

VeFarm

White paper V1.0

Farm Smartly and Automatically, Creating Precise Agriculture



VeFarm Team

Disclaimer

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Introduction

The global population is anticipated to grow up to between 9.4 to 10.1 billion in 2050 (United Nation, 2019). This growth in population is expected to pose intense pressure on the global food supply. Even at this moment, food crisis, food shortage, malnutrition are phrases that we are not unfamiliar with. Traditional farming, although it is the major method of producing food to us now, is facing various problems, especially being blamed for impacting environment. For instance, pollution from biomass burning and deforestation (Bruinsma, 2003). Therefore, alternate farming practices, such as greenhouse /shade net farming, urban farming and vertical farming are being developed (Farah, 2013) Among all, vertical farming is receiving great attention. According to a research done by Grand View Research, Inc (2019), the global vertical farming market size is anticipated to reach 9.96 billion by 2025 and its compound annual growth rate is expected to be 21.3%.

Hydroponic system and aeroponics system, methods of growing plants without soil, eliminate the need for pesticides and artificial ripening agent. Some research papers also pointed out that it helps in producing nutritionally-rich vegetable. However, it is commonly known that factors such as high initial investment, high labour cost and fewer crop varieties are likely to restrain the market growth.

The mission of VeFarm, therefore, is to address the problems that other farming techniques are facing while at the same time, bring agriculture to the a new level, enhancing the development of this industry and aim at automatizing the whole agriculture process in order to create precise agriculture and high quality organic products.

Problem Statement

Indoor farming is being more and more popular now. Alternate indoor agriculture practices, such as vertical farming, are hitting its strides. Without doubt, vertical farming is a revolutionary and relatively more sustainable method of agriculture. However, we should not neglect the problems that nowadays vertical farming is facing.

High Initial Investment Cost

Banerjee and Adenaeur (2014) noted that the 37-stored vertical farm on a quarter-hectare of land they investigated had an investment cost of more than 220 million USD (including site) in which around 100 million USD are spent on equipment. Additionally, Institution of Space System [ISS] (2013) estimated that the non-recurring cost for building the Vertical Farm is 280 million USD, in which 116 million Euro was spent on building 37-storied VF while 121 million Euro was spent on equipment. Even we take the lowest number provided by the Columbia University think-tank, the total building Cost for vertical farming is around 83.7 million USD.

From the above data, we can clearly notice that the initial investment, or specifically, the initial equipment costs are much higher compared to traditional farm, which usually requires only 1 to 2 million USD.



Continuous labour cost

Yes, indoor vertical farming sounds awesome, but same as traditional farming, it always require people to do the farming stuffs.

As estimated by ISS (2013), around 40-60 personnel are required for vertical farming, in which around 50% of the them are responsible in harvesting 92m² grow area of the vertical farm. If we assume that the average monthly salary of them is 3000 USD, 60000 - 90000 USD are spent on harvesting every month, let alone including all the other personnel, such as those responsible for packaging, sowing and cleaning.

Advance Technologies and Complex Processes needed

Another problem or disadvantage is the need to apply various technologies and design complex processes. Vertical farming is more complicated to initiate and maintain than traditional field agriculture.

For example, automation through information technology and information systems in vertical farming are essential for maintaining and adjusting appropriate climate conditions without the need for regular human intervention.

Therefore, it would be challenging to build and operate a vertical farm for someone who does not have relevant familiarity, connection, and capital.



Our Beliefs

It's time to change the way and method we used in farming. Did you know that by 2050, we will need to produce enough food to feed an estimated world population of 9.4 to 10.1 billion?

The journal Bioscience suggests that overall food production will need to increase by anywhere from 25-70%. As a result, we need to produce more, feed more efficiently and economically.

VeFarm recognise that running agriculture business, especially vertical farm business, is not an easy stuff as mentioned before. We also recognise that vertical farm needs to be changed so that it can be simple and affordable. Vertical farming has long been a technical, complex and costly business than traditional farm or other farming alternatives.

Therefore, VeFarm is here to bring you the initial equipment that the whole vertical farming business need. We think out of the box to work on how we can making indoor farming more accessible to everyone. We aim to address the problems that other farming techniques are facing, especially to automate the maximum amount of the agriculture process. With the build-in IoQ system (Internet of Quality System), we hope to plant precisely and produce high quality products. Ultimately, we strive to be the leader of this industry.

