

AQUAPONICS-BASED LOT SYSTEM PLATFORM

Rui Zhang*, Supot Rattanapun** & Worawut Wachiraworagunchai ***

* Graduate School, Southeast Asia University, Bangkok, Thailand

E-mail: *s6341B20037@live.sau.ac.th, **drsupotr@gmail.com, ***worawutw@sau.ac.th

ABSTRACT

Aquaponics is a new type of compound farming system, which takes aquaculture and hydroponic cultivation, two originally completely different farming techniques, through clever ecological design, so that recycling aquaculture and plant hydroponics integrated in a production system, to achieve scientific synergy and symbiosis, so as to achieve the ecological symbiosis effect of fish farming without water change and no water quality worries, vegetable cultivation without fertilization and normal growth. R&D concept: technology creates ecological environment, and aquaponics produces healthy food. R&D achievement: whole life cycle aquaponics system. R&D goal: 0 soil, 0 waste water, 0 pollution, 0 chemical fertilizer, 0 pesticide, 0 nutrient solution, first-class quality, four-season output, 5 times the production of vegetables, 10 times the production of fish. Based on the static payback period projection is 289 days, net present value is 35.08 and an internal rate of return is 328%.

Keywords: Industrial fish farming; aquaponics; recirculation farming; purification

INTRODUCTION & COMPANY DESCRIPTION

The farm is located in Kunbeishan, Muping District, Yantai City, Shandong Province, established in 2011, covering an area of 20 acres, is the key project research, demonstration and test pilot base set up by Shandong Avi Technology Co. The farm is famous for the aquaponics of "raising fish without changing water and growing vegetables without fertilizer" and the aerosol cultivation planting mode of "vegetables growing in the air". It is the first place in China to start aquaponics design and operation, and is by far the most successful commercial aquaponics + aerosol ecological farm in China.

INDUSTRY ANALYSIS

With the improvement of living standards, many families also began to focus on food safety issues, but most vegetable foods on the market have excessive heavy metals, pesticide residues and other problems. In addition, in recent years, China's environment has been deteriorating, food problems have been exposed, and the 3-15 party in 2021 revealed that food from Japan's Fukushima nuclear contaminated areas quietly appeared in the domestic market; there are illegal additives in feed; including previously reported lean meat extract, flavoring, tainted milk powder, and countless black-hearted food, even many well-known brands have been exposed to problematic products; at present, genetically modified The market is flooded with genetically modified products, vegetables and fruits are sprayed with

pesticides, herbicides, ripening agents, etc. during the growth process. Even the soil where crops are grown is contaminated, with industrial wastewater, waste and pesticides causing damage to the soil. When food safety issues raise concerns, the source of ingredients is quite important.

2.1 Advantages

2.1.1 Advantages of target customers

Different consumer groups have their own unique tastes and views on food. In response to the strong demand of modern consumers for healthy and green ingredients, Aquaponics accurately grasps the consumer psychology and habits and provides people with high-quality, hygienic, fresh, safe fish and vegetables without antibiotic residues, which has obvious advantages in this regard.

2.1.2 Advantage of product characteristics

Through investigation and analysis of our target customers, we have introduced for our customers the use of natural health products farmed in a clean and hygienic environment, free of chemical growth hormones and antibiotics, which is both safe and healthy; the absence of growth promoters, hormones and antibiotics is very attractive to modern consumers. Therefore, aquaponics is green and healthy and will definitely be at the forefront of market trends.

2.2 Disadvantages

2.2.1 High cost of aquaculture

Modern farming feeds are increasingly using growth promoters, hormones and antibiotics, therefore, the growth cycle of aquaponics is short and the profit margin is high, T aquaponics farming is green and healthy and the cost is high.

2.2.2 Staff risk

In order to provide high quality product technology, the aquaponics system requires a high selection of employees. Not only do we require employees to have certain qualities, but they must also agree with our corporate culture and support the business philosophy. It takes some time to train them into a team that meets the requirements.

2.2.3. Management analysis

Aquaponics farming system will encounter certain difficulties in the initial operation and management. The operation managers are required to have certain management knowledge, to uphold the service spirit of dedication, innovation and trustworthiness in the operation process, to treat the staff and business operation with strict, standardized and efficient management policy, to take consumer demand as the guide, to take consumer health as the demand, and to provide customers with convenient, safe and green ingredients in strict accordance with the concept of standardization, process, intensification, serialization and greening.

2.3 Opportunities

2.3.1 Aquaponics farming is green and healthy, and there is plenty of room for market development.

2.3.2 The aquaculture industry itself is a big cake, customers are always varied, the characteristic theme creates a good opportunity to enter the industry, using the fun of the cooperative farm to attract customers to experience dining, undoubtedly makes the creation of a huge market.

