianism, flexitarianism, etc.).

1.4 Unique Selling Points

The shopping experience of Nexus Farms centerpoint, with a focus on transparency in the production process as well as embracing emerging products, concepts, and processes in sustainability. Interest in going green is growing in businesses, but few integrate these concepts into the foundation of their business model. From the start, we aim to be zero-waste, packaging free, No-Kill, 100% renewably-powered, as well as sustainably supply nutrients within the farms themselves through our aquaponic systems.

Zero-Waste: Any excess produce will be donated locally to foodbanks, food-sharing programs, and local food-sharing stores such as “The Good Food.” Any produce that can’t be donated will be processed into fish feed.

Packaging-Free: Fresh, local produce doesn’t need to be packaged in thick plastic packaging destined to pollute our natural ecosystems and oceans.

No-Kill: Raising fish for slaughter is an unnecessary, resource-intensive process. At Nexus Farms, our fish live symbiotically with us to help us grow our food, rather than be our food.

100% Renewably-Powered: Nexus Farms plans to be the world’s first Hydrogen Powered Farm. Hydrogen fuel cell technology is emission-free, and the waste heat can help keep our fish warm. Where needed, supplementary grid energy will be sourced through renewable energy providers.

Natural Fertilizers: Nexus Farms uses Aquaponic Technology, where the fish produce valuable nutrients to the plants. This lowers the need for chemical fertilizers that are regularly used in traditional agricultural methods, and hydroponic systems.

1.5 Potential Site

The historical city of Cologne is a large metropolitan city located in the North Rhine- Westphalia province of Germany. It is an important economic center for the region and is home to 3 universities/technical universities. Cologne is an environmentally conscious city with many “smart-city” and “green” technological innovations. Along with Berlin, it has been the base for recent environmental protests as concerns rise over nearby coal operations[1].

The neighbourhood of Ehrenfeld has been selected as a preferred location for Nexus farms. Ehrenfeld is a district of Cologne, with many facilities that cater to younger people. It is regarded as a hub for arts & culture, bars & restaurants and cafes.

[1] (https://www.dw.com/en/germany-protests-call-for-leadership-on-climate-action/a-46534850)

1.6 Key Statistics for Market Analysis

1.6.1 Interest in Plant-Based lifestyles

The following statistics show a large interest in plant-based diets and lifestyles:

Interest in Veganism: 1.6%
Of vegans, % university educated: 70%
Interest in Vegetarianism: 10%
Of these:
-Women: 80%
-Men: 20%
Most popular age range: 18-29, 60-69
Interest in Flexitarianism: 56%

Overall vegetarians tend to be woman, educated, and located in cities with populations over 500,000. The overall proportion of the population that is interested in these topics is growing.

1.6.2 Demographic Statistics:

The following demographic statistics are of interest to the project:

Cologne Population: 1,080,394
Metropolitan Area Population: 3.5M

Ratio of Men to Women: 1.00:1.04

Population Cologne, female, 18-30yo: 96,675
Population Cologne, male, 18-30yo: 185,983

% Pop. NRW, female, university edu: 13%
% Pop. NRW, female, educated (edu certificate/qualification): 67%

GDP Per Capita (2016)
Cologne: €41,400
Germany: €38,200

Ehrenfeld Population: 37,856
Population Density: 10,172/km^2

2.0 Consumer Interest

2.1 Target Group

The target group for Nexus Farms are people in the Ehrenfeld neighbourhood, young (<40 years old), “hip” and environmentally conscious image (ie. vintage clothing, reusable shopping bags, bike in hand, tattoos, etc.), educated (ie. speak english).

2.2 Consumer Interest Survey

On December 7, 2018, we surveyed people in the community of Ehrenfeld about what their preferences are when buying produce products, where they purchase them and what their concerns are.

a) When asked what kinds of things they were looking for (in regard to sustainability) when buying produce, responses included:

- “Quality” and/or “freshness” x 4
- “Convenience” and/or “easily accessible options available within the community” x 3
- “A desire to start shopping at markets more” x 2
- “Not perfect looking fruits/vegetables” x 2
- “Price” and/or “cheaper options” x 2
- “Locally grown” x 1
- “Seasonality doesn’t matter” x 1
- “Taste” x 1

b) When asked if interested in buying locally grown produce, 7 out of 9 agreed (3 female, 4 male)

c) When asked if interested in buying organic produce, 3 out of 9 agreed (2 female, 1 male) (2 claimed that organic produce was “too expensive”)

d) When asked if “vegetarian” or “vegan” labels are of concern, 5 out of 9 agreed (3 female, 2 male)

e) When asked where they like to shop, responses included:

Supermarkets (general) x 5
Rewe x 2
Aldi x 2
Farmer’s Market (sometimes) x 2

f) When asked if they knew about hydroponic farming, 1 out of 8 said “yes” (male)

g) When given a brief explanation on the concept of urban hydroponic farming, 8 out of 8 were interested in more information or thought it was an interesting concept.

2.3 Survey Analysis

Ehrenfeld has a large and growing population of environmentally-conscious people. Within the city of cologne, interest in sustainable development and concern for the environment has gained a lot of attention due to recent protests and demonstrations. Based on results of the survey, when it comes to sustainable practices when shopping for produce, shopping locally was the primary concern. 78% of people surveyed paid attention to vegetarian labels, which is much higher than the national average. Interest in organic produce ranked quite low for the population, with concerns about the price. Hydroponic farming was still unknown to most people, but the concept provoked interest.

3.0 Competition

The following competitors were identified at both the local level (supermarkets and other sellers) and the regional level (technological competitors).

3.1 Local Competitors

Within Ehrenfeld, fruits and vegetables can be bought at supermarkets, bio-markets, as well as local farmers markets.

3.1.1 Supermarkets

Aldi Sud (Grüner Weg 2, 50825 Köln)
Aldi Sud (Marienstraße 147/159, 50825 Köln)
Aldi Sud (Venloer Str. 181/185, 50823 Köln)
Aldi Sud (Venloer Str. 760, 50827 Köln)
Kaufland (Thebäerstraße 9, 50823 Köln)
Lidl (Leyendeckerstraße 2a, 50825 Köln)
Lidl (Widdersdorfer Str. 254, 50933 Köln)
Lidl (Hornstraße 88, 50823 Köln)
Lidl (Rochusstraße 227-235, 50827 Köln)
Netto Marken-Discount (Oskar-Jäger-Straße 52, 50825 Köln)
Netto Marken-Discount (Vogelsanger Str. 202, 50825 Köln)
Netto Marken-Discount (Venloer Str. 474, 50825 Köln)
Netto Marken-Discount (Wilhelm-Mauser-Straße 19, 50827 Köln)
Netto Marken-Discount (Venloer Str. 899, 50829 Köln)
Rewe Center (Venloer Str. 601-603, 50827 Köln)
Rewe City (Vogelsanger Str. 16, 50823 Köln)
Rewe City (Venloer Str. 287, 50823 Köln)
Rewe City (Lenaupl. 3, 50825 Köln)
Rewe City (Sandweg 120-122, 50827 Köln

3.1.2 Bio/Health/Produce Markets

Alnatura Super Natur Markt (Venloer Str. 301/303, 50823 Köln)
Denn's Biomarkt (Venloer Str. 254, 50823 Köln)
The Good Food (food sharing) (Venloer Str. 414, 50825 Köln)
Halal Kauf Koln (350B, Venloer Str., 50825 Köln)
Karadag Supermarket (turkish) (Subbelrather Str. 234, 50823 Köln)
Sark (asian food market?) (Venloer Str. 450/452, 50825 Köln)

3.1.3 Farmer's Market

Wochenmarkt Ehrenfeld (Neptunplatz) Tues & Friday 7am-1pm ($)
Wochenmarkt Bickendorf (Rochusplatz) Wed & Sat 7am-1pm ($)
Okomarkt (rudolfplatz) Wed 11-6 & Sat 8-2 ($$$)

3.2 Competitor Pricing

Four central competitors were chosen for a preliminary analysis on pricing:

Denn's Biomarkt (Venloer Str. 254, 50823 Köln)
Alnatura Super Natur Markt (Venloer Str. 301/303, 50823 Köln)
Basic Bio-Supermarkt (Venloer Str. 47-53, 50672 Köln)
Rewe City (Venloer Str. 287, 50823 Köln)

The average prices of the following products were found:

Organic Lettuce: 2.49 € / unit
Organic Arugula: 1.88 € / 100g
Organic Cucumber: 2.71 € / unit
Organic Spinach: 2.06 € / 100g
Organic Tomatoes: 2.11 € / 250g
Organic Pepper (paprika): 3.39 € / 500g

3.3 Technological Competitors

Other German and/or European competitors offering/utilizing similar technologies and their models:

3.3.1 INFARM

Berlin based hydroponics start-up that designs, builds, and both operates and sells modular closed hydroponics systems. INFARM sells systems to be operated directly at the POS whether that is at a supermarket, hotel or a restaurant. They also own and operate several urban indoor farms to supplement supply to supermarkets. They currently operate (or plan to operate) in multiple stores in multiple German cities as well as Paris, Amsterdam and Zurich. Installations range from single farm module to large scale projects.

Funding Received: 4 Rounds of Private, $34.1M
Business Model: Sell/lease equipment to HORECA clients
Price: $7000 ongoing of $1500
Output (per m2): 2500-5000 plants per m2
German Cities Operating: Berlin, Stuttgart, Hannover, Essen, Hamburg, Tübingen, Rostock, Möchengladblach, Wuppertal, Heilbronn, Düsseldorf, Frankfurt, Minden, München, Hagen, Minden, Münster, Dorsten, Bielefeld, Bochum
Products Grown: Herbs, Lettuce

INFARM System in Edeka

3.3.2 ECF Farmsystems

Berlin based aquaponics farming company, that offers consulting, construction management, and planning services for aquaponics. They also operate their own aquaponics farms, as well as, designs, builds, and sells aquaponics farming technology. Completed projects in Switzerland and Belgium. Installations range from container box size to entire commercial farm systems.

