International Journal of Application on Economics and Business (IJAEB)
Volume 3, Issue 1, 2025. ISSN: 2987-1972

INNOVATION BUSINESS MODEL OF VANILLA IN TAIWAN

Chia-Yin Huang[1,2], Chin-Chiuan Lin[1*]

[1] Department of Business Administration, Kun Shan University, Tainan, Taiwan
[2] CEO of Fan Fun Company
Email: cclin@mail.ksu.edu.tw

*Corresponding Author

Submitted: 14-11-2024, Revised: 18-12-2024, Accepted: 05-02-2025

ABSTRACT

Vanilla pod is one of the most expensive spice in the world. The international price is as high as 300 to 600 US dollars per kg of vanilla pods, therefore, vanilla planting has sprung up in various countries. The present study proposed an innovation business model of vanilla in Taiwan. The innovative business model based on the SID (supply-interface-demand) model and the 9 building blocks model, combines capital suppliers, land suppliers, labor providers, and case company to provides various combinations of cooperation modes for the four parties to choose their best cooperation programs. For the investors, the return rate for the first round of investment is about 13%; and the second round is about 25%. For the labors, they can have at least NT$ 40,000 per month and just need to work about 4 days per week. For land providers, every units of land they can received NT$ 20,000 per year. Because the innovation business model has very good business benefits not only for the case company but also for the investors, labors, and land providers. Therefore, the innovation business model proposed in the present study can be promoted and applied to relevant countries.

Keywords: *Innovation business model, SID model, 9 building blocks model, Vanilla.*

1. INTRODUCTION

Agricultural production is greatly affected by environmental conditions, especially climate conditions and soil resources, and varies with species and farming patterns. Among them, changes in climate conditions have the most significant impact on agricultural productivity, stability and farming systems. The current global climate change process is intensifying. The IPCC (United Nations Intergovernmental Panel on Climate Change) stated that if the global average annual temperature rises, it will slow down the global food supply capacity, thereby affecting the rise in food prices.

Agriculture once played an important role in Taiwan's economic development, providing a large amount of capital, labor and market for industrial development, laying the foundation for Taiwan's economic take-off. However, after 1969, Taiwan's agriculture gradually entered a stage of stagnation. In the mid-1960s, Taiwan's economic structure began to transform, gradually transforming from an economy dominated by agriculture to one dominated by industry and commerce. Rural labor forces began to flow into cities and industry and commerce in large numbers.

Vanilla is a genus of the orchidaceae families with about 110 species. Widely known include vanilla, a species used commercially to obtain vanilla (spice) seasonings. Vanilla is a perennial climbing vine and semi-sun plant. It is a type of vanilla (spice) and is often used as a spice in desserts [1; 2].

In 2015, American food companies announced a ban on artificial flavors. The global supply of vanilla pods suddenly exceeded the demand. The international price is as high as 300 to 600

US dollars per kilogram [3]. Therefore, vanilla cultivation has sprung up in various countries which include Taiwan.

The present study tried to develop an innovative business models to enhance the competitiveness of vanilla in Taiwan.

Vanilla

Native to the El Taxin region of Mexico, vanilla was first introduced to Europe by Spanish colonists. Prior to 1841, Mexico held a unique position as the only area where vanilla could be cultivated, as it relied on a specific bee species (Melipona) for pollination. In 1841, however, a 12-year-old slave in Madagascar developed a technique for artificial pollination, which enabled broader cultivation. Today, Madagascar stands as the world's top vanilla producer [4]. Vanilla ranks among the priciest spices on the global market. In Madagascar and La Réunion, the top producers, it holds both economic and cultural significance. Like other orchids, vanilla plants form mutualistic relationships with mycorrhizal fungi in their roots, which supports their growth and health. Recognizing the diversity of these fungi, particularly in the Indian Ocean islands where this has yet to be studied, is increasingly essential. This knowledge is critical for sustaining vanilla crops in these areas, particularly given climate change and the rise of new pathogens [5]

Current Status of Taiwan's Vanilla Industry

Since 2017, more and more people in Taiwan have invested in vanilla cultivation. At present, the Ministry of Agriculture has not compiled statistics on the planting area of vanilla. Based on the unit area yield of 500 kilograms per hectare, a vanilla garden of about 20 hectares can meet Taiwan's domestic demand market, but now it is estimated that the total area in Taiwan has reached about 30 hectares.