VeFarm does our best in reducing power consumption and maximally reducing labour cost through automatization. Our approach will soon be able to reduce up to 30% power usage and 60% labour costs.

“Agriculture is the foundation of manufactures, since the productions of nature are the materials of art.”

-VeFarm

Our Solutions

VeFarm is currently constructing a farming framework that is with lower initial investment, lower fertilizer consumption, lower labour cost and higher efficiency.

Therefore, we design and provide you with modular equipment with everything set up and included, saving your time, cost, and brainpower.

Modular Design Aeroponic system

We know that building a vertical farm is challenging. Hence, we include everything that you need in our WeFarm Framework. We know the importance of getting the climate, lighting and spacing right. We focus a lot of attention on creating a facility that allows you to produce the highest yield of crops, in an affordable way.

Our modular aeroponic system saves your time in designing and planning your vertical farm. Yes, everything is set up and well equipped.

Based on various peer-reviewed researches and our own experiments, we developed a coloration light recipe that fit the needs of the plants. To ensure that the plants are growing under the most suitable environment, a good ventilation and air handling system are developed and are used in our framework. Together with the auto and smart climate control components, the best climate environment and condition can be maintained inside the framework.



Modular Automotive System

The automotive system is the core of our framework. As we can see from the report done by ISS (2013), money spent on hiring personnel cannot be neglected. Therefore, automotive system is required in order to minimize the labour cost and making the whole production process more efficient and precise.

Our modular automotive system will be a multi-purpose, movable small vehicle that control almost everything related to farming, including but not limited to pH control, water refill, nutrient refill, seeding and harvesting.

This automotive system will take care of the corps most efficiently based on the data received in our loQ system (Internet of Quality). If any problem detected, it will tackle the issues immediately. For example, if the temperature within the aeroponic system is too low, it will adjust the temperature back to the optimal level.

loQ System (Internet of Quality)

To ensure that the food produced under our system is high in quality, we develop a loQ system that safeguard the growing of plants. The loQ system monitor and control the pH value and the nutrient of corps and also observe the atmosphere within the aeroponic system.

The data received by our loQ system will also automatically be upload to blockchain so that our end-users can check and verify if the corps they receive are grew in a suitable environment.

Comparative Advantages

Higher Cost Effectiveness

Lower Initial and Continuous Cost, 100X Lower Labor Cost.

Higher Workplace Efficiency

WeFarm machines is suitable for both micro or massive deployment because of its modular design.

Higher sustainability

With Renewable Energy and vermiculture feeding, we do not have to worry to much about electricity and nutrient.

Higher Growing Efficiency

Growing corps with WeFarm machines can have 3 times Faster Growing Rate and receive 3 times more quantity.

Organic Farming

No Pesticides and fertilizers will be used. Safe.

Product traceability

Autonomous Tracking with IoT and Blockchain Technologies.



Business Model

As mentioned before, current vertical farming technique requires high initial investment and certain amount of continuous costs spent on hiring personnel. Beside, the need of advance technologies and complex processes also turn vertical farming into a less attractive business. WeFarm aims to be the leading vertical farming technique provider that eliminate the challenges that you will face when starting up a vertical farming business.

VeFarm plans to expand our business through the following ways:

1. Massive Deployment

Deploying the VeFarm Machine to warehouses and greenhouses and selling our quality organic products for stable harvest revenue.