Business model: Providing consulting, general contractor services for AP projects
Funding received: Private, multiple millions of Euros
Price: €1.5M Construction €500,000 ongoing costs
Output: 25kg veg, 12.5 kg fish per m2
German Cities Operating: Berlin
Products grown: Basil, perch

ECF Farm in Berlin

3.3.3 UrbanFarmers (Filed for bankruptcy)

Netherlands based aquaponics start-up, founded by aquaponics researchers to develop commercial aquaponics systems and farms. Operated a rooftop aquaponics in a converted light bulb factory the Netherlands as well as in Switzerland. Sold fruits as well as services. Farms filed for bankruptcy in May (Swiss) and July (NL). Reasons cited were inability to reach target customer, lack of

differentiation with local farmed produce to justify price (etc.), and potentially growing low value products (tilapia, tomatoes vs. perch, fruits)

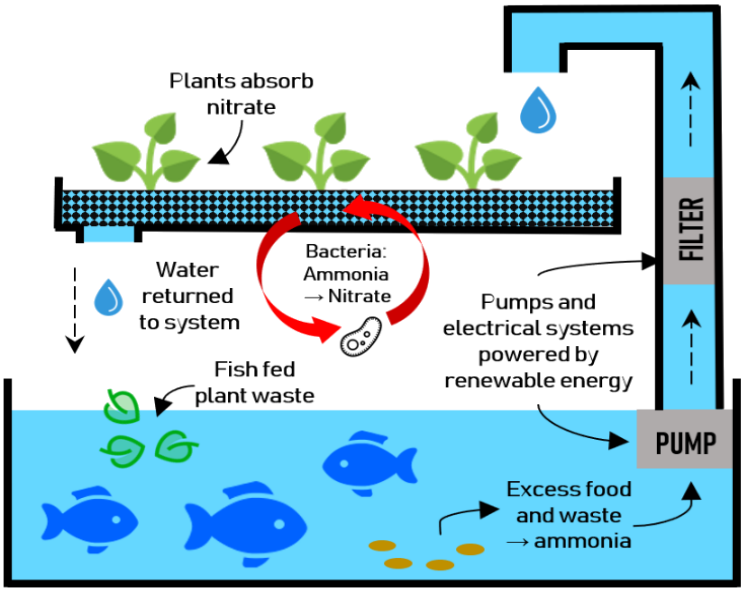
Business Model: Operating farms, selling produce and services
Funding received: €6M
Price: €2.5M
Output: 35 kg veg, 12.5 kg fish per m2
Germany Cities Operating: None
Products grown: Tomatoes, tilapia

3.4 Competition Analysis

	Organically Produced	Affordable	Locally Grown	Water Efficient	Source of Nutrients
Supermarket Produce		yes			Chemicals
Biomart Produce	yes		yes		Chemicals
Hydroponic Farms	yes	yes	yes	yes	Chemicals
Nexus Farms	yes	yes	yes	yes	**FISH**

4.0 Farm Operation

Nexus Farms is an urban aquaponic farm. Aquaponics combines aquaculture, the raising of fish or other animals, with hydroponics, the process of growing plants in water. The natural wastes of the fish can provide valuable nutrients to the plants forming a symbiotic relationship and therefore lowering the amount of chemical fertilizers needed.



A simplified schematic drawing of an aquaponic setup.

4.1 Aquaponic Setup

4.1.1 Basic System Design

The aquaponics system is made up of two key production subsystems: Aquaculture and hydroponics. The aquaculture system takes the inputs of water, fish, feed, heat and oxygen to produce dissolved and suspended solid fish waste containing 12 of the 14 essential nutrients for plant growth. The waste flows into a filtration device, which uses gravity or mechanical energy to filter the suspended solid waste from the solution. The resultant grey water is channeled through a bioreactor to convert ammonium, toxic to plants, into nitrite and nitrite,

which makes nitrogen available for plant uptake. At this stage, basic aquaponics systems pump nutrient rich water directly from a collection sump tank into the hydroponic grow beds. The hydroponics production subsystems takes the inputs of nutrient rich water, light, and oxygen to produce plants for sale, and ultimately consumption.

4.1.2 Decoupling Dual-Loop System Design

Directly pumping nutrient solution into the hydroponics system without an intermediary step, known as single loop aquaponics, while more economical, is disadvantageous for two reasons. Due to different optimum nutrient and pH levels between fish and plants, in a single loop aquaponics system neither fish nor plants are growing at maximum efficiency. Secondly, in the event of a pest or disease outbreak in either production subsystem, a farm manager cannot quarantine the affected subsystem for treatment. A dual loop solves these by implementing a second intermediary sump tank before the hydroponic grow beds. The water in the dedicated collection tank is optimized for plant growth with supplementary nutrients. Any remaining wastewater from the aquaculture loop is disinfected and reused. The primary outputs of this system are crops, fish (if raised for harvest), and sludge. While aquaponics is water efficient relative to modern field agriculture, the single dues consume water through waste flows and plant respiration. See Figure 1 for depiction of this design.

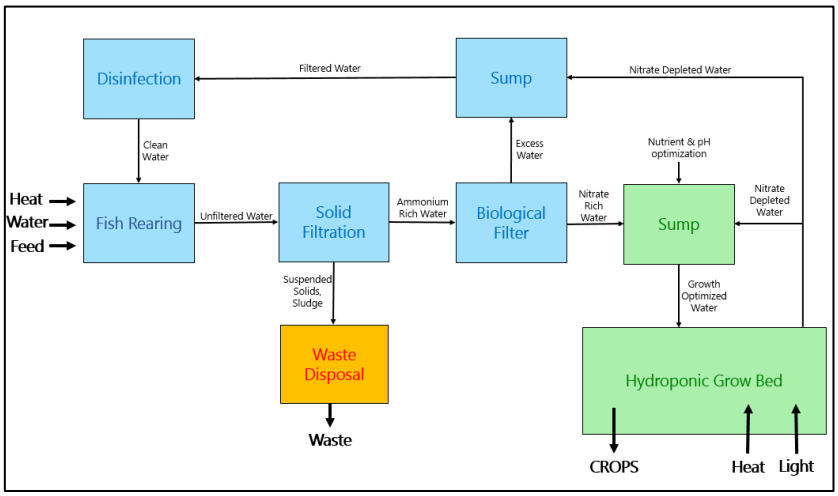


Figure 1: A decoupled dual-loop system design

4.1.3 Estimated Outputs

Based on a total floor space of 260m^2, the areas summarized in Table 1 are used for calculations of equipment and production capacity. With 3 stacked beds, a growing area of 150m^2 can be designed.

Usage of Space		
Desired growing area	150	m2
Number of stacked beds	3	50 m2
Total area available	260	m2
Administrative area	25	m2
Selling area	40	m2

Table 1: Available Area and planned usage of space

Other areas of floor space include a retail space, administrative area, and space for fish tanks. Parameters and sizing information for the fish tanks is provided in Table 2, and based on these numbers, a tank footprint calculated in Table would be 59.28 m^2. Additional space would be used for business operations (cleaning, walking, mobility, etc.).

General data for Tanks		
Ratio of fish to grow area	5	kg/m2
Ratio of tank volume to fish weight	0.04	m3/kg of fish
Depth of growing bed	0.3	m2
Water tank volume	2	m3
Water tank footprint	1.56	m2

Table 2: Equipment parameters and general data for fish tanks

Tank Space		
Growing area footprint (elevation incl)	50	m2
Weight of fish required	750	kg
Growing water volume	45	m3
Fish water volume	30	m3
Total water volume	75	m3
Number of tanks required	38	unit
Tanks footprint	59.28	m2
Remaining space	85.72	m2

Table 3: Calculations for tank space

Utilizing the grow area of 150 m^2 effectively and specializing in one specific crop, Lettuce, Spinach or Basil could produce 4500, 2700, or 3300 kg/year respectively.

Produce Outputs	
Desired Grow Area	50
Including Elevated Grow Area	150
Kg Fish Required	750
Liters of Waters Grow Area	33750
Liters of Waters Fish	39000
Liters of Waters Fish	72750
Tanks Required	37
Tank Space	57.72
Remaining Space	87.28
Output Lettuce (kg/yr)	4500
Output Spinach (kg/yr)	2700
Output Basil (kg/yr)	3300
Value of Lettuce (euros)	36000
Value of Spinach (euros)	54000
Value of Basil (euros)	59400

Table 4: Outputs of produce and expected value

4.2 Electrical Equipment

In order to predict the costs regarding the electricity consumption of the aquaponics farm, a study of the energy demand of all electrical equipment was done.

4.2.1 Equipment Needed

The electrical equipment needed for aquaponic farming are:

Water Pump: Water pumps are responsible for pumping the water around the system, allowing it to be cleaned as it goes through the filter and also to bring the nutrients from the fish tank to the growing beds. Water pumps should work 24 hours/day.

Water Heater: A heater is needed to control water temperature. Fish requires specified temperatures to remain healthy and thrive. A water temperature between 16 and 23 degrees Celsius is typically a good range but that is highly dependent on the fish type.

Aerator: Air diffusers, or aerators, provides supplemental oxygen to the fish tanks. Aerators should work 24 hours/day.

Artificial Lighting: Since the aquaponics farm from Nexus Farms is idealized indoors, artificial lighting is necessary. The main goal of artificial lightning is to imitate sunlight. The system should have at least 14 to 16 hours of bright artificial light, followed by 10 to 12 hours of darkness every day.

4.2.2 Equipment size and selection

For sizing the equipment, the following data was assumed:

Desired growing area	150	m^2
Total water volume	75	m^3
Ideal water temperature	17	°C
Lightning hours	14	hours/day

After analyzing the data and dimensioning the machinery, the following pieces of equipment were selected (See Appendix B for details on equipment parameters):

Equipment	Units	Model/Brand	Electricity consumption (kWh/month)
Water pump	3	Honda Frischwasserpumpe WX 15	2.657,14
Aerator	38	Ubbink Teichbelüfter Air 200 indoor	4,56
Growing lights	65	Roleadro Galaxyhydro Series 1000W	3723,72
Water heater	1	1,000 watt titanium heat stick	56,93
Other devices	[-]	Computer and lamps	938,24

As a result form this study, it is possible to predict an electricity consumption of **7.380 kWh/month.**

4.3 Energy Supply

The Cologne region produces large amounts of residual hydrogen through the local chemical production industry. Currently, this makes the region one of the only regions in Germany or the world where the use of hydrogen for power generation is viable. In many parts of the country the cost of hydrogen can be up to 12 euros/kg; however, in Cologne it can cost under 2 euros/kg. The low costs and regional availability of hydrogen is a driver for hydrogen fuel cell technology use.

In conjunction with highly efficient fuel cell applications, hydrogen offers excellent opportunities to reduce greenhouse gases emissions and to decouple the power supply from fossil energy sources. Therefore, by using hydrogen to supply clean energy to the farm, one of the main conceptual pillars of Nexus farms, energy security, would be fulfilled. Therefore, Nexus Farms plans to take advantage of this hydrogen to supply the energy demand by pioneering the first aquaponics farm powered by hydrogen in the world.

An assessment of the energy demand of Nexus farms was made in order to size a hydrogen system for a 260 m^2 aquaponics farm. All devices that demand electricity were considered, as well as, the operating hours of each one of it. As a result of this study, it is recommended that a 17 kW hydrogen system be used to meet the electricity demand.

Some local companies that offer consulting, engineering and service in the subject areas of fuel cells and hydrogen technology, such as EMCEL, HyCologne and AirProducts have taken the initiative to use this hydrogen for establish green hydrogen use in the region. Nexus farms has contacted EMCEL for system quotation and further information.

According to EMCEL, a 17 kW hydrogen system would cost about 17.000,00 euros and would demand a fuel consumption of about 720 kg of hydrogen per month, which represents 1.440,00 euros per month of fixed costs. A brief meeting with EMCEL´s manager has already shown great potential for a partnership between

EMCEL and Nexus Farms. This could result in high savings on the investment cost, since EMCEL is looking to install a fuel cell system in Cologne as a demonstration model. This way, Nexus Farms would have to bear mainly with operational cost.

Hydrogen can be supplied in Cologne, by AirProducts, in high pressure tanks with the following dimensions: 6,06 m length, 2,44 m width and 2,60 m height. Thus, to supply the monthly fuel demand of the farm, it would be necessary to have at least 15 m^2 available on site for the fuel storage and energy generation.

Taking into account that the farm would be initially located in a commercial building in Ehrenfeld, allocating about 6% of the total available area for energy generation is not technically feasible. However, knowing that the hydrogen use could reduce in up to 32% the fixed costs of electricity, a hydrogen power supply system could be idealized for a middle term future perspective, when Nexus Farms scales up its production and moves its main growing area to outside of the city center of Cologne. This setup is shown in figure 2.

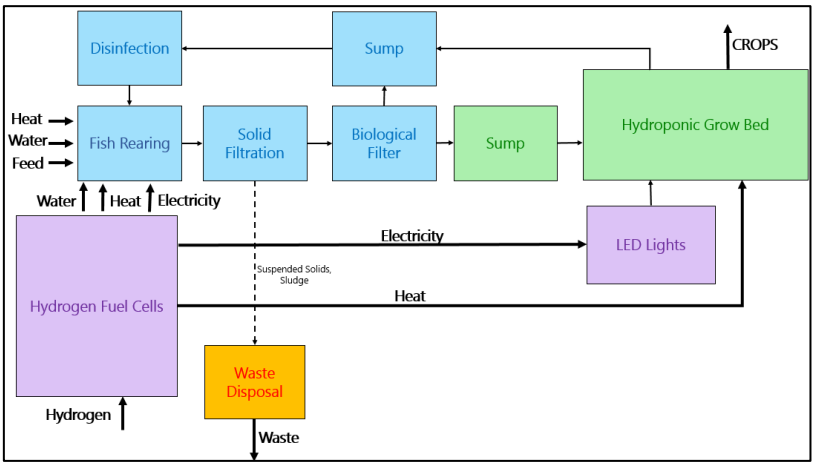


Figure 2: A system design with a Hydrogen Fuel Cell subsystem

4.4 Real Estate

A search was performed on Immobilien Scout 24 (www.immobilienscout24.de) for potential locations in Ehrenfeld. Desired features of the property included:

- frequent foot traffic,
- retail store space,
- additional space to set up grow equipment,
- facilities available for kitchen equipment,

Based on results found and for calculation purposes, the following numbers will be used:

Size: 260 m^2
Rental Price: 2,600 €/ month
Additional Costs: 400 € / month
Deposit: 10,000 €
Building Energy Costs (heating & Lights)*: 886.03 € / month

*Based on 139.00 kWh / (m^2 · a) and the 2018 German energy price of 29.42 euro cents per Kilowatt (https://www.cleanenergywire.org/factsheets/what-german-households-pay-power)

5.0 Administration

5.1 Insurances

In Germany, a common fund exists for all social security components. Only the health insurance provider can be chosen individually by the employee.

5.1.1 Pension Insurance

Pension insurance is compulsory for employees. The premium is 18.6 % of the gross wage and is divided equally between employee and employer. The employee's health insurance company is responsible for collecting these contributions.

5.1.2 Health Insurance

Employees earning a gross wage of up to EUR 59,400 per year are compulsorily insured by one of the public health insurance providers (*Gesetzliche Krankenversicherung, GKV*). Employees whose earnings are above this income threshold can choose from both public and private insurance companies *(Private Krankenversicherung, PKV*).

Contributions are calculated on the basis of the employee's remuneration. When calculating contributions to statutory health and nursing care insurance, the part of the employee's remuneration exceeding the applicable contribution ceiling will not be considered. The contribution ceiling for health and nursing care insurance is €4,350 per month. The contribution to statutory health insurance is 15.5%, of which the employer pays 7.3% and the employee 8.2%. Depending on the regulations of the relevant statutory health insurance scheme, the employee might have to bear an additional contribution of approximately 0.9 %. The German National Association of Statutory Health Insurance Funds (*GKV-Spitzenverband*) provides a list of all public health insurance providers and their additional contribution rates online.

5.1.3 Unemployment Insurance

The premium for the mandatory unemployment insurance is 3.0 %of the gross wage and is shared equally by the employer and employee. Contributions for unemployment insurance are collected by the health insurance company of the employee, which transfers the money to the Federal Employment Agency (*Bundesagentur für Arbeit*).

5.1.4 Nursing Care Insurance

Nursing care insurance is organized in more or less the same way as health insurance, with a contribution rate of 2.55 % of the gross wage. Employer and employee both pay half of the contribution rate, with childless employees paying an extra 0.25 % on top of their contribution. The premiums are deducted in the course of payroll accounting and transferred to the nursing care insurance company via the health insurance company. Specific regulations apply in the federal state of Saxony.

5.1.5 Accident Insurance

Statutory accident insurance provides coverage if an employee suffers an accident at the workplace or on the way to work. In contrast to the other four obligatory insurances (health, nursing, pension, and unemployment), the costs for accident insurance are exclusively borne by the employer.

Every employer must inform the relevant trading association about the establishment of his or her business and register with this organization. The accident insurance rate is determined on the basis of the company's total remuneration sum and the hazard category of the work concerned (the hazard category is determined by the relevant employers' liability insurance association). According to the German Social Accident Insurance (DGUV), the average accident insurance contribution in 2016 was 1.18 %.

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6.0 Revenue & Cost Analysis

All cost and revenue tables are attached in Appendix A.

6.1 Costs

For a ten-year breakdown of total costs, refer to Table 1. With an initial investment expenditure of 34,806.97 €, the breakeven point occurs at year 7 of operation. Revenue increases until year 3, with addition of secondary services and products. Costs are divided into depreciation costs, labour costs, financing costs, production costs and administrative costs. After the ten-year period, an accumulated dividend has been calculated as **29,113.94€,**

6.1.1 Financing Costs

A bank loan or any other funding by a third party will be needed to finance 60% of the total investment, for a total of 52,210.46 € (Table 2). A bank loan over a period of 10 years with constant annual loan redemption and a 7% interest rate was assumed (Table 3)

6.1.2 Depreciation Costs

Germany offers different depreciation schemes. Depreciation is based on either the cost of acquisition or the cost of production. Rates of depreciation are statutorily fixed only for buildings. The Federal Ministry of Finance publishes tables which can be used as guidelines for the calculation of the useful life of most assets. Acceptable methods of depreciation for tangible assets are: the straight-line method and the declining balance method. In this study, depreciation is calculated on a straight-line basis.

Examples of straight-line depreciation rates are shown on Table 4. Data was retained from the AfA table for the agriculture and livestock industry. Specific

aquaponics equipment that don't appear in the AfA table was estimated to have 10 years depreciation time. Office equipment was estimated as having 3 years depreciation time. Vehicle depreciation cost only starts at year 3 because the aquisition of a car is only predicted for the end of the second year of operation. For a 10 year depreciation cost analysis refer to Table 5.

6.1.3 Labour Costs

For the labor cost calculations, it was assumed that all employees will get the minimum wage in the first two years. Total cost for each type of labour was calculated in Table 6.

In the first year of operation, there is no need for a farm expert, and only one farm worker and one seller would be needed, since the partners would help in the farming activities. The yearly labour totals are shown in Table 7.

6.1.4 Production Costs

The costs involved to run the facility include the costs to maintain fish, grow produce, heat and supply electricity. The production cost parameters are shown in Table 8.

The utilization of capacity for the first year of operation was considered to be 92% of the total capacity, taking into consideration that it takes 4 weeks to complete the initial production run. All other coming years were considered to have full production capacity. The 10 year production costs are shown in Table 9.

6.1.5 Administration Costs

Administration costs were broken down into land rental, marketing, business ongoing cost and unexpected. A constant value of 4,800.00 € per year was used (Table 10)

6.1.6 Investment Expenditure

The total investment to begin operation has been calculated at 87,017.43 €. This has been broken down into the start-up costs and the equipment costs in Table 11.

6.2 Revenue

Revenue is expected from multiple sources. At full production, produce will make a total of 59,400.00 € per year. This will be supplemented by the following sources:

Beginning year 1, technical tours will add 4,800 € per year.
Beginning year 2, sale of merchandise will add 2,400 € per year.
Beginning year 3, educational material will add 4,800 € per year.
Beginning year 5, other services such as rooftop farming will add 6,00 € per year.

Table 12 shows the annual expected revenue over a 10 year period.

6.3 Opening Balance

The opening balance is displayed in Table 13 (See Appendix). Our primary liabilities are outstanding share capital and our initial bank loan. Our assets are divided between start-up costs, fixed assets (including the entire production system and other miscellaneous office supplies), current assets (fish and crops), and cash on hand.

7.0 Business Development & Strategy

Based on the assumptions Nexus Farms plans to make

7.1 Vision

Nexus Farms envisions a future where we can develop our services to the point where sustainable communities are based around urban aquaponic food production.

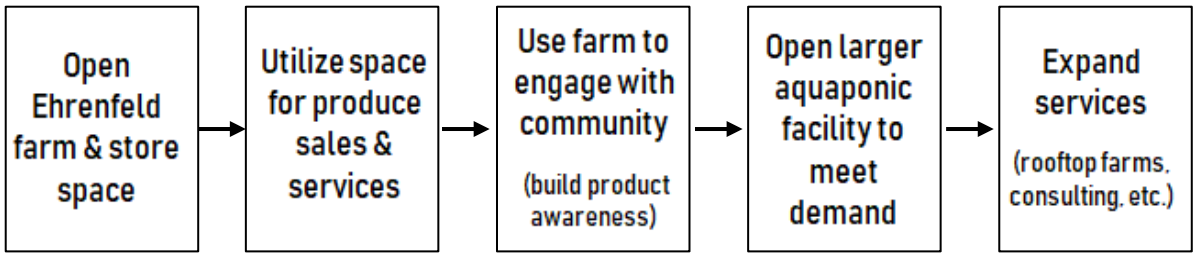
Work with experts to design new innovative technologies

Use our university network to develop research projects

Establish a regional network of urban aquaponic farms

Build **sustainable communities** with **aquaponics** at their core

7.2 Go to Market Strategy



Nexus Farms is looking at a five-step go to market strategy:

The first stage is to open the Ehrenfeld Farm and Store Space. This location will host a small-scale aquaponic facility. This space will be the primary location for retail sale of products. Aquaponically grown produce has a high market value and we plan to sell at or above current market prices for organically grown produce. It is also

important for this location to engage with the community. To do this, we have built education directly into our business model, with technical tours of the facility, local school visits, and interactive learning material. A sustainable community is an educated community. In order to take advantage of economies of scale, our fourth step is to open a larger facility. Finally, we believe there is potential to expand our services to include urban farm consulting, and rooftop farm services.

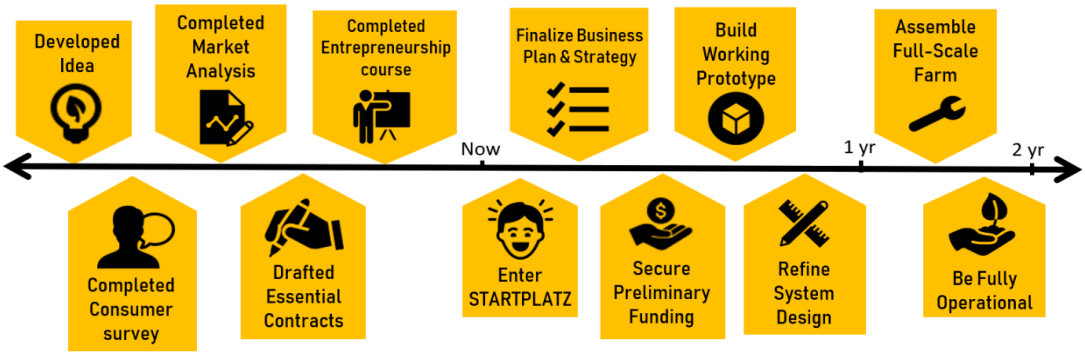
7.3 Milestones & Goals

After completion of Entrepreneurship T3181, Nexus Farms will be entering the NRW region's STARTPLATZ Accelerator. This accelerator assists startups and helps guide them to success by offering advice on business strategy, navigating regulations, and getting to a stage where they are ready to apply for funding.

Within the next 12 months, Nexus Farms has a goal of securing preliminary funding through EU sponsored research grants and/or initial investments from angel investors. Within this year, Nexus Farms also has a firm goal of developing and building a working prototype. This working prototype will give valuable data on exact amounts of inputs needed to scale production up to the Ehrenfeld location.

Based on the data we receive from our prototype setup, we will refine our system design and finalize our business plan.

Within the two-year timeline, Nexus Farms would like to develop and assemble the full-size Ehrenfeld location and become fully operational.



8.0 Conclusion

8.1 Market Analysis

Based on this preliminary market analysis, there is potential interest in an urban farm within the Ehrenfeld neighbourhood. Given the current increasing levels of interest in vegan, vegetarian, and flexitarian lifestyles in Germany and the high population of individuals in Cologne & NRW whose demographics match those associated with these lifestyles, we believe there is a large potential market for aquaponically grown produce. Although there are many supermarkets within the area that sell organic/local produce that would be interesting to our target demographic, Nexus farms would be the first and only aquaponic urban farm within the region, giving our produce a unique marketing point. Other unique selling points include While we may be the only aquaponics farm in the region, competitors are developing rapidly, with INFARM installing locations in NRW in 2019. Analysis of competing aquaponics shows that while success in urban aquaponics farming is possible, profitability is difficult if the market costs of produce are low and quality is high. Therefore, care must be taken to select produce that both can be grown efficiently indoors in large quantities and has a high market price.

8.1 Business Development Strategy

The business plan outlined in this report shows potential to be profitable; however, this profit does not occur until year 7 of operation. To justify these numbers, the following areas of development should be considered for further expansion of capacity, efficiency, and research potential:

a) A larger off-site production facility that's able to produce at economies of scale will generate much higher yields, at lower per unit costs. This will increase revenue based on sale of produce. By partnering with EMCEL, we could significantly lower energy related production costs.

b) Many aquaponic setups implement secondary stages of filtration using mollusks (e.g. oysters, mussels) (Figure 3). This would reduce the load on the filtration units and reduce operating costs.

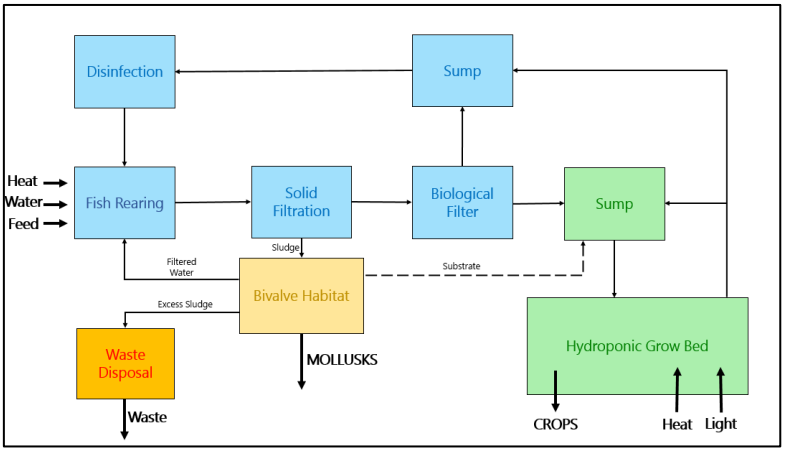


Figure 3: Aquaponic setup with mollusk subsystem.

c) Mollusks grown within the system can also be used as a secondary high-protein food source for the fish. Vermiculture (worms) can also be raised by repurposing some of the excess sludge (lowering waste). These can also be used as feed, thus biomimicking a natural ecosystem and lowering operating costs associated with fish food.

d) Hydroponic grow media is an ongoing production cost; however, there is potential to repurpose the excess shells from the mollusks to use as a natural grow media and reduce production costs.

e) Constructing the world's first hydrogen-powered farm will create enormous research potential. There is potential to develop technology that re-ionizes the water generated in the HFC by using the solid waste. This water can be recycled and could make Nexus Farms 100% water efficient.

These methods would further increase Nexus Farms' efficiency, as well as our environmental footprint, and therefore lowering our costs and adding value to our product by sticking to our goal of being a sustainable producer.

Appendix A:
Cost and Revenue Calculations

The following pages contain Tables 1-12 with details about cost and revenue. See section 6 for more information.

Table 1: 10 Year Cost Analysis											
	Year 0	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Expected income		59,448.00 €	66,600.00 €	71,400.00 €	71,400.00 €	77,400.00 €	77,400.00 €	77,400.00 €	77,400.00 €	77,400.00 €	77,400.00 €
Investment expenditure	34,806.97 €	- €	- €	- €	- €	- €	- €	- €	- €	- €	- €
Depreciation costs		9,423.51 €	9,423.51 €	9,423.51 €	8,590.18 €	8,590.18 €	2,796.98 €	2,796.98 €	2,796.98 €	2,796.98 €	2,796.98 €
Labor costs		8,395.20 €	10,494.00 €	13,642.20 €	13,642.20 €	13,642.20 €	13,642.20 €	13,642.20 €	13,642.20 €	13,642.20 €	13,642.20 €
Financing costs		3,654.73 €	3,289.26 €	2,923.79 €	2,558.31 €	2,192.84 €	1,827.37 €	1,461.89 €	1,096.42 €	730.95 €	365.47 €
Production costs		35,451.54 €	37,919.28 €	37,919.28 €	37,919.28 €	37,919.28 €	37,919.28 €	37,919.28 €	37,919.28 €	37,919.28 €	37,919.28 €
Administrative costs		4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €
Loss carried forward			- 2,276.98 €	- 1,603.03 €	- €	- €	- €	- €	- €	- €	- €
Profit before tax		- 2,276.98 €	- 1,603.03 €	1,088.20 €	3,890.03 €	10,255.50 €	16,414.18 €	16,779.65 €	17,145.12 €	17,510.60 €	17,876.07 €
Taxes (40%)		- €	- €	435.28 €	1,556.01 €	4,102.20 €	6,565.67 €	6,711.86 €	6,858.05 €	7,004.24 €	7,150.43 €
Profit after taxes		- 2,276.98 €	- 1,603.03 €	652.92 €	2,334.02 €	6,153.30 €	9,848.51 €	10,067.79 €	10,287.07 €	10,506.36 €	10,725.64 €
Cash flow (net profit + depreciation)		7,146.53 €	7,820.48 €	10,076.43 €	10,924.20 €	14,743.48 €	12,645.48 €	12,864.77 €	13,084.05 €	13,303.33 €	13,522.62 €
Repayment credit		5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €	5,221.05 €
Dividend		1,925.48 €	2,599.44 €	4,855.38 €	5,703.15 €	9,522.43 €	7,424.44 €	7,643.72 €	7,863.01 €	8,082.29 €	8,301.57 €
Accumulated dividend	- 34,806.97 €	- 32,881.49 €	- 30,282.05 €	- 25,426.67 €	- 19,723.52 €	- 10,201.09 €	- 2,776.65 €	4,867.07 €	12,730.08 €	20,812.37 €	29,113.94 €

Table 1: A ten year cost analysis. Break even point occurs at year 7.

Table 2: Financing	
Total investment	87,017.43 €
Share of finance	60%
Amount to be financed	52,210.46 €
Personal investment	34,806.97 €
Interest rate (year)	7%

Table 2: Total investment and amount to be financed.

Table 3 Financing Cost per Year				
Year	Balance of debt	Refunding Bank loan	Interest cost	Parcel
0	52,210.46 €			
1	46,989.41 €	5,221.05 €	**3,654.73 €**	8,875.78 €
2	41,768.37 €	5,221.05 €	**3,289.26 €**	8,510.30 €
3	36,547.32 €	5,221.05 €	**2,923.79 €**	8,144.83 €
4	31,326.27 €	5,221.05 €	**2,558.31 €**	7,779.36 €
5	26,105.23 €	5,221.05 €	**2,192.84 €**	7,413.88 €
6	20,884.18 €	5,221.05 €	**1,827.37 €**	7,048.41 €
7	15,663.14 €	5,221.05 €	**1,461.89 €**	6,682.94 €
8	10,442.09 €	5,221.05 €	**1,096.42 €**	6,317.47 €
9	5,221.05 €	5,221.05 €	**730.95 €**	5,951.99 €
10	- €	5,221.05 €	**365.47 €**	5,586.52 €

Table 3: Ten year financing cost based on 7% interest

Table 4: Depreciation Rates			
Depreciation rate in years	AfA table reference number	Depreciation rate in percentage	Depreciation cost/year
12	1.3.6.	8.3%	833.33 €
5	1.6.1.2.	20%	5,793.20 €
10	1.6.1.1.	10%	191.70 €
10	[-]	10%	500.00 €
10	[-]	10%	571.94 €
10	2.7.10.3.	10%	200.00 €
10	[-]	10%	500.00 €
3	[-]	33%	833.33 €

Table 4: Depreciation rates used from AfA table

Table 5: Depreciation costs per year										
Asset	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**	**Year 6**	**Year 7**	**Year 8**	**Year 9**	**Year 10**
Growing bed	833.33 €	833.33 €	833.33 €	833.33 €	833.33 €	833.33 €	833.33 €	833.33 €	833.33 €	833.33 €
Water tank	5,793.20 €	5,793.20 €	5,793.20 €	5,793.20 €	5,793.20 €					
Water pump	191.70 €	191.70 €	191.70 €	191.70 €	191.70 €	191.70 €	191.70 €	191.70 €	191.70 €	191.70 €
Filtration equipment	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €
Lights	571.94 €	571.94 €	571.94 €	571.94 €	571.94 €	571.94 €	571.94 €	571.94 €	571.94 €	571.94 €
Pipes	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €
Tools and machinery	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €	500.00 €
Office equipment	833.33 €	833.33 €	833.33 €							
TOTAL	**9,423.51 €**	**9,423.51 €**	**9,423.51 €**	**8,590.18 €**	**8,590.18 €**	**2,796.98 €**	**2,796.98 €**	**2,796.98 €**	**2,796.98 €**	**2,796.98 €**

Table 5: Depreciation costs for equipment over 10 year period

Table 6: Labour Costs														
No.	Full Name of Employee	Quantity	Standard working hours	Working hours paid this month	Salary per month	Gross income this month	Others/ Adjustment for private	Non-taxable allowance this month	Deduction by law	Other deduction for each employee	Payable by employer for each employee	Net take home income this month for each employee	Total employer's paid amount for each employee	Total employer's paid amount
1	Manager	1	176	176	2,640.00 €	2,640.00 €	- €	- €	1,478.76 €	- €	508.20 €	1,161.24 €	3,148.20 €	3,148.20 €
2	Store Manager	1	176	176	2,640.00 €	2,640.00 €	- €	- €	1,478.76 €	- €	508.20 €	1,161.24 €	3,148.20 €	3,148.20 €
3	Energy Expert	1	176	176	2,640.00 €	2,640.00 €	- €	- €	1,478.76 €	- €	508.20 €	1,161.24 €	3,148.20 €	3,148.20 €
4	Farm Expert	1	176	176	2,640.00 €	2,640.00 €	- €	- €	1,478.76 €	- €	508.20 €	1,161.24 €	3,148.20 €	3,148.20 €
5	Farm Worker	4	176	176	1,760.00 €	1,760.00 €	- €	- €	1,030.84 €	- €	338.80 €	729.16 €	2,098.80 €	8,395.20 €
6	Seller	2	176	176	1,760.00 €	1,760.00 €	- €	- €	1,030.84 €	- €	338.80 €	729.16 €	2,098.80 €	4,197.60 €
Total						14,080.00 €	- €	- €	7,976.72 €	- €	2,710.40 €	6,103.28 €	16,790.40 €	25,185.60 €

Table 6: Types of labour and associated costs

Table 7: Labour Costs per year										
Employee	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Manager	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €
Store Manager	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €
Farm Expert		2,098.80 €	3,148.20 €	3,148.20 €	3,148.20 €	3,148.20 €	3,148.20 €	3,148.20 €	3,148.20 €	3,148.20 €
Farm Worker	2,098.80 €	2,098.80 €	4,197.60 €	4,197.60 €	4,197.60 €	4,197.60 €	4,197.60 €	4,197.60 €	4,197.60 €	4,197.60 €
Seller	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €	2,098.80 €
TOTAL	**8,395.20 €**	**10,494.00 €**	**13,642.20 €**	**13,642.20 €**	**13,642.20 €**	**13,642.20 €**	**13,642.20 €**	**13,642.20 €**	**13,642.20 €**	**13,642.20 €**

Table 7: Labour costs over 10 year period.

Table 8: Production Parameters & Values		
Growing area	150	m2
Yearly electricity consumption	88567	kWh/year

General data		
Specific unit	1	kg of basil
Year production capacity	22	kg/m2
Cost of electricity	0.29 €	euros/kWh
Weight of one bunch of basil	0.1	kg/bunch
Fish weight requirement	5	kg/m2
Fish food requirement	5%	of fish weight
Fish food cost	0.87 €	euros/kg food
Rockwool cost	0.19 €	euros/bunch
Water consumption/year	0.02	m3/kg basil
Water cost	4	euros/m3

Outputs		
Total year production	3300	kg/year
Specific electricity consumption	26.8	kWh/kg
Specific electricity cost	0.78 €	euros/bunch of basil
Fish requirement	750	kg/year
Fish food requirement	13687.5	kg/year
Specific fish food requirement	4.148	kg food/kg basil

Specific costs		
Specific electricity cost	7.78 €	euros/kg basil
Specific fish food cost	3.61	euros/kg basil
Specific rockwool cost	0.02 €	euros/kg basil
Specific water cost	0.08 €	euros/kg basil

Table 8: Production costs and parameters

Table 9: Production Costs per year										
Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Utilization of capacity	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%
electricity cost	23,629.70 €	25,684.46 €	25,684.46 €	25,684.46 €	25,684.46 €	25,684.46 €	25,684.46 €	25,684.46 €	25,684.46 €	25,684.46 €
fish food cost	10,955.48 €	11,908.13 €	11,908.13 €	11,908.13 €	11,908.13 €	11,908.13 €	11,908.13 €	11,908.13 €	11,908.13 €	11,908.13 €
rockwool cost	57.68 €	62.70 €	62.70 €	62.70 €	62.70 €	62.70 €	62.70 €	62.70 €	62.70 €	62.70 €
water cost	242.88 €	264.00 €	264.00 €	264.00 €	264.00 €	264.00 €	264.00 €	264.00 €	264.00 €	264.00 €
Fish cost	414.00 €	450.00 €	450.00 €	450.00 €	450.00 €	450.00 €	450.00 €	450.00 €	450.00 €	450.00 €
Seed cost	151.80 €	165.00 €	165.00 €	165.00 €	165.00 €	165.00 €	165.00 €	165.00 €	165.00 €	165.00 €
TOTAL	**35,451.54 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**	**37,919.28 €**

Table 9: Total production costs over 10 year period.

Table 10: Administration Costs										
Cost	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Land rent	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €	3,000.00 €
Marketing	100.00 €	100.00 €	100.00 €	100.00 €	100.00 €	100.00 €	100.00 €	100.00 €	100.00 €	100.00 €
Business on going costs	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €	1,500.00 €
Unexpected	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €	200.00 €
TOTAL	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**	**4,800.00 €**

Table 10: Breakdown of administration costs over 10 year period

Table 11: Investment	
Start-up costs	
Lawyer and Notary cost	2,500.00 €
Real estate deposit	10,000.00 €
Bussiness registration	500.00 €
Building adaptation	1,000.00 €
Engineering services	250.00 €
Unexpected	10,000.00 €
Fish	1,500.00 €
Seeds	165.00 €
Equipment costs	
Growing bed	10,000.00 €
Water tank	28,966.00 €
Water pump	1,917.00 €
Filtration equipment	5,000.00 €
Lights	5,719.43 €
Pipes	2,000.00 €
Tools and machinery	5,000.00 €
Office equipment	2,500.00 €
TOTAL	87,017.43 €

Table 11: Breakdown of investment costs

Table 12: Expected Revenue										
	Year 1	Year 2	Year 3	Year 4	Year 5	Year 6	Year 7	Year 8	Year 9	Year 10
Utilization of capacity	92%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Produce	54,648.00 €	59,400.00 €	59,400.00 €	59,400.00 €	59,400.00 €	59,400.00 €	59,400.00 €	59,400.00 €	59,400.00 €	59,400.00 €
Technical tours	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €
Merchandise		2,400.00 €	2,400.00 €	2,400.00 €	2,400.00 €	2,400.00 €	2,400.00 €	2,400.00 €	2,400.00 €	2,400.00 €
Educational material			4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €	4,800.00 €
Other services (rooftop)					6,000.00 €	6,000.00 €	6,000.00 €	6,000.00 €	6,000.00 €	6,000.00 €
TOTAL	**59,448.00 €**	**66,600.00 €**	**71,400.00 €**	**71,400.00 €**	**77,400.00 €**	**77,400.00 €**	**77,400.00 €**	**77,400.00 €**	**77,400.00 €**	**77,400.00 €**
Contribution from produce	92%	89%	83%	83%	77%	77%	77%	77%	77%	77%

Table 12: Expected revenue over 10 year period.