Taiwan mostly uses mesh chambers for cultivation, and mass production will not occur until the third year after planting. It blooms from April to June every year. After artificial pollination, it waits for 8 months for the pods to mature. Harvesting begins in December of the following year. The picked pods undergo another 5 to 6 months of finalize, fermentation, drying and it matures in four stages and finally becomes the common "vanilla pod".

The estimates that farmers are planting vanilla all over Taiwan, with countless small areas less than one 0.1 hectare of land. The actual planting area has exceeded 50 hectares, or even 100 hectares. In other words, the domestic demand market is not only saturated, but oversupply has also emerged.

In addition to the risk of imbalance between supply and demand, quality is also a concern. The quality of the vanilla produced in 2021 is quite polarizing. Half of them are good, but the quality of the other half is of concern, including poor water and fertilizer management, which affects the plumpness of the pods, and the dry and humidity control during fermentation is too wet. The fruit pods are prone to meld and affect the aroma. In addition, farmers mostly ferment their own food, and the aroma components cannot be analysed, which is also a factor causing quality problems.

Smart Agriculture

Smart agriculture (SA) can save manpower, stabilize quality, and increase output. Gao et al. [6] indicated that the food security is a top priority in governing the country. They focusing on the three stages of grain production: pre-production, mid-production, and post-production, and focusing on the entire process from land preparation to grain storage, the article proposes a "nine-step method" for smart agriculture, namely the "two-step method" "Precision", "Three Changes", "Three Reductions" and "One Use", and respectively elaborated on the connotation of each link, the existing technical bottlenecks and the role of cost-saving and efficiency-increasing in grain production.

Gemtou et al. [7] highlighted that agriculture currently faces significant hurdles, especially in addressing food security for a growing global population and coping with climate-related challenges such as extreme weather. Additionally, agriculture itself contributes to environmental issues like pollution, habitat destruction, and biodiversity loss. SA has been proposed as a sustainable pathway to address these challenges and foster responsible agricultural growth.

Similarly, Arshad et al. [8] emphasized that today's global agricultural systems are under intense pressure to boost productivity to meet food demand. Yet, achieving the necessary productivity levels remains difficult, primarily due to various plant diseases. By leveraging deep learning (DL) technologies, farmers gain the ability to continuously monitor plant health, rather than relying solely on manual inspections. Improving the efficiency of resource usage in agriculture entails optimizing technology, resource distribution, and environmental stewardship. An efficient farmer strategically manages resources such as labor, water, and land to maximize profit while minimizing costs over the long term.

Business Model Analysis
For the study of business models, Wirtz et al. [9] were among the first to introduce the concept of the "business model" in 1957 [10]. By the late 1990s, researchers had expanded on this idea, exploring the strengths and limitations of business models in the context of the emerging internet economy.

Johnson et al. [11] developed a theoretical framework for analyzing core business structures (Figure 1), emphasizing the interaction between "key processes," "key activities," and "profit models." The model also includes how customer value orientation influences these elements. Key resources within this framework include assets, workforce, technology, products, infrastructure, sales channels, and branding, all of which support a value proposition aimed at target customers. The customer value proposition and profit model outline the distinct values provided to customers and the company, while key resources and processes explain how value is created for both parties.

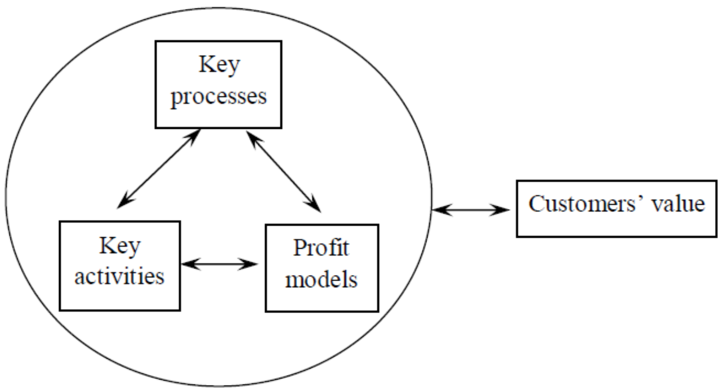

Figure 1. Theoretical model of the basic business model [8]

Osterwalder & Pigneur [12] proposed a 9 building blocks (Figure 2) that describes the business model rationale on how an organization creates, delivers, and captures the business values. The detail of 9 building blocks are described as Table 1:

Table 1. The description of the 9 building blocks

9 Blocks	Description
Key partners	Some activities are outsourced and some resources are obtained inside the company.
Key activities	These are the most important measures the company must take.
Key resource	There are the assets needed to provide and deliver the above elements.
Value proposition	It is committed to solve the customers' problems and satisfy the customers' needs through a value proposition.
Customer relationship	Establish and maintain customer relationships with each customer group.
Channel	The value proposition is delivered to customers by communication, distribution, and sales channels.
Customer segment	The organization serves one or several customer groups.
Cost structure	Business model elements lead to cost structure.
Revenue stream	The source of income comes from the value proposition successfully provided to customers.

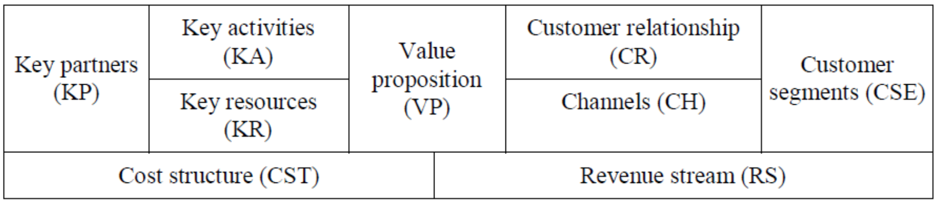

Figure 2. The 9 building blocks of business model analysis architecture [9]

Lin & Foung [10] proposed a supply-interface-demand (SID) model for analysing a business model. They claim that the SID framework can analyse the existing business model, also can develop a new business model for the enterprises. Figure 3 shows the SID for business model analysis.

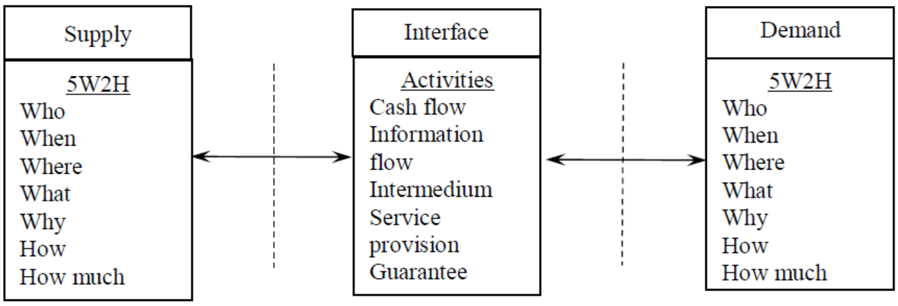

Figure 3. S-I-D business model analysis [10]

Overview of Case Company

The case company is an agricultural consultant which located in Tainan, itself has about 3 units (each unit is about 0.4 acre) of land planted with vanilla.

The case company's vanilla adopts a grid-house cultivation method (Figure 4). In order to collect environmental data in the grid-house and use it as a reference for control, sensing equipment such as luminosity, temperature, humidity, wind speed, soil pH and EC value are also installed.

In the past, the traditional planting method was to plant off the ground. The main nutrients came from the medium. The medium needed to be supplemented every year to maintain nutrients, but it was still limited, and the mother plant itself would gradually wither. The case company uses ground planting, and the nutrients in the soil can make the plants grow longer. Therefore, the harvesting life of vanilla planted off the ground is usually 7-8 years, but the harvesting life can be increased to 12-15 years due to the use of ground planting of case company.

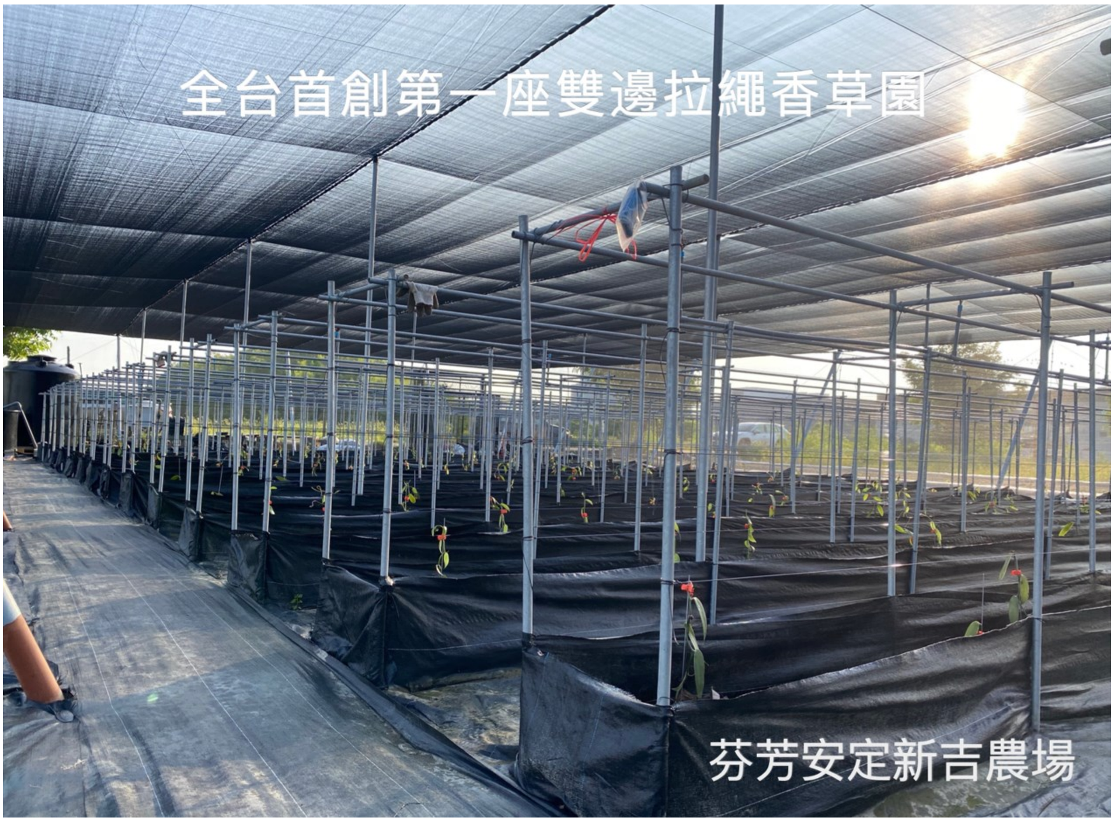

Figure 4. The grid-house of the case company

2. RESEARCH METHOD

Research Framework

There are four roles and four stages in the innovation business model of vanilla. The four roles are investor, land provider, labor, and case company. Corresponding to the SID model (Figure 5), the pure investment funds, simply provide land, and simply provide labor are supply side, case company is the interface, and the domestic and export market are demand side. The SID framework for business model analysis of the present study is shows in Figure 5.

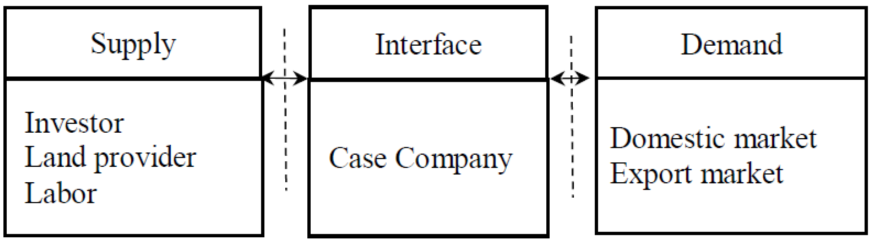

Figure 5. The SID framework of the present study

The relationship of the four stages are seedling, planting, fermentation, and marketing and the brief research framework of the present study is shows in Figure 6.

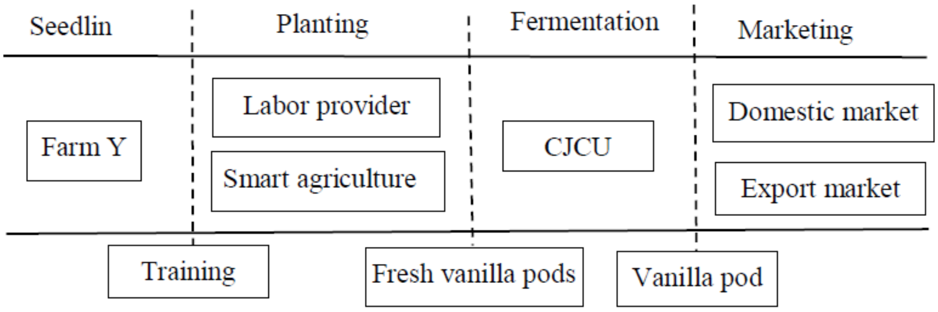

Figure 6. Research framework of the present study

The 9 Building Blocks of Case Company

Table 2 shows the relationship analysis between thw 9 building blocks with the operation cycle of the case company.