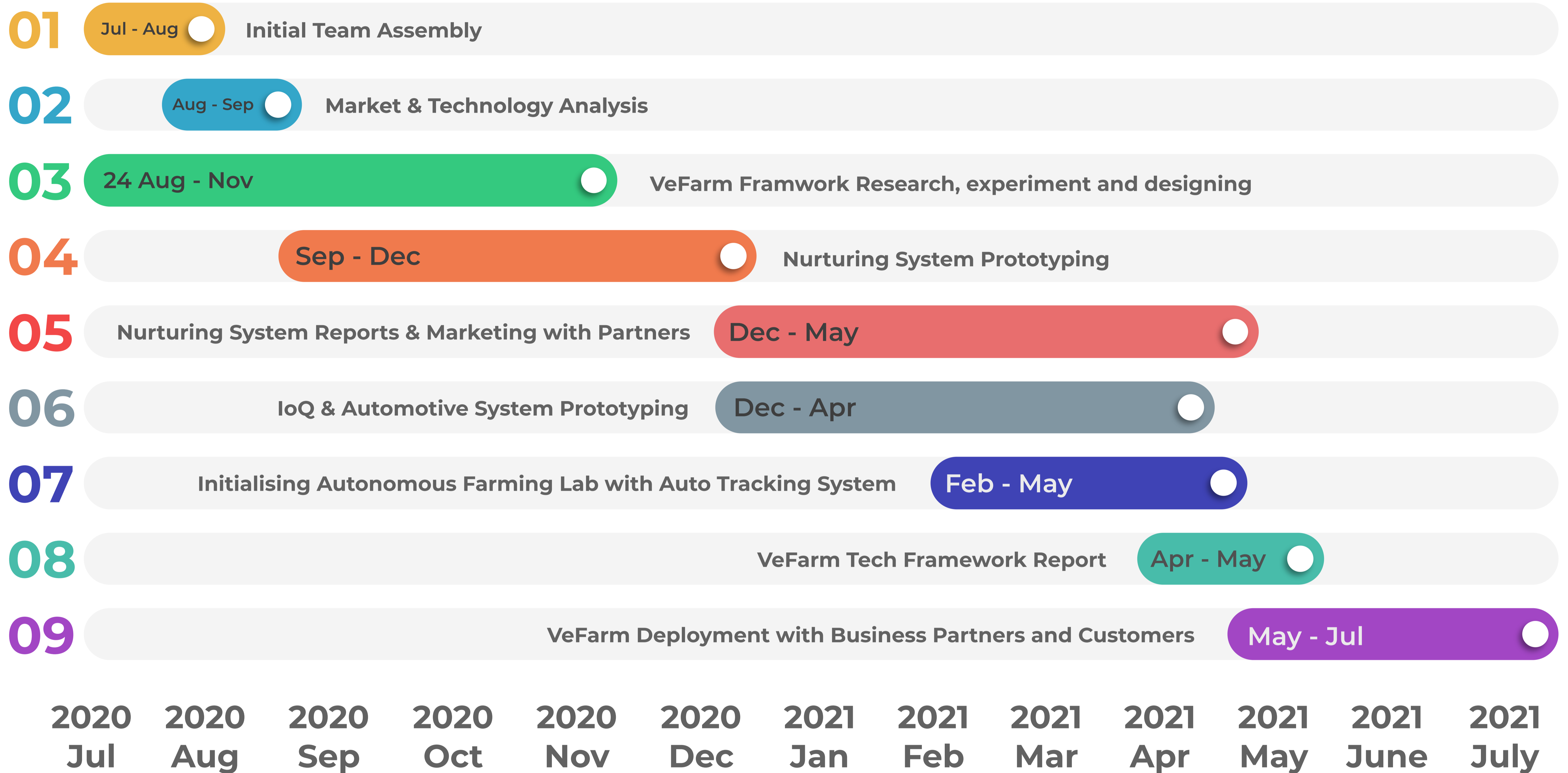
2. Machine Selling

Selling VeFarm machines to vertical farming businesses, hobbyists, households and education institutions (specifically for STEM education)

3. Develop Partnership

Cooperating with farm owners and warehouses, sharing our techniques with them while at the same time, partner with restaurants or canteen to be their directed vegetable supplier.

Road Map



Future Development

VeFarm is currently experience the final stage of designing the VeFarm Framework and the initial prototyping stage of our nurturing system. By the end of the first quarter of 2021, it is expected the VeFarm can complete and finalise its technology framework. By then, VeFarm will publish a report regarding the whole framework. Hopefully, we will be able to massive deploy our system with our business partners and customers starting from the 2nd quarter of 2021.



Conclusion

The world is changing so quickly that it's hard to keep up. We have prepared ourselves to weather the coming storm, in fact, we expect to be soaring above the clouds through our highly responsive initiatives. Change will have never looked so good.

VeFarm aims to address the problems that other farming techniques are facing while at the same time, bring agriculture to the a new level, enhancing the development of this industry and aim at automatizing the whole agriculture process in order to create precise agriculture and high quality products.

We bring changes, and we will keep moving.





VeFarm

The New Way of Farming



VeFarm

White paper V1.0

高智能精準耕作，引領農業新革命。



VeFarm團隊

免責聲明

本白皮書只用於在提供VeFarm的商業運作模式以及其科技資訊。所有本白皮書內的資料只供討論和參考用。本白皮書旨在釐清VeFarm技術背後的原理和概念，而本白皮書的最終版本將會於所有修訂完成後刊出。

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簡介

全球人口數目將於2050年增長至94至101億（聯合國，2019）。如此龐大的人口增長無疑為全球糧食供應帶來沉重壓力。而當下，我們正面對諸如糧食危機、糧食短缺、營養不良等的糧食問題。傳統耕作雖然是主要生產糧食的方法，但它同時亦面臨著不少問題和批評，當中以由生物質燃燒和森林砍伐帶來的污染尤其受矚目（Bruinsma，2003）。因此，其他耕作方式，例如溫室耕作、都市農業、垂直農業應運而生（Farah，2013）。其中垂直農業最受歡迎。根據Grand View Research 2019年的研究，預計全球垂直農業規模於2025年將增長至99.6億，其複合年增長率約為21.3%

水耕和氣耕種植顧名思義就是耕作時不用土壤。此種植方法無需使用農藥和催熟劑。一些研究也指出這類的耕作方法能產出營養豐富的蔬果，但水耕和氣耕種植的弊端卻讓它難以被大量用作生產糧食。它們需要大量及昂貴的初期投資金，而後續的高昂的營運成本也無法避免。此外，現時的水耕和氣耕種植只能生產某幾種的蔬菜。

VeFarm力求解決目前其他農耕方式的缺點和弊端，同時帶領全球農業進入新時代領域，促進行業發展，並將科技應用於農業上，務求自動化所有耕作步驟，達至精準農業，生產高質量有機作物。

室內耕作面臨的問題

近年，室內耕作變得越發流行。另類的室內耕作模式，例如垂直耕作，得到青睞，大批投資者對垂直農業抱有興趣。無可否認垂直耕作是一種相對來說較可持續發展的耕作模式，但我們也不能忽視它目前存在的問題。

大量、昂貴的初期投資金

Banerjee and Adenaeur (2014) 指出一個佔地2500平方米，樓高37層的垂直農場需要投資不少於2.2 億美元，當中約1億美元用於添置及購買所需設備。此外, Institution of Space System [ISS] (2013) 也估計，興建一個樓高37層的垂直農場需要2.8億美元，而購買器材、設備經已花費約1.37億美元。翻查由哥倫比亞大學提供的數字，興建一個垂直農場至少也需要投資8370萬美元，數字依然龐大驚人。

由上述數字可見，垂直農業的初始投資金，尤其是購買垂直農業所需的設備便已需要投入大量的資源，比起只需要投資100到200萬美金的傳統農業，垂直農業的興建成本實在難以負擔。



高人工成本

儘管垂直農業在大部分方面都較傳統農業出色，但它與傳統農業一樣，依然需要大量人手處理農務相關的事項。

ISS的報告指出，一個92平方米的垂直農場需要聘用40至60位人員，其中接近一半的人員負責收割作物。假如每位人員的平均薪金為3千美元，那麼單是收割作物，每月便需花費6萬到9萬美元。若加上其他負責包裝、播種、清潔人員的薪金，數字之大可想而知。

流程複雜、需要先進科技配套

垂直農業的另一個問題在於它需要運用到大量科技配套，以及擁有一套複雜的設計流程。簡單來說，垂直農業比起傳統農業更難開展。

要有效率地調節垂直農場的氣候條件，自動化技術和信息系統是不可或缺的一部分。因此，垂直農業並不適合由一些缺乏相關知識，人脈和資金的人開設。這也是垂直農業難以大量應用的原因。



VeFarm的核心理念

我們是時候改變耕作模式，不能一直只沿用傳統耕作方法。我們需要知道，直到2050年，我們必須生產足夠的食物以供養全球94到101億的人。期刊BioScience指出我們必須將食物生產量提高25-70%。因此，我們需要有效率、低成本地生產更多的食物，避免糧食危機。

VeFarm深知經營農業，尤其是垂直農業，絕不是一件易事。我們也明白垂直農業需要作出改變，讓它成為一個可負擔、門檻低的農業業務。一直以來，垂直農業都是一門高技術性、高複雜度又高成本的業務，難以吸引他人進入這項新業務。

因此，VeFarm為你帶來一整套垂直農業必須的設備。我們從你的角度出發，將興建垂直農業的成本降至最低。VeFarm力求解決目前其他農耕方式的缺點和弊端，同時帶領全球農業進入新時代領域，促進行業發展，並將科技應用於農業上，務求自動話所有耕作步驟，達至精準農業，生產高質量有機作物。我們力爭成為行業領導。

與此同時，VeFarm致力將垂直農業的用電量減至最低，透過自動化系統，大量減少人工成本。VeFarm的農業系統將可減少近30%的電力消耗和60%的人工成本。

“農業是所有製造業的基本，大自然的產物是所有藝術的根本。”

解決方案

目前，VeFarm正構建一個低初始投資金、低人工成本和高效能的垂直農業新框架。我們為你設計和提供模組化設備，一切器材一應俱全，無需花費頭腦、浪費額外時間和資源來組裝和開展你的垂直農業業務。

模組型氣耕系統

我們深諳成立垂直農業並非一門易事。因此，VeFarm的垂直農業框架為你提供一切你需要的設備。我們了解合適的氣候、光度和距離的重要性，故此，經過大量的研究和實驗，我們的團隊為你帶來一個高產量、低成本的垂直農業系統。

VeFarm的模組化氣耕系統為你省卻不少設計和規劃時間——一切的設備都安裝妥當，即見即用。

根據各大農業機構的研究報告，以及我們團隊的實驗，我們研發出一套符合植物生長原理的LED光譜。為確保作物在最舒適的環境下生長，優質的通風系統絕不可或缺。配以VeFarm團隊研發的智能氣候調節系統，VeFarm農業系統內的氣候和環境便可隨時處於最佳狀態。



模組型自動化系統

模組型自動化系統是VeFarm垂直農業系統的核心。從ISS的報告可見，後續持續的人工成本花費絕不可忽略。因此，自動化農業系統的出現能將人工成本減至最低，同時將整個生產過程自動和標準化，更具效率。

我們的模組化自動系統是一個體積小，功能多的可移動裝置。它可管理和控制所有與耕作有關的事項，例如控制pH值、為植物換水、加水、補充養分、播種和收割。

透過由質量監控物聯網系統監測所得的數據，我們的自動化系統能為作物提供最佳的照顧。一旦出現任何問題，自動化系統會立刻解決。假如氣耕系統內的溫度過低，自動化系統會馬上將系統內的溫度調節至最佳水平。

質量監控物聯網系統 (IoQ)

為確保透過VeFarm農業系統生產的作物的質量，我們研發了一套質量監控物聯網系統（簡稱IoQ）。IoQ能監控作物的生長環境，保護我們的作物。IoQ可以監管作物的pH值、營養水平，更可監測氣耕系統內的氣候。

IoQ所錄得的數據更會自動上傳至VeFarm的區塊鏈，方便顧客隨時查閱作物的生長環境，確保作物質量。



VeFarm的優勢

省卻大量成本

無論是初始還是後續成本都可大大減少，當中人工成本更大量減少100倍。

高工作空間效率

WeFarm的模組化系統可靈活運用在大、小或微型的环境內。

高度可持續性

透過可再生能源和蚯蚓養殖系統，電力和營養供給再不是煩惱。

高生長效率

透過WeFarm農業系統，在同樣的面積下你可以用更快的速度獲得更多的作物。

有機耕作

不使用任何農藥和化肥，安心放心。

作物可追溯性

透過IoT和區塊鏈科技，整個VeFarm農業供應鏈都可追溯。



VeFarm營運模式

上文提及，目前垂直農業需要大量初始基金以及昂貴的運作成本、人工成本。除此以外，垂直農業比起傳統農業更難開展。VeFarm力求成為領先垂直農業設備供應商，致力解決目前其他農耕方式的缺點和弊端，降低垂直農業的入門門檻。

VeFarm計畫透過以下渠道擴充我們的業務範圍：

1. 大量投產

將VeFarm農業系統大規模部署到倉庫和溫室，從穩定收成獲得收入。

2. VeFarm系統銷售

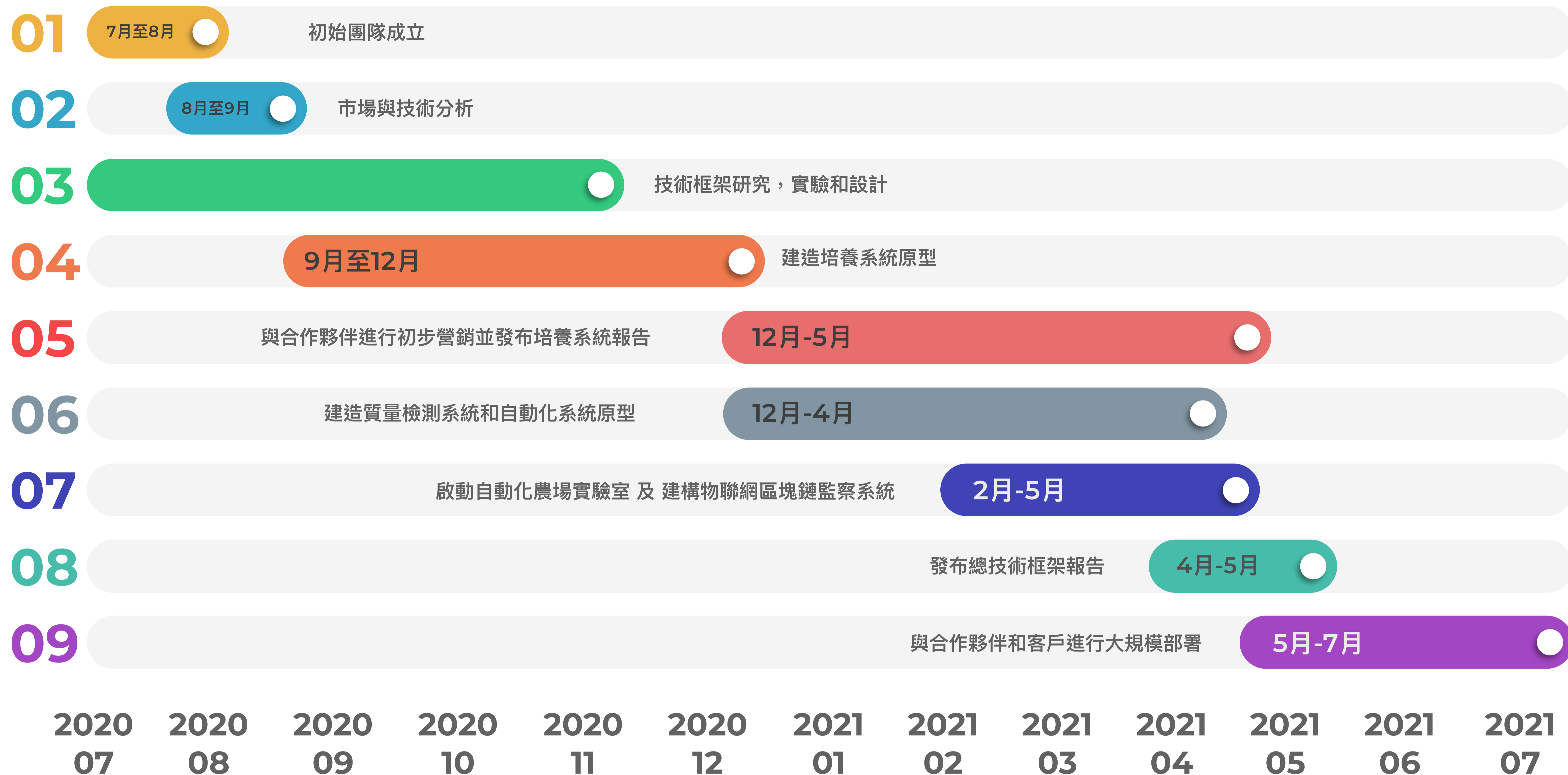
向業餘愛好者，家庭種植，室內裝飾和STEM教育機構銷售VeFarm農業系統，並提供優質售後服務。

3. VeFarm合作夥伴

與農場及倉庫合作，與包括餐廳在內的大量終端用戶共享穩定的收益回報，更可成為他們的有機蔬菜供應商。



里程碑



未來發展

VeFarm目前正位於設計VeFarm農業系統框架的最後階段，同時正著手建造培養系統的原型。

我們期望在2021的第一季度末，VeFarm能完成整個VeFarm農業系統的技術框架，並向公眾發布VeFarm的技術框架報告。預計在2021年的第二季度開始與我們的合作夥伴和客戶共同進行大規模部署。



總結

世界瞬息萬變，VeFarm已準備迎接未來挑戰，我們思及未來，隨時做好準備。

VeFarm力求解決目前其他農耕方式的缺點和弊端，同時帶領全球農業進入新時代領域，促進行業發展，並將科技應用於農業上，務求自動化所有耕作步驟，達至精準農業，生產高質量有機作物。

VeFarm帶來革命性的改變，引領先鋒時代。





VeFarm

The New Way of Farming