Table 13: Opening Balance			
Assets		**Liability**	
Cash Out		**Investment Capital**	
Start-up Costs	€14,250.00	Outstanding Share Value	€34,806.97
Fixed Assets		**Long-Term Liability**	
Hydroponics Equipment	€15,719.43	Bank Loan	€52,210.46
Aquaculture Equipment	€37,883.00		
Other Tools, Machinery	€5,000.00		
Office Equipment	€2,500.00		
Current Assets			
Fish	€1,500.00		
Seeds	€165.00		
Liquidity			
Cash	€10,000.00		
Total	€87,017.43	**Total**	€87,017.43

Table 13: Opening Balance

Appendix B:
Aquaponic Equipment

Water Pump:

Model: Honda Frischwasserpumpe WX 15
Available from:
https://www.bauhaus.info/gartenpumpen/honda-frischwasserpumpe-wx-15/p/23140310

Inputs		
Pump working hours	24	hours/day

Honda Frischwasserpumpe WX 15		
Maximum flow	16.8	m3/hour
Power	1600	W
Height	8	m
Unit Price	639.00 €	euro
Electricity consuption/unit	1,190.40	kWh/month

Outputs Water pump		
Total water tank voulme	75	m3
Cycle time	2	hour
Water flow	37.50	m3/hour
Number of pump needed	2.23	units
Number of pump needed (Round-up)	3	units

Aerator:

Model: Ubbink Teichbelüfter Air 200 indoor
Available from:
https://www.bauhaus.info/teichpumpen/ubbink-teichbeluefter-air-200-indoor/p/16146353

Inputs		
Working hours	24	hours/day

Ubbink Teichbelüfter Air 200 indoor		
Unit price	21.90 €	euros
Number of aerator	38	units
Power/unit	5	W
Electricity consumption	4.56	kWh/month

Growing Lights:

Model: AgroLED® Dio-Watt
Available from:
https://aquaponics.com/store2/agroled-dio-watt-1440-865w-full-spectrum-low-pro/
Model: Roleadro Galaxyhydro Series 1000W
Available from:
https://www.amazon.com/Roleadro-Galaxyhydro-Indoor-Spectrum-Flower-1000w/dp/B00PH1MQV8

Inputs		
Power needed	40	W/ft
Working hours	14	hours/day

Roleadro Galaxyhydro Series 1000W		
Power needed	431	W/m2
Growing area	150	m2
Unit Power	1000	W
Number of lamps	65	units
Unit Price	$ 99.99	dollars
Unit Price	87.99 €	euros
Power for consumption	132	W/unit
Total price	5,719.43 €	euros
Electricity consumption	3,723.72	kWh/month

Water Heater

Model: 1,000 watt titanium heat stick
Available from:
https://www.theaquaponicsource.com/shop/build-your-system/1000-watt-titanium-heater-controller/

Inputs		
Working hours	1.5	hours/day
Water temperature	17	celcius
Genneral data		
Water volume	75	m3
Water mass	75000000	g
Specific heat	4.186	joule/gram °C
1,000 watt titanium heat stick		
Unit price	$ 229.00	dollars
Unit price	201.52 €	euros
Number of heater	38	units
Power/unit	1000	W
Electricity consumption	57	kWh/month

	Min Temp	Max Temp
January	-1	5
February	-1	7
March	2	11
April	4	15
May	8	17
June	11	17
July	13	17
August	12	17
September	10	17
October	6	15
November	3	9
December	0	6
AVERAGE	5.6	12.8
	9.2	
Heat needed	2,459,275,000.00	Joules
	683.13	kWh
	56.93	kWh/month

Power needed	124.77	W
Heaters needed	1.00	units

Appendix C:
Depreciation Cost Reference

The following pages contain the “AfA-Tabelle für den Wirtschaftszweig “Landwirtschaft und Tierzucht”” , which was referenced for depreciation costs for this project

Normgeber:	Bundesministerium der Finanzen	**Quelle:**	juris
Aktenzeichen:	IV A 8-S 1551-122/96, S 1551-122/96, S 2230-42-St 215, S 2191-1-St 215	**Normen:**	§ 193ff AO , § 7 Abs 1 EStG
Fassung vom:	19.11.1996	**BStBl-Fundstelle:**	BStBl I 1996, 1416
Gültig ab:	19.11.1996	**Karteifundstellen:**	Lafo-Kartei BW Fach 12 Nr 1.3, ESt-Kartei ST (alt) § 13 EStG Karte 10.2

AfA-Tabelle für den Wirtschaftszweig "Landwirtschaft und Tierzucht"

Mit der Bitte um Kenntnisnahme übersende ich einen Abdruck der neuen AfA-Tabelle für den Wirtschaftszweig "Landwirtschaft und Tierzucht".

Anlage

AfA-Tabelle
Landwirtschaft und Tierzucht

a) **Allgemeine Vorbemerkungen** [1]

Hinweis auf die Vorbemerkungen zu den AfA-Tabellen für verschiedene Wirtschaftszweige, und zwar
zur Tabellenspalte 2 auf Ziffer 1,
zur Tabellenspalte 3 auf Ziffer 3 bis 8,
zur Tabellenspalte 4 auf Ziffer 2,
zum folgenden Hinweis unter b auf Ziffer 4.

b) **Besondere Vorbemerkungen nur für diesen Wirtschaftszweig**

Bei der durchschnittlichen Nutzungsdauer in dieser Tabelle ist für Anlagegüter, deren Nutzungsdauer von den Bodenverhältnissen abhängt, ein mittelschwerer und überwiegend ebener Boden angenommen worden.

Werden höhere Absetzungen für Abnutzung geltend gemacht, sind diese zu begründen. Sie können z.B. im Wege der Leistungs-AfA anteilig nach den vom Kuratorium für Technik und Bauwesen in der Landwirtschaft (KTBl) festgelegten Gesamtlaufzeiten (Lebensleistung) bemessen werden.

c) **Tabellenabschluß**

Die Tabelle gilt für alle Anlagegüter, die nach dem 30.6.1996 angeschafft oder hergestellt worden sind. Die Tabelle gilt für alle folgenden Wirtschaftszweige:

Marktfruchtbau
Milchviehhaltung
Rindermast
Futterbau

Schweinehaltung
Geflügelhaltung
Tierische Veredlung

Lfd. Nr.	Anlagegüter	Nutzungs-dauer AfA-Satz (ND) i.J.	Linearer v.H.
1	2	3	4
1	Ackerbau		
1.1	Schlepper u. Zubehör	8	12
1.2	Transport		
1.2.1	Ackerwagen und Kipper	12	8
1.2.2	Aufsatzbehälter	12	8
1.2.3	Container	12	8
1.3	Bodenbearbeitung		
1.3.1	Bodenfräsen	8	12
1.3.2	Feingrubber und Zinkeneggen	8	12
1.3.3	Gliedereggen	8	12
1.3.4	Pflüge	10	10
1.3.5	Pflugnachläufer (Packer, Krümler)	10	10
1.3.6	Saatbettkombination	8	12
1.3.7	Scheibeneggen	8	12
1.3.8	Schwergrubber	10	10
1.3.9	Spatenrolleggen	8	12
1.3.10	Untergrundlockerer	8	12
1.3.11	Walzeggen	8	12
1.3.12	Walzen	10	10
1.3.13	Zapfwelleneggen (Kreisel-, Rüttel-, Taumeleggen)	8	12
1.4	Mineraldünger Stalldüngerausbringung s. Tierzucht und -haltung)		
1.4.1	Anbau-Exaktdüngerstreuer	8	12
1.4.2	Anbau-Schleuderdüngerstreuer	10	10
1.4.3	Flüssigdüngungsgeräte (Injektion)	8	12
1.4.4	Fördergeräte für losen Dünger	10	10
1.4.5	Großbehälterstreuer	10	10
1.4.6	Lagerbehälter für losen Dünger (Holz-, Stahl-, Kunststoff- und Hochsilos)	20	5
1.4.7	Reihendüngerstreuer	8	12
1.5	Saat- und Pflanzgutausbringung		
1.5.1	Drillmaschinen, Drillkombinationen	10	10
1.5.2	Einzelkorndrillmaschinen	8	12
1.5.3	Folienlegegeräte	10	10
1.5.4	Kartoffel-Legemaschinen	10	10
1.6	Pflege und Pflanzenschutz		
1.6.1	Beregnungsanlagen		
1.6.1.1	beweglicher Teil	10	10
1.6.1.2	stationärer Teil	20	5
1.6.2	Beregnungsmaschinen	8	12
1.6.3	Feldspritzen (An-, Aufbau- und Bandspritzen)	10	10
1.6.4	Gebläse-Sprühgeräte	10	10
1.6.5	Kartoffelpflegegeräte (Häufler, Striegel, Netzeggen)	12	8
1.6.6	Maishackgeräte	12	8
1.6.7	Rübenhackgeräte	12	8

1.7	Erntemaschinen		
1.7.1	Getreide, Körnermais, Raps	10	10
1.7.2	Kartoffeln und Rüben		
1.7.2.1	Futter-, Stoppelrübenziehmaschinen und Häckselanbaumaschinen	8	12
1.7.2.2	Futterrübensammelroder	8	12
1.7.2.3	Kartoffelkrautschläger	12	8
1.7.2.4	Kartoffelroder	10	10
1.7.2.5	Kartoffelsortiermaschinen	10	10
1.7.2.6	Vollerntemaschinen		
1.7.2.6.1	einreihig	7	14
1.7.2.6.2	mehrreihig	5	20
1.7.2.7	Zuckerrübenverladeeinrichtungen	10	10
1.7.3	Feldgemüse		
1.7.3.1	Buschbohnenvollernter	8	12
1.7.3.2	Erbsenvollernter	8	12
1.7.3.3	Gemüsesortiermaschinen	12	8
1.7.3.4	Gemüsewaschmaschinen	14	7
1.7.3.5	Gurkenflieger-Erntegeräte	10	10
1.7.3.6	Kohlrabi-Erntevorrichtungen für Zuckerrübenvollernter	8	12
1.7.3.7	Kopfkohlernter	8	12
1.7.3.8	Vollernter für Blumenkohl	8	12
1.7.3.9	Möhrensammelroder	8	12
1.7.3.10	Möhrenvollernter	8	12
1.7.3.11	Verlesebänder	12	8
1.7.4	Grünfutter, Stroh, Blatt, Heu		
1.7.4.1	Anbaumaishäcksler	8	12
1.7.4.2	Anbau-Anhängestrohhäcksler	8	12
1.7.4.3	Anhängefeldhäcksler	8	12
1.7.4.4	Ballenladewagen	12	8
1.7.4.5	Ballenwurfgabel, Ballenauflader	12	8
1.7.4.6	Gitteraufsatz für Ballentransport	12	8
1.7.4.7	Häcksel-Automatikwagen	12	8
1.7.4.8	Kreiselmähwerk	10	10
1.7.4.9	Kreiselschwader	12	8
1.7.4.10	Kreiselzettwender	12	8
1.7.4.11	Kurzschnitt-Ladewagen	8	12
1.7.4.12	Mähaufbereiter (Quetschen, Knicken, Schlagen)	10	10
1.7.4.13	Mähwerke, Anbaugeräte	12	8
1.7.4.14	Ladewagen	10	10
1.7.4.15	Pressen		
1.7.4.15.1	Aufsammelpressen (m. Ballen-schleuder) Hoch- u. Niederdruck	10	10
1.7.4.15.2	Großpackenpressen	6	17
1.7.4.15.3	Rundballenpressen	10	10
1.7.4.16	Schlegelfeldhäcksler	8	12
1.7.4.17	Schlegelmäher, Mulchgeräte	10	10
1.7.4.18	Selbstfahrerfeldhäcksler	8	12
1.7.4.19	Sternradrechen	12	8
1.8	Einlagern und Konservieren der Ernte, Saatgutaufbereitung		
1.8.1	Getreide		
1.8.1.1	Einrichtungen zur Annahme, Trocknung, Reinigung und Aufbereitung von Getreide	12	8
1.8.1.2	Körnerannahmegosse	20	5
1.8.1.3	Körnerannahmesumpf	20	5
1.8.1.4	Lagerbehälter f. Getreide	20	5
1.8.2	Kartoffellager- und Kartoffelaufbereitungsmaschinen (Abkippanlagen, Förderbänder, Boxenstapler, Teleskopbefüllgeräte, Sortiermaschinen, Aufnahmegeräte, Enterder, Verlesebänder)	10	10
1.8.3	Grünfutter, Stroh, Blatt, Heu		

1.8.3.1	Abladegebläse und Gebläsehäcksler	12	8
1.8.3.2	Dosiergeräte für Siliermittel und Futterzusätze	10	10
1.8.3.3	Drehkrangreifer	12	8
1.8.3.4	Förderbänder, Ballenförderanlagen	12	8
1.8.3.5	Greiferaufzüge	12	8
1.8.3.6	Hallenlaufkräne	12	8
1.8.3.7	Heubelüftungsanlagen (Gebläse, Schächte)	14	7
1.8.3.8	Heutürme	10	10
1.8.3.9	Heuunterdachtrocknung	8	12
1.8.3.10	Hochsilos f. Häckselgut	14	7
1.8.3.11	Silopressen	8	12
1.8.3.12	Teleskopverteileranlagen für Heu und Stroh	12	8
1.9	Auslagerung		
1.9.1	Flachsiloentnahmegeräte	8	12
1.9.2	Futterverteilwagen, Futtermischwagen	8	12
1.9.3	Siloobenfräsen	8	12
1.9.4	Vorschneidegeräte	8	12
2	Tierhaltung und -zucht		
2.1	Tiere		
2.1.1	Zuchthengste	5	20
2.1.2	Zuchtstuten	10	10
2.1.3	Zuchtbullen	3	33
2.1.4	Milchkühe	3	33
2.1.5	übrige Kühe	5	20
2.1.6	Zuchteber und -sauen	2	50
2.1.7	Zuchtböcke und -schafe	3	33
2.1.8	Legehennen	1,33	75
2.1.9	Damtiere	10	10
2.2	Rindviehhaltung		
2.2.1	Anbindevorrichtungen	12	8
2.2.2	Eimermelkanlagen	12	8
2.2.3	Freßgitter	12	8
2.2.4	Kälberbuchten	12	8
2.2.5	Klauenpflegeeinrichtungen	12	8
2.2.6	Kraftfutterzuteilung	12	8
2.2.7	Melkstände	12	8
2.2.8	Milchsammelbehälter und Kühleinrichtungen	12	8
2.2.9	Rohrmelkanlagen	12	8
2.2.10	Selbsttränkeanlagen	12	8
2.2.11	Stallmattenbelag	12	8
2.3	Schweinehaltung		
2.3.1	Abferkelbuchten	8	12
2.3.2	Ferkelaufzuchtbuchten	8	12
2.3.3	Flatdeckanlagen	8	12
2.3.4	Flüssigfütterungsanlagen	8	12
2.3.5	Futterdämpfer	8	12
2.3.6	Futterdosierungswaagen	8	12
2.3.7	Futtermuser	8	12
2.3.8	Futtertröge	8	12
2.3.9	Sauenaufstallung	8	12
2.3.10	Schweinemastbuchten	8	12
2.3.11	Tränkebecken und -nippelanlagen	8	12
2.3.12	Trockenfütterungsanlagen	8	12
2.4	Schafhaltung		
2.4.1	Schäfer-Wohnwagen	12	8
2.4.2	Schafpferche, transportabel (Netzgeflecht mit Pfosten)	10	10

2.4.3	Schafscheranlagen, transportabel	12	8
2.5	Geflügelhaltung		
2.5.1	Brutmaschinen	10	10
2.5.2	Eiersortiermaschinen	10	10
2.5.3	Eiertransportanlagen	10	10
2.5.4	Fütterungsanlagen (Kettensystem)	8	12
2.5.5	Geflügelaufzucht- und Legebatterien	8	12
2.5.6	Schlachtereieinrichtung	8	12
2.6	Tierhaltung allgemein		
2.6.1	Biogasanlagen	16	6
2.6.2	Dosier-, Mahl- und Mischanlagen	10	10
2.6.3	Flachschieberentmistung	10	10
2.6.4	Flüssigmistbelüftung	10	10
2.6.5	Futtermischer	12	8
2.6.6	Futtermittelsilos	16	6
2.6.7	Güllebehälter		
2.6.7.1	Stahlblech, Beton	20	5
2.6.7.2	Holz	10	10
2.6.8	Güllemixer	10	10
2.6.9	Jauchefässer	12	8
2.6.10	Jauchepumpen	12	8
2.6.11	Mischfuttervorratsbehälter	16	6
2.6.12	Mistauflader	12	8
2.6.13	Radlader	8	12
2.6.14	Reinigungs- und Desinfektionsgeräte	10	10
2.6.15	Rührmixpumpen	8	12
2.6.16	Schleudertankwagen	10	10
2.6.17	Schrapperentmistung	10	10
2.6.18	Schrotmühlen	10	10
2.6.19	Schubstangen- und Kettenentmistung	10	10
2.6.20	Ställe		
2.6.20.1	Massivbauweise	25	4
2.6.20.2	Leichtbauweise (Holz, Faserzement, Leichtmetall)	17	6
2.6.20.3	Offenställe	10	10
2.6.21	Maschinen- und Lagerhallen		
2.6.21.1	Massivbauweise	25	4
2.6.21.2	Leichtbauweise (Holz, Faserzement, Leichtmetall)	17	6
2.6.22	Stallüfter	10	10
2.6.23	Stallmiststreuer	10	10
2.6.24	Stallraumheizung (bewegliche)	10	10
2.6.25	Stallschlepper	8	12
2.6.26	Strohverbrennungsanlagen	10	10
2.6.27	Vakuum- und Pumpentankwagen	8	12
2.6.28	Viehtransporter (o. Antrieb)	20	5
2.6.29	Güllewagen	10	10
2.7	Übrige Anlagegüter		
2.7.1	Alarmanlagen	6	17
2.7.2	Elektromotoren, bewegliche	20	5
2.7.3	Funkanlagen	8	12
2.7.4	Luftentfeuchter	15	7
2.7.5	Notstromaggregate	20	5
2.7.6	Treibstofftankanlagen	20	5
2.7.7	Ultraschallgeräte	10	10
2.7.8	Waagen	14	7
2.7.9	Windmühlen (f. Wasserförderung)	16	6
2.7.10	Drainagen und Leitungen		
2.7.10.1	aus Beton oder Mauerwerk	33	3
2.7.10.2	aus Ton	10	10
2.7.10.3	aus Kunststoff	10	10

Hinweis

ESt-Kartei ST:

Ausgesondert durch Verfügung vom 14.01.2008,
VV ST OFD Magdeburg 2008-01-14 S 2506-1-St 212

Fußnoten

1) **Lafo-Kartei BW:** Zu den Allgemeinen Vorbemerkungen vgl. Fach 12 Nr. 1.1.

Ändernder Verweis

VV DEU BMF 1995-07-01 S 1551 III (Neuregelung)

Anwendende Verweise

VV DEU BMF 1989-01-01 S 1551 (Anwendung)
VV DEU BMF 1997-04-18 IV A 8-S 1551-38/97 (Anwendung)
VV DEU BMF 2001-12-06 IV D 2-S 1551-498/01 (Anwendung)

Sonstige Verweise

AO 1977 § 193 (Durchführungsvorschrift)
EStG § 7 Abs 1 (Durchführungsvorschrift)

Appendix D:

Sample Employment Contracts

The following pages contain a sample employment contract between the Employer and Employee

Cristian & Trevor
132 Mülheimer Freiheit
51063 Köln, DE
Email: Tel:

LABOR CONTRACT

No.

- *Based in the Labor Law of Germany;*

We are, from one party: **Nexus Farms (the Employer)**

Address:

Email: Tel:

Representative: **Mr. Cristian Wedgwood**

Dated of birth: Nationality: American

Passport No. Expiration date:

Position:

And from other party: **XX (the Employee)**

Date of birth: 02/09/1987 Nationality: Vietnam

Passport No. Expiration date:

Home address: 10000 Hanoi, Vietnam

Current address: 51063 Köln, DE

Email: Tel:

Profession: Farmer

Today, at the representative office of Nexus Farms, both parties agree to sign this labor contract and commit to perform in accordance with following terms and conditions:

Article 1: Job description and workplace

1. Job description: To undertake all tasks related to the production, harvest, processing, and sales of product. Additionally, should follow all necessary processes to ensure water quality, plant growth, and health and safety requirements are met.
   - Job position: Farmer
   - Main duties:
     - Planting seeds and sprouts
     - Feeding fish – daily
     - Checking water quality parameters – daily
     - Harvesting crops

- Maintaining an orderly farm and POS environment
- Operate POS for products

Workplace: the representative office of Nexus Farms

Article 2: Term of labor contract

- This Labor Contract is limited duration.
- Contract term is 01 year from 01/01/2019 until 31/12/2019/
- Probation period is two months. During probation period, each party will have the right to terminate the probation agreement without prior notice. After probation period this agreement shall continue with all the conditions set forth in this agreement.

Article 3: Working regime

- Working time:
  - 40 hours per week
  - 8 hours per day from Monday to Friday
- Daily start time: 900 hour
- Fully paid vacation: entitlement to national holidays and 4 weeks of annual leave.

Article 4: Obligations and rights of the employee

1. Rights

- Monthly Income: **3,000 EUR**

  Above income includes:

  - Basic salary;
  - Employer's contributions to Employee's compulsory insurance and taxes as stipulated by German Law.

  Above income excludes:

  - Personal Income tax, for which however the Employee is responsible to give all necessary information to the Employer, including information of deductibles.
  - Employee's compulsory insurance and taxes contributions as stipulated by German Law.
- Salary payment shall be made based on monthly timesheet of the Employee.
- Salary payment shall be made in Euro by the last day of each month by bank transfer.
- Other allowances (if any):
  - Housing allowance:
  - Transportation allowance:
  - Phone allowance:

- Bonus payments are according to the Company's regulations.
- The employee will be equipped with working tools as specified by the Company.
- Means of transportation shall be arranged by both Employer and Employee.
- The Employee has the right to propose changing terms and conditions of the labor contract, and delay or terminate the labor contract as regulated in applicable law provisions.

2. Obligations

- Fulfill the job undertaken in this contract;
- Comply with management and assignment of the Manager;
- Strictly follow provisions of laws; rules and labor safety of Company regulations; commitment on information security and anti-competition;
- Compensate material violation as regulated by the Company and Labor Law and other provisions of law.

Article 4: Obligations and rights of the Employer

1. Obligations:

- Ensure the work and completely fulfill all commitments in the Labor Contract.
- Duly and in time settle salary and other benefits to the Employee as stated in the Labor Contract.

2. Rights:

- Manage employee to finalize works in accordance with labor contract (arrangement, transfer, suspension).
- Suspend, terminate the contract according to provisions of law, collective labor agreement (if any) and labor regulation of the Company.
- Claim for compensation to competent organizations to protect rights of the Company if the employee terminates laws and/or other terms of the Labor Contract.

Article 5: Implementation provisions

- Other terms and conditions that are not stated in this Labor Contract shall be applied in accordance with the Labor Law and the Company's rules and regulations.
- This Labor Contract is made in 02 originals of the same legal value, each party shall keep 01 copy. In case both parties sign appendix, the contract appendix shall be the integral part of this Labor Contract.

  This Labor Contract is made at the Nexus Farms office in Koeln, Germany on 8th 1st January 2019.

Employee	**Employer**
_____	_____
Name, Date, Location	**Name, Date, Location**

Cristian & Trevor
132 Mülheimer Freiheit
51063 Köln, DE
Email: Tel:

Appendix E:
Articles of Association

The following pages contain an Articles of Association contract

Articles of Association

Between:

- Cristian Wedgwood
- Trevor Weiss

following articles of association for the formation of a GmbH are contracted:

§ 1 Name, Registered Office and Financial Year

(1) The name of the company is Nexus Farms GmbH

(2) The company is located in Cologne, Germany

(3) The financial year shall be the calendar year.

§ 2 Object of Business

The object of the Nexus Farms is to bring the food-water-energy nexus concept into a physical urban environment, and give customers the opportunity to support sustainable development and consumption in a local community setting.

§ 3 Share Capital

(1) The share capital is 35,000 Euro.

(2) The associates Cristian Wedgwood and Trevor Weiss have a share of 50%

(3) The share shall be paid immediately on the bank account of NexusFarms.

§ 4 Manager and Representation

(1) The manager of Nexus Farms is Cristian Wedgwood.
(2) The manager can represent the whole association.
(3) The manager can be represented with a written consent by Trevor Weiss.
(4) The Company is to be represented legally by the manager or an authorized person with a written power of attorney.

§ 5 Announcements

Announcements of the company shall be published on the official Nexus Farms webpage www.nexusfarms.de.

§ 6 Formation costs

Both associates shall bear the costs of incorporation.

§ 7 Final provisions

(1) This contract can only be changed in a written form.
(2) This article of association shall be governed by the laws of the Federal Republic of Germany.

Cologne, January 27, 2019 Cologne, January 27, 2019

_____ _____

Cristian Wedgwood Trevor Weiss

Appendix F:
Pitchdeck

The following pages show a sample pitchdeck. In this example, Nexus Farms pitched to STARTPLATZ accelerator on Jan. 21, 2019.

NEXUS FARMS

Farming Redefined.

www.nexusfarms.de

"Combine the 3 pillars of sustainable development:

Renewable Energy,

Water Efficiency,

Low Impact Agriculture

in an urban farm setting."

Challenge:

Many people are turning towards more environmentally friendly behaviour, but sustainable options related to food are **extremely** limited.

Solution:

Bring the **Food-Water-Energy Nexus** concept into a physical urban environment giving customers the opportunity to support sustainable development in a local community setting.

Current Food Production

Air Pollution from 1000's of km of travel, Farm → Table

Contamination from **chemicals** and **fertilizers**

Inefficient water usage creates **drought** worldwide

Aquaponic Farming

70% **Savings in Water**

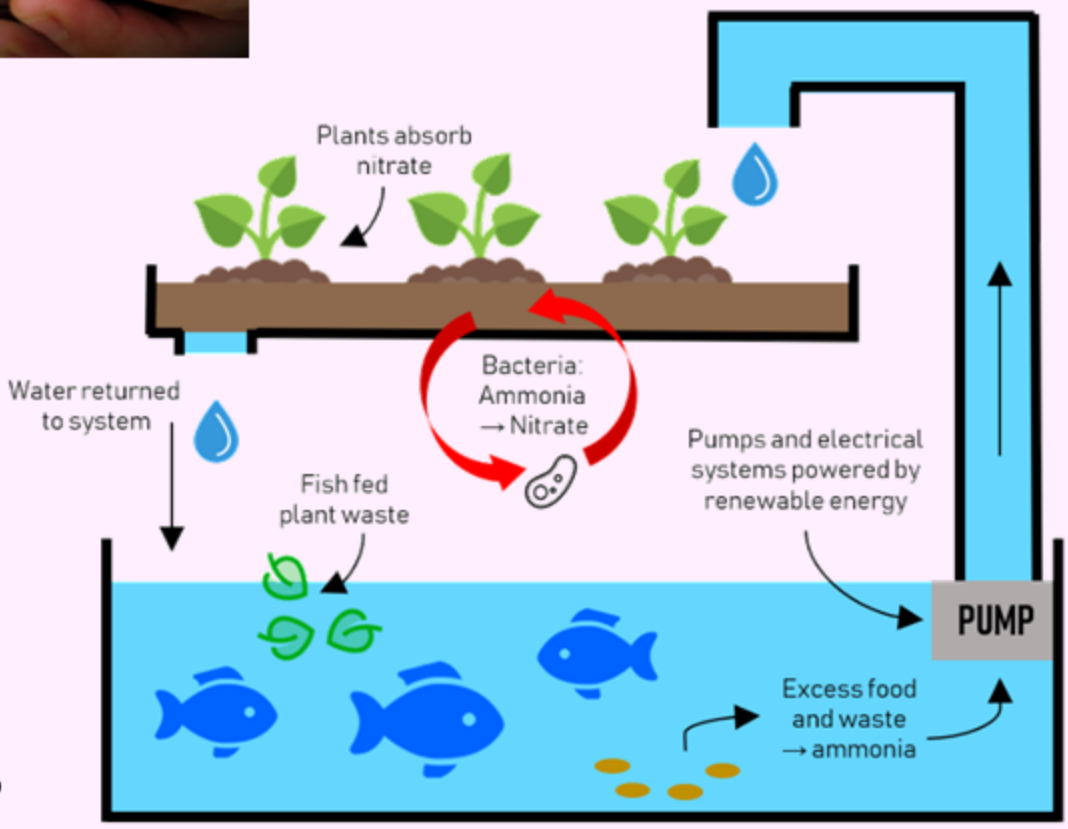
Powered by **Renewable Energy**

Minimal fertilizers, **ZERO impact** on soil

Natural Fertilizers. Zero Waste.

100% Sustainable.

Aquaponics uses the natural nutrients provided by fish, to promote healthy plant growth.



Why Nexus Farms?

Our fish grow our food...

Why eat them?

Nexus Farms is a **kill-free** facility.

Waste-Free

No **Plastic**.

No **Food-Waste**.

Minimal fertilizers needed

(Our fish do that!)

We're **Local**

Growing in the community

Watch your food grow.

Your produce **grows on site**, we want you to **see** the process.

First Aquaponic Farm in **NRW**!

Cologne is a **sustainable city**

Our Customers

- Eco-Friendly
- Locally Involved
- Health Conscious
- Ehrenfeld community

Flexitarian 56%

Vegetarian 10%

Vegan 1.6%

Rates of plant-based diets are increasing throughout Germany

These people tend to be **educated, women** & **young**

Cologne

Population

City 1.08 M

Metro : 3.5 M

18-30 yo: 282,000

Ratio Male:Female

49:51

GDP Per Capita (2016):

Cologne: €41,400
Germany: €38,200

Ehrenfeld

Population: 37,856

Density: 10,172/km^2

We talked to the people of **Ehrenfeld**:

78% wanted locally grown produce
33% wanted organically grown
56% wanted vegan & vegetarian options

100% were interested in Aquaponic Farming

Streams of Revenue

- **Aquaponically** grown **fruits** & **vegetables**
- Local **school visits** & presentations
- Community based **learning material**
- **Technical Tours** of facility

Open Ehrenfeld farm & store space → Utilize space for produce sales & services → Use farm to engage with community (build product awareness) → Open larger aquaponic facility to meet demand → Expand services (rooftop farms, consulting, etc.)

INFARM, Berlin

1. Design & construct 3rd party hydroponic systems (e.g. supermarkets)
2. Operate all 1st and 3rd party facilities

- **Hydroponics***
- **Grid-dependent power****
- No-kill

ECF Farmsystems, Berlin

1. Provide design & construction consulting for aquaponic systems
2. Operate model farm

- Aquaponics,
- Renewable Energy
- **Kill*****

* Hydroponic systems rely heavily on synthetic chemical fertilizers
** Environmental impact of system is dependent on the energy source of grid electrical providers
*** Animals are raised for slaughter

	Organically Produced	Affordable	Locally Grown	Water Efficient	Source of Nutrients
Supermarket Produce		☺			Chemicals
Biomart Produce	☺		☺		Chemicals
Hydroponic Farms	☺	☺	☺	☺	Chemicals
Nexus Farms	☺	☺	☺	☺	FISH

Our Vision:

- Work with experts to **design new innovative technologies**
- Use our university network to **develop research projects**
- **Establish a regional network** of urban aquaponic farms

Build **sustainable communities** with **aquaponics** at their core.

Why **STARTPLATZ Accelerator** is right for us:

- Establish **network** with industry experts & academics
- Identify and **develop partnerships** with complimentary businesses and institutions
- Receive assistance navigating the **regulatory environment** of Germany
- Leverage experience in small market enterprise funding instruments to **secure funding** to develop initial installation
- Develop **brand** & implement **marketing strategy**

Cristian Wedgwood

Cristian has in-depth experience working and developing small businesses. In San Francisco, he worked for a 3D printing startup, before moving to Berlin for 2 years where he worked for successful hydroponic farm. He now studies Integrated Water Resource Management at TH Köln, where you can often find him between classes buying another chocolate cookie from the cafeteria.

Trevor Weiss

Trevor has a background in Earth Sciences and specializes in technical communication. In British Columbia, he worked for an environ-mental engineering firm before moving to Seoul for 2 years where he taught Business English. He is now completing his masters in Natural Resource Management at TH Köln. He is most happy when riding his bicycle, or just finishing a bowl of vegetable curry.

Our Team

Due Minh Nguyen, Water Resources
Yen Pham, Farm & Water Systems
Jingo Ikejiri, Renewable Energy
Clemens Dryer, Renewable Energy

Milestones & Goals