Table 2. The relationship analysis of the case company

	Seedling	Planting	Fermentation	Marketing
KP	S-KP	P-KP	F-KP	M-KP
KA	--	P-KA	F-KA	M-KA
KR	S-KR	P-KR	F-KR	M-KR
VP	S-VP	P-VP	F-VP	M-VP
CR	--	--	--	M-CR
CH	--	--	--	M-CH
CSE	--	P-CSE	--	M-CSE
CST	S-CST	P-CST	F-CST	M-CST
RS	S-RS	P-RS	--	M-RS

The relationship analysis between thw 9 building blocks with the operation cycle of the case company were detail description below:

S-KP: The farm Y use different from other off the ground planting operators, it is planted on the ground. The seedlings of vanilla are strong and long lived.

S-KR: Excellent seed dealers can provide seedlings with a length of more than 100 cm and a diameter of about 1 cm. The first flowering can occur about 1 year after planting.

S-VP: The flavour of Bourbon variety is more accepted and popular in the international market, and it is widely accepted in the international market.

S-CST: Fixed costs which including the purchase of seedlings; variable costs: additional purchases due to damage to seedlings caused by climate change

S-RS: Income from seed trading.

P-KP: Agricultural team / contract farmers.

P-KA: Hardware scaffolding construction and daily farm management (branch thinning / vine management / pollination / harvest).
P-KR: Materials store, fertilizer, water and electricity equipment, smart agriculture.
P-VP: Innovative bilateral planting methods; AI smart agriculture (temperature, humidity, soil, water quality, pH quality and plant growth recording and monitoring; farm talent cultivation).
P-CSE: Individual farmers; direct investment fields.
P-CST: Fixed costs of network room construction, agricultural facilities, water and electricity facility costs / full-time management personnel. Variable costs of equipment maintenance / part time labor during pollination and harvest period.
P-RS: Planting coaching fees, farm management fees, roof rental.
F-KP: CJCU is the only university in southern Taiwan with a vanilla laboratory.
F-KA: Fermentation process optimization/stabilization and processing plant equipment flow optimization.
F-KR: Fermentation equipment, processing plants, and personnel.
F-VP: Internationally certified standards; friendly agriculture, vanillin standards (different from traditional methods, the laboratory environment is controlled to improve hygiene and safety, and patented technology shortens the fermentation processing time and increases the vanillin content of the fruit pods).
F-CST: Fermentation processing costs and investment in fermentation processing equipment.
M-KP: Domestic and overseas channels / general consumers.
M-KA: Vanilla pod promotion / product application and sales.
M-KR: Marketing channels, social media exposure, salesperson development and maintenance.
M-VP: Mainly for export, it will not cause domestic price confusion. In addition to Vanilla pods, we also develop peripheral products to increase sales diversity. (Certification, resume acquisition/brand image establishment / product experience planning).
M-CR: Establish long-term cooperative relationships and provide stable supply of high-quality products.
M-CH: For domestic sales channel: wholesale (food manufacturers and bakers), general retail, and agricultural products trading platform. For export sales: foreign trading companies, distributors, and agents.
M-CSE: Mainly the domestic and the export market develop, and the export market has not yet been fully developed.
M-CST: Sales activities and logistics expenses.
M-RS: The revenue of Vanilla pod sales.

3. RESULTS AND DISCUSSIONS

Investment and Income Analysis

For the investors, the setup costs for the first round is shows in Table 3.

Table 3. The setup costs for the first round

Item	Unit	#	Unit cost	Subtotal
Land rent	Y^1	2	20,000	40,000
Site preparation costs	Set	1	10,000	10,000
Grid-house construction	Set	1	0.12AM	0.12AM
Grid-house net	Set	1	0.012AM	0.012AM
Seedling	Strain	375	150	56,250
Planting pit	pc	375	750	281,250
Automatic irrigation system	Set	1	0.08AM	0.08AM

Technology transfer costs	Set	1	0.04AM	0.04AM
Labor cost[3]	M[2]	24	20,000	480,000
Organic verification Fee	Set	1	0.012AM	0.012AM
Fertilizer	M	24	2,000	48,000
Field setup fee	Set	1	0.08AM	0.08AM
Construction design fee	M	4	0.028AM	0.112AM
Security system	Set	1	0.148AM	0.148AM
Security system maintenance costs	M	24	2,000	48,000
Miscellaneous branches	Set	1	46,500	46,500
Total			AM[3]	

Note: Y[1]: means year; M[2]: means month; Labor cost[3]: each labor can take care about 2 units of grid-house and due to the automatic irrigation system the labor just need to work about 4 days per week. AM[3]: amount of invest money.

Because the hardware equipment can last about 30 years. Therefore, there is no hardware equipment costs for the second round, the setup costs for the second round is shows in Table 4.

Table 4. The setup costs or the second round

Item	Unit	#	Unit price	Subtotal
Land rent	Y	2	20,000	40,000
Seedling	Strain	375	150	56,250
Labor cost	M	24	20,000	480,000
Organic verification Fee	Set	1	30,000	30,000
Fertilizer	M	24	2,000	48,000
Security equipment maintenance costs	M	24	2,000	48,000
Miscellaneous branches	Set	1	0.0008AM	0.0008AM
Total				0.292AM

Annual operating expenses from each round of the 3th to 12th year is shows in Table 5.

Table 5. The annual operating expenses (OP) of the 3th to 12th year

Item	Unit	#	Unit price	Subtotal
Land rent	Y	1	0.029OP	0.029OP
Labor cost	M	12	0.057OP	0.686OP
Organic verification Fee	Set	1	0.086OP	0.086OP
Fertilizer	M	12	2,000	0.069OP
Security system maintenance costs	M	12	2,000	0.069OP
Miscellaneous branches	Set	1	0.063OP	0.063OP
Total			OP	

It is conservatively estimated that if vanilla is planted in the ground, it can be harvested for at least 12 years. The investment income analysis of round 1 and round 2 for the investor is shows in Table 6 and Table 7.

Table 6. The income for the first round

R	Y	Yield[1] (kg)	Estimated revenue (1200 / kg)	Net income (unit: NT$)	Investor profit[2] (unit: NT$)
1st	1	0	0	0	0
	2	0	0	0	0
	3	375	450,000	100,000	70000
	4	750	900,000	550,000	385000
	5	750	900,000	550,000	385000
	6	750	900,000	550,000	385000
	7	1,125	1,350,000	1,000,000	700000

	8	1,500	1,800,000	1,450,000	1015000
	9	1,500	1,800,000	1,450,000	1015000
	10	1,500	1,800,000	1,450,000	725000
	11	1,125	1,350,000	1,000,000	500000
	12	750	900,000	550,000	275000
Sub Total			12,150,000	8,650,000	5,455,000

Note: Yield[1]: Each unit of land can be planted with about 375 to 500 vanilla seedlings. The estimate is conservative based on 375 seedlings per unit of land. Each vanilla seedling cannot be harvested in the first two years. In the third year, each ripe vanilla can harvest more than 1 kg of vanilla pods; in the 4th to 6th year, can harvest more than 2 kg; in the 7th year, can harvest more than 3 kg; in the 8th to 10th year, can harvest more than 4 kg; in the 11th year, can harvest more than 3 kg, and in the 12th year, can harvest more than 2 kg. After the 13th year, the harvest of each aging vanilla is significantly reduced and has no economic value. Therefore, the entire batch must be replanted for the second round. Investor profit[2]: From 3rd to 9th year, the investors share 70% of net income; and from year 10th to 12th year, the investors share 50% of net income.

Table 7. The income for the second round

R	Y	Yield[1] (kg)	Estimated revenue (1200 / kg)	Net income (unit: NT$)	Investor profit[2] (unit: NT$)
	1	0	0	0	0
	2	0	0	0	0
	3	375	450,000	100,000	70000
	4	750	900,000	550,000	385000
	5	750	900,000	550,000	385000
2nd	6	750	900,000	550,000	385000
	7	1,125	1,350,000	1,000,000	700000
	8	1,500	1,800,000	1,450,000	1015000
	9	1,500	1,800,000	1,450,000	1015000
	10	1,500	1,800,000	1,450,000	725000
	11	1,125	1,350,000	1,000,000	500000
	12	750	900,000	550,000	275000
Sub Total			12,150,000	8,650,000	5,455,000
Total of R1 and R2			24,300,000	17,300,000	10,910,000

Note: Yield[1]: Each unit of land can be planted with about 375 to 500 vanilla seedlings. The estimate is conservative based on 375 seedlings per unit of land. Each vanilla seedling cannot be harvested in the first two years. In the third year, each ripe vanilla can harvest more than 1 kg of vanilla pods; in the 4th to 6th year, can harvest more than 2 kg; in the 7th year, can harvest more than 3 kg; in the 8th to 10th year, can harvest more than 4 kg; in the 11th year, can harvest more than 3 kg, and in the 12th year, can harvest more than 2 kg. After the 13th year, the harvest of each aging vanilla is significantly reduced and has no economic value. Therefore, the entire batch must be replanted for the second round. Investor profit[2]: From 3rd to 9th year, the investors share 70% of net income; and from year 10th to 12th year, the investors share 50% of net income.

4. CONCLUSIONS AND SUGGESTIONS

For the investors, the return rate for the first round of investment is about 13%; and the second round is about 25%. This investment return rate is much higher than the return rate of time deposits and bonds. For the labors, they can has at least NT$ 40,000 per month and just need to work about 4 days per week. This salary level is much better than that of ordinary office workers. For land providers, every units of land they can received NT$ 20,000 per year.

Because the innovation business model has very good business benefits not only for the case company but also for the investors, labors, and land providers. Therefore, the innovation business model proposed in the present study can be promoted and applied to relevant countries.

REFERENCES

Arshad, A., Adil, S. H., & Ebrahim, M. (2024). Plant disease detection using convolutional neural network. *Journal of Independent Studies and Research Computing, 22*(1), 73-79.

Bellman, R., Clark, C. E., Malcolm, D. G., Craft, C. J., & Ricciardi, F. M. (1957). On the construction of a multi-stage, multi-person business game. *Operations Research, 5*(4), 469-503.

Fouché, J. G., & Jouve, L. (1999). Vanilla planifolia: history, botany and culture in Reunion Island. *Agronomie, 19*(8), 689-703.

Gao, S., Hu, Z., Wang, H., Zhang, X., & Zhang, Y. (2024). "Nine-step method" for smart agriculture to help save costs, increase yields and increase efficiency in food production. *Bulletin of Chinese Academy of Sciences (Chinese Version), 39*(1), 198-209.

Gemtou, M., Kakkavou, K., Anastasiou, E., Fountas, S., Pedersen, S. M., Isakhanyan, G., Tarekegn, K. & Pazos-Vidal, S. (2024). Farmers' transition to climate-smart agriculture: A systematic review of the decision-making factors affecting adoption. *Sustainability, 16*(7), 2828.

Goodman, M. J. (2017). The "natural" vs. "natural flavors" conflict in food labeling. *Food and Drug Law Journal, 72*(1), 78-102.

Johnson, M. W., Christensen, C. M., & Kagermann, H. (2008). Reinventing your business model. *Harvard Business Review, 86*(12), 50-59.

Lin, C. C., & Foung, W. T. Y. (2021). A new conceptual framework for business model analysis. In Proceedings of the Ninth International Conference on Entrepreneurship and Business Management (ICEBM 2020). *Advances in Economics, Business and Management Research, 174*, 51-56.

Lubinsky, P., Bory, S., Hernández Hernández, J., Kim, S. C., & Gómez-Pompa, A. (2008). Origins and dispersal of cultivated vanilla (vanilla planifolia jacks. [orchidaceae]). *Economic Botany, 62*, 127-138.

Osterwalder, A., & Pigneur, Y. (2010). Business Model Generation: A Handbook for Visionaries, Game Changers, and Challengers (Vol. 1). John Wiley & Sons.

Petrolli, R., Selosse, M. A., Bonillo, C., Griveau, C., Lalanne-Tisné, G., Comes, B., Kodja, H., & Martos, F. (2024). Mycorrhizal communities of vanilla planifolia in an introduction area (La Réunion) under varying cultivation practices. Plants, People, Planet, 6, 683-696.

Rivera, E. S., Esparza, B. C. R., & Parraguez-Vergara, E. (2011). The Cultural Weight of Nature: The Intra and Inter-Institutional Conflicts about Biodiversity and Ethnicity in Chile and Mexico. Santiago.

Wirtz, B. W., Pistoia, A., Ullrich, S., & Göttel, V. (2016). Business models: Origin,