2.3.3 People pay more attention to the quality of life extremely spiritual realm, and thus pay more attention to the health and safety of ingredients.

2.4 Threats

2.4.1 Uncertainty of the market

Like its opportunities, opportunities and threats coexist. The lack of clarity in the consumer market also poses a great threat, as the lack of clarity in its customer base and the absence of the concept of consumer share undoubtedly makes it a fatal threat.

2.4.2 Industry competition

There are many specialized farms in the market and they are all trying to attract their own customer base, leading to increased competition in the industry. If aquaponics farming cooperatives cannot distinguish themselves from other farms, they will lose their unique appeal and will not be able to benefit from the competition.

MARKET ANALYSIS & MARKETING PLAN

However, the agricultural production methods are backward and most of the regions still rely on experience, which is a great waste of human and material resources on the one hand, and is not conducive to environmental protection on the other. The use of computer networks, the Internet of Things, and big data technologies to significantly reduce agricultural production costs, improve efficiency and protect the rural ecological environment to achieve sustainable development of modern agriculture is the general trend. The marketing plan of this project includes the following seven main aspects.

3.1 Establishment of marketing center

Establishing a marketing center to make a comprehensive and detailed overall plan for market development.

3.2 Build sales network

On the basis of conducting a detailed market survey, analyze and study the survey data, and develop corresponding sales programs according to different markets. Selecting target markets, determining the order of market entry, and establishing sales networks in a gradual and point-by-point manner.

3.3 Formation of management level

Around the marketing center, responsible for market planning, investigation and development, product sales. Establish a marketing network in the target market, managed by the regional sales manager. Gradually expand the sales market and promote one city at a time to form a regional level and provincial sales management level.

3.4 Product exhibitions and sales fairs

Participate in national, provincial and municipal product fairs to promote aquaponics products and seek larger sales markets.

3.5 Promote visibility

Strengthen quality management, use publicity media to establish an image and build product brands; help poverty alleviation activities as well as various competitions to increase visibility.

3.6 Build a team

To promote product sales, establish a team with high quality, strong career spirit and proficiency in market planning and sales, set up representative sales points in various areas suitable for aquaponics promotion, and assign business managers and salesmen to do a good job in sales.

3.7 New mode of cross-border e-commerce

Take advantage of the team, understand and study the market demand, combine the team's advantages and product characteristics, develop the national market, and develop the new cross-border e-commerce sales model through cooperation with reliable e-commerce platforms.

MANAGEMENT TEAM & COMPANY STRUCTURE

Through the operation mode of "cooperative+base+farmers", the cooperative takes the lead and the basic farmers as the basis to carry out the trust of members' land, organize the production service team and carry out the trust service, and take the cooperative as the grip to realize the trust of farmers' land in large-scale operation. The cooperative aims to serve its members and seek the common interests of all members, and implements independent operation and democratic management; members are equal in status, joining voluntarily and withdrawing freely; major decisions are made by voting and the minority obeys the majority. The cooperative has a members' representative assembly, a council and a supervisory board. There are 5 functional departments under the cooperative, including: marketing department, office, engineering department, technology department and finance department.

4.1 Marketing Department

Responsible for marketing and propaganda of products, promoting aquaponics farming technology, developing foreign markets, developing new sales model of cross-border e-commerce, etc.

4.2 Office

Under the guidance of the project leadership team, it is responsible for the daily affairs of the project.

4.3 Engineering Department

Responsible for the infrastructure construction of the project. Uniform planning and management of the project's construction projects; responsible for major infrastructure bidding work; daily management of acceptance and delivery of each construction project.

4.4 Technical Department

Employ technical experts from domestic and cooperative units as consultants, recruit scientific research talents, gradually establish a supporting technical system to solve technical problems in production and emergence; combine with universities and agricultural research institutes, adopt flexible and diversified ways to train agricultural technicians, so as to improve the overall quality of agricultural technicians and provide the project with all kinds of urgently needed technical talents.

4.5 Finance Department

Responsible for the use and management of project funds to ensure the supply of input funds during the implementation of the project; supervise and audit project funds to ensure the effective use of funds, especially the project funds of the government; manage the application funds of various departments.

OPERATIONS & PRODUCTION PLAN

5.1 Product development stage

Integrate the existing technical achievements, focus R&D efforts on overcoming technical difficulties, further improve the platform and product functions, and cover the whole Yantai with the aquaponics platform.

5.2 Register a company for labeling and production

Create a company brand, promote it vigorously in various provincial governments and rural areas, and support students from colleges and universities in the region to return to their hometowns through aquaponics technology to promote rural revitalization by exchanging costs for income.

5.3 Market Expansion

Expand marketing and sales channels nationwide. When the company achieves a certain scale, it can focus on building an aquaponics cloud data center to create a nationwide aquaponics cloud platform.

FINANCIAL ANALYSIS & FEASIBILITY ANALYSIS

6.1 Financial Analysis

The project requires a self-financing start-up capital of RMB 1 million and a financing amount of RMB 7 million, mainly in the form of financing, borrowing and cooperation. The use of funds mainly includes breeding platform construction, gas chain logistics, cold chain logistics, brand construction, marketing construction, e-commerce, etc. During the start-up period, the company needs to invest in design, development, maintenance of the platform, purchase of fixed assets, renting office space, marketing, promotion, etc. The company's monthly revenue balance analysis for year 1 was RMB 183,915 (see Table 1). Sales are expected to increase by 8% per month in years 2 to 5 due to the company's internal expansion and corresponding advertising. The company is a limited liability company with an estimated income tax rate of 25%.

Table 1 Break-even Analysis

Break-even Analysis	
Monthly Units Break-even	7,000
Monthly Revenue Break-even	¥183,915
Assumptions	
Average Per-Unit Revenue	¥30
Average Per-Unit Variable Cost	¥18.7
Estimated Monthly Fixed Cost	¥79,051

6.2 Feasibility Analysis

With the improvement of living standards, many families also began to focus on food safety issues, but most vegetable foods on the market have excessive heavy metals, pesticide residues and other problems. In addition, in recent years, China's environment has been deteriorating, food problems have been exposed, and the 3-15 party in 2021 revealed that food from Japan's Fukushima nuclear contaminated areas quietly appeared in the domestic market; there are illegal additives in feed; including previously reported lean meat extract, flavoring, tainted milk powder, and countless black-hearted food, even many well-known brands have been exposed to problematic products; at present, genetically modified The market is flooded with genetically modified products, vegetables and fruits are sprayed with pesticides, herbicides, ripening agents, etc. during the growth process. Even the soil where crops are grown is contaminated, with industrial wastewater, waste and pesticides causing damage to the soil. When food safety is a concern, the source of the ingredients is quite important. It is in this context that the Aquaponics IoT system platform was created.

In writing this business plan, the STP strategy was used to segment the market in the aquaponics industry, identify the target market and market positioning, and provide the basis for the subsequent marketing plan, financial analysis, and risk analysis. Based on the static payback period projection, the investment will pay for itself in 289 days. The investment cash flow forecast was used to calculate the operating cash flow of the project over a five-year period. It yielded a net present value of 35.08 and an internal rate of return of 328%, which indicates that it has investment value.

CONCLUSION & FUTURE WORK

The aquaponics system uses feed as material input, which is both a source of nutrients for fish and a direct or indirect source of nutrients for vegetables. The water body is used as the carrier or medium, and there is no pollution link in between. The fish is the first output and the vegetables are the second output, and both have pollution-free quality, reflecting the advantages of adding value to itself in the purification process. Aquaponics system as a multidisciplinary high-tech integrated engineering has the potential to enter the production field and become one of the effective ways to develop modern agriculture.

The development of aquaponics is very much in line with the development trend of modern rural areas and can effectively alleviate the current problems faced in agriculture. Moreover, aquaponics makes use of the latest and hottest Internet of Things technology, which can realize automatic control methods such as intelligent planting and intelligent breeding, changing the traditional production methods in the past and having obvious effects on agricultural cost control and efficiency improvement.

ACKNOWLEDGMENTS

I would like to express my sincere gratitude to Professor Dr. Supot Rattanapun and Professor Dr. Napapron Khantanapha of the International College of Southeast Asia University for their advice and assistance.

REFERENCES

- [1] Aquatree Global LLC. (2019). Patent Application Titled "Aquaponics System" Published Online (USPTO 20190230879)[J]. Politics & Government Week, 2019,
- [2] Ciência & Educação (Bauru). (2019). Science teachers' continuing training using Aquaponics as a didactic tool, 25(2)
- [3] Kaleihua et al. (2020). Reconnecting Rural Native Hawaiian Families to Food through Aquaponics. Genealogy, 4(1), 9-9.
- [4] Lee, H., Choi, K., & Choi, E. Determination of Mineral Nutrient Concentrations in Fish Growing Water and Lettuce Leaf for Hydroball Aquaponics. Protected horticulture and Plant Factory, 29(3), 293-305.
- [5] Zhao et al. (2016). Study on Fish and Vegetable Co-existing System Based on Wireless Sensor Network. Shenyang, China.