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DISCUSSION ON ECOLOGICAL AQUACULTURE AND INNOVATIVE OPERATION STRATEGY

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ABSTRACT

This study aims to improve the problems faced by Taiwan's aquaculture industry, such as the increased risk of drug residues caused by excessive use of water and soil resources and high-density farming, and to improve its competitiveness. Improve regional production and marketing operations, increase environmental protection production methods, and increase young people's willingness to return to their hometowns to invest. In order to increase consumers' trust in aquaculture aquatic products, basic safety requirements can be achieved through production and sales history labels, vacuum-sealed packaging, and clear labels, thereby enhancing consumer loyalty. Brand features and product discounts can also enhance loyalty. This study uses the focus group interview method to understand the problems of regional farming and the expected future prospects. Results found that it is possible to integrate regional farmers, establish sales channels for agricultural and fishery products in Chiayi, achieve sustainable development and improve competitiveness, and increase the willingness of young people to return to their hometowns to invest. To sum up, there are the following three propositions: (1) Construct cooperation channels to increase the added value of production and sales. (2) Introduce friendly breeding and increase product differentiation. (3) Establish an intelligent platform to train young people to return hometown. In addition, it is also suggested to combine the promotion of local recreational fishery and the characteristics of e-commerce distribution and sales to establish an operation model of online distribution and sales; and widely publicize Taiwan's seafood and aquatic product certification and inspection system to promote friendly farming methods to improve the existing breeding environment. Protect the sustainable environment and increase production value.

Keywords: *Focus group interview method, Ecological aquaculture, Operation strategy.*

1. INTRODUCTION

The aquaculture industry in Taiwan has a long history. Since World War II, the demand for aquatic products has increased and the density of aquaculture has increased. In order to facilitate management and reduce the occurrence of pests and diseases, farmers often use some drugs to reduce the mortality of cultured organisms and reduce losses. However, some drugs are likely to have a negative impact on the human body, and even have a high risk of cancer, such as organophosphates, chloramphenicol, malachite green, nitrofuran, etc. Around 2000, as countries successively banned such highly toxic drugs or enacted regulations to restrict their use, Taiwan also revised the relevant laws and regulations on aquatic drugs at this time to regulate the legal and rational use of drugs by farmers [1].

In recent years, some farmers have gradually realized that although the output of intensive farming is higher and more stable, they find that there seem to be fewer and fewer organisms around the farms, and the surrounding ecosystems are becoming more and more monotonous. Although the Council of Agriculture of the Executive Yuan has formulated the "Standards for Medication of Animals", some farmers still hope to go further and work towards the direction of drug-free, to provide safe aquatic products for their families and consumers, and even restore fish farms.

For ecological farming, maintaining stable water quality and feed sources are two important factors. Taiwan has developed aquatic fisheries for more than 40 years. However, aquaculture fisheries require large amounts of water. In Taiwan, where water resources are unevenly distributed, this is quite a problem. Although the development of environmentally friendly agriculture and fisheries has been widely accepted, it is not easy for more than 40% of the small family fish farms in the southwest coast of Taiwan to invest initial costs to transform or change the past farming methods. The subsidence problem of land is still serious.

Therefore, it is worthy of attention and promotion to develop a farming method with sustainable development environment. Friendly aquaculture, organic aquaculture or ecological aquaculture is a method that allows farmers to invest in aquaculture systems, production environments and sustainable environmental protection with low energy input. Friendly aquaculture has gradually attracted the attention of farmers because its production methods are more cost-friendly and environmentally friendly than traditional intensive farming methods [2].

Based on the above mentioned background and motives, the purpose of this research is as follows after understanding Taiwan's aquaculture industry is facing problems such as limited water and land resources and relatively high production costs.
The research objectives of the present study are summarized as follows:
(1) To build a sales channel for young farmers and aquatic products in Chiayi by means of aquaculture management, and to improve regional production and marketing operations.
(2) Under the premise of sustainable development, environmentally friendly production methods increase the differentiation from market products and improve competitiveness.
(3) Increase the willingness of young people to return hometown to invest.
The research questions are as follows:
Q1: What are the challenges and difficulties in introducing ecological aquaculture?
Q2: How to introduce ecological aquaculture to increase market competitiveness?
Q3: What are the key success factors for introducing ecological aquaculture?

This section is include three parts; the first part is the relevant literature review of ecological aquaculture, the second part discusses the situation and difficulties of ecological aquaculture, and the third part is the operation strategy of ecological aquaculture.

Ecological aquaculture from different definitions, it generally refers to the implementation and management of aquatic ecosystems. In addition to economic benefits, aquaculture can also produce social and ecological benefits.

The principle of ecological aquaculture is to encourage low energy input farming system and protect its production environment, and support local consumption as much as possible [2]. This sustainable and friendly aquaculture method is gradually attracting attention because its production methods are friendly to the production environment than traditional intensive farming.
Another important significance of ecological agriculture compared with organic agriculture is that it is friendly to wild animals, which is a kind of thinking from the perspective of biological protection and environmental ethics [3]. Fishermen often have conflicts between aquaculture and bird predation [3]. Aquaculture operators often regard birds as pests, and it is difficult for fishermen to treat birds well. As a result, examples of wildlife-friendly aquaculture are rare.

In the world's oceans, approximately 90% of large fish stocks have disappeared, and 70% of fisheries are overfished or fishless [4]. Habitat destruction, pollution, the human factor of invasive

species and climate change have all contributed to the decline of fishery stocks. However, since the interplay of various factors is not easy to figure out, it is easy to blur responsibility.
In fact, overfishing is to blame, including in Taiwan. Over the past five to six decades, industrialization, expansion of fisheries, improved fishing methods, increased population (demand for food), resource use and mismanagement have rapidly depleted fish stocks.

Worm et al. [5] predict that by 2048, marine resources will be depleted and there will be no fish to eat. Therefore, aquaculture will become the main source of fishery product supply in the future, and fishery products need to be provided through aquaculture to supplement the shortage of fishery products and food shortage.

From the perspective of ecological aquaculture, the question of future is not whether to increase production, but how to increase environment production, that is, whether the way of increasing production can reduce the pollution load on the environment, and take into account the health of farmers and consumers.

The safety and health of aquaculture is a necessary condition for its products, and ecological farming products must be environmentally friendly and friendly to wild animals. However, few of the aquaculture products sold on the market meet the elements of ecological farming, which also reflects the special difficulty of implementing ecological farming.

Ecological aquatic fishery takes ecology, environmental science, limnology and aquaculture as the main body, integrates knowledge in several related fields, and uses the knowledge and strength of ecological design, ecological engineering, ecological construction methods and ecological governance to study natural ecosystems [3]. Therefore, reducing environmental pollution, cultivating safe and healthy products are important issues in the aquaculture industry.
In addition, the excessive extraction of groundwater by the breeding industry will cause land subsidence, increase the risk of regional floods, and affect the safety of residents' property.

For hundreds of years, humans have always believed that the ocean is boundless, rich in resources, and has a strong ability to contain and repair, and it is impossible to change the ocean by manpower alone. However, in the past 50 to 60 years, with the advancement of marine science and the results of a large number of investigations and researches, people have discovered that human beings can not only change the ocean, but also irreversibly plunder resources. It wasn't until 2002 that scientists confirmed that global fisheries were in decline.

The annual output of aquaculture aquatic products is about 292,507 metric tons, and the output value is about NT$37.4 billion. In addition, according to the customs clearance data of Taiwan's aquatic products import and export in 2019, the import volume is 494,665 metric tons (worth about 1.7 billion US dollars), and the import is reduced by 8,953 metric tons (-1.8%) compared to 2018, exports amounted to 727,069 metric tons (worth about $1.8 billion), an increase of 48,585 metric tons (+7.2%) compared to 2018. In terms of global fish production, both marine and inland aquaculture are gradually increasing each year. In 2018, the output of aquaculture aquatic products accounted for 46% of the total output of aquatic products.

2. RESEARCH METHOD

Qualitative research methods are used to collect data for this article; when relevant articles are obtained, interpretive analysis begins, and conclusions are made after discovery and discussion.

The above process is repeated continuously, and at the same time, the researchers are constantly correcting and checking according to their actual research needs, until the overall research results are finally presented. This section describes the choice of qualitative research methods, research design, data analysis and interpretation.
The purpose of research design is to find the appropriate research method to answer the research question. In literature reading, although the research results can be presented concretely through numbers, researchers still believe that if they are interpreted with numbers, the development of the topic cannot be truly presented. Based on the identity of the researchers as those who explore the operation strategy, what they want to explore is not only the results, but more importantly, the process behind the results, which may further provide beneficial strategies for the breeding industry. Therefore, the considerations in deciding to use qualitative research in this study were: (1) Quantitative research generally interprets the meaning of the results through questionnaires, and lacks opportunities for research participants to actively voice their voices. (2) Through qualitative research, it is possible to have direct and in-depth contact with farmers to understand how farmers improve regional production and marketing operations through breeding management, and establish sales channels for young agricultural and fishery products in Chiayi. (3) Sustainable production methods increase the differentiation from commercially available products and increase the willingness of young people to invest in their hometowns.

It mainly uses oral in-depth talks between the researcher and the researched participants to realize communication and construction. This is a personal and personal interaction, through the process and content of the interview, the researcher discovers and analyse the motivations, beliefs, attitudes, practices and opinions of the research participants [6]. Kavle & Brinkmann [7] pointed out that qualitative research interviews are beneficial to collect background information of research participants through the steps of finding research topics, designing research, interviewing, transcribing, analyse, validating, and writing reports. The researchers used a face-to-face dialogue interaction method to allow the research participants to speak freely.

Researchers can find many aspects worth thinking about from the interview data; if the research uses quantitative methods such as questionnaires, it will be difficult for the research participants to find the real answer close to the research participants due to the lack of sufficient description of the event, and it is impossible Summarizing the crux of practical problems prevents research from going deep into the core. This study uses semi-structured interview method to collect more relevant information. Therefore, in accordance with the principle of intentional and intensive sampling, and in pursuit of the goal of "information saturation" of sample data to a certain extent, three interview cases with high information density and intensity were selected. They have many years of practical experience in the breeding industry. The information of the participants of in-depth interview is summarized in Table 1.

Table 1. Basic data of the in-depth interview participants

No.	Gender	Experience	Aquaculture	Company
B01	Male	5 years	Clams	Zhi's fish farm life
B02	Male	12 years	Clams	Clam farming
B03	Male	3 years	Clams	Xiaobai safood

This study designs the semi-structured in-depth interview outline according to the research topic, as shown in Table 2. Focus group interviews are conducted in a relaxed atmosphere, and the interviewees can communicate, support or discuss with each other. Based on the group effect, member interaction and listening to other people's experiences can stimulate the interviewees, evoke memories and generate opinions on issues [8].

Focus group interviews are also called focus groups, focus interviews, or group in-depth interviews. Focus group interviews are researchers using interviews in group situations, and through the process of group interaction and discussion, to achieve the purpose of collecting research data [9].

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Focus group interviews have the following four characteristics: (1) Conduct interviews with at least four research participants; (2) Encourage research participants to talk to each other, not just to the researcher, so that knowledge constructed after group interaction can be collected; (3) In addition to observing the participants' verbal and non-verbal contact, you can also see their mutual behavioural reactions; and (4) The moderator will promote the interaction and discussion among members of the research group [10].

Table 2. Semi-structured in-depth interview outline

Outline	Item	Content
Warm up	1	How long have you been doing ecological aquaculture?
	2	What drew you to the ecological aquaculture bandwagon?
	3	Please outline your thoughts on ecological aquaculture?
	4	What is the most important thing in ecological aquaculture?
Dilemma and innovative	5	In ecological aquaculture technology, which aspects do you think can be promoted the most? What are the difficult things? Why?
	6	Based on your experience, what kind of abilities do you think you need to be competent for the work of ecological aquaculture? Why?
	7	How would you adopt a new approach to farming if there were ecological aquaculture methods that were different from the past?
Production and sales evaluation	8	What do you think is the dilemma of Taiwan's aquaculture industry from production to sales?
	9	What impact do you think aging will have on Taiwanese ecological aquaculture? How to attract young people to return to their hometowns to engage in the production and sales of related farming?
	10	How do you think Taiwan's ecological aquaculture production and marketing will go global? Any suggestions?
	11	Ecological aquaculture is the wave of the future. How to seize the opportunity and what advantages does Taiwan have?
Suggestion	12	For this research topic, what parts do you think need to be informed or supplemented?

The information of the participants of focus group interview is summarized in Table 3.

Table 3. Basic data of the focus group interview participants

No.	Gender	Experience	Aquaculture	Main business
A01	Male	34 years	White shrimp	Production and sales
A02	Male	15 years	Aquatic material	Aquatic material store
A03	Male	3 years	Aquatic strain cultivation	Aquatic strain cultivation and sales
A04	Male	19 years	Clams	Production and sales
A05	Male	6 years	Crab	Production and sales
A06	Male	27 years	Snapper fry	Production and sales

Focus group interviews have the following four advantage [9; 11]:
(1) Can collect oral and non-verbal data from most research participants on the same focus topic in the same time period.
(2) Through group interaction, research participants can stimulate various perspectives, produce different effects, and have more in-depth discussions on certain issues.
(3) Encourage research participants to talk to each other and observe their most natural vocabulary to respond to each other and not just talking to the researcher, so their perspectives can be understood.
(4) Time-saving, cost-saving, easy to carry out, researchers can collect a wide range of data in a short time.

3. RESULTS AND DISCUSSIONS

The research results obtained by the researchers through semi-structured in-depth interviews and focus group interviews (Figure 1).

Figure 1. Focus group interviews

The results are divided into: the first section is constructs cooperation channels and increases the added value of production and sales; the second section is introduces ecological aquaculture and increases product differentiation; the third section is establishment of an intelligent platform and the cultivation of young people to return to their hometowns. The results are described below:

Constructs cooperation channels and increases the added value of production and sales. The ecological aquaculture products produced can establish cooperative relations with supermarkets, restaurants, restaurants, agricultural product markets, etc., and sell the products directly to consumers. At the same time, an online platform can be set up to conduct online sales and expand product sales channels.

Introduces ecological aquaculture and increases product differentiation. Adopting environmentally friendly farming methods, such as circular farming, organic farming, etc., can reduce the impact of farming on the environment. For example, the farm can be designed as a natural circulation system to reduce the impact on the surrounding ecological environment. In farming, you can choose to use sustainable feed, such as plant protein, algae protein, etc., to reduce damage to the marine ecosystem, improve feed utilization efficiency, and reduce feed costs.

By optimizing production management, reducing the waste of energy, water resources and other resources, and strengthening the recycling and reuse of resources to reduce production costs. In addition, we can also pay attention to environmental protection in the production process, strictly abide by environmental laws and regulations, and control the discharge of pollutants in the production process.

Establishment of an intelligent platform and the cultivation of young people to return to their hometowns. Establishing a good breeding environment, such as improving water quality and improving the quality of aquatic products, can increase the output and quality of aquaculture products, improve the efficiency and competitiveness of aquaculture, and attract more young people to return to their hometowns to invest.

In addition, professional training and technical support are provided to help young people understand the knowledge and skills of the aquaculture industry, improve their experience and technical standards, and enhance their confidence and ability to invest. Use the promotion of successful cases to demonstrate the development potential and investment value of the aquaculture industry, and encourage young people to actively participate in investment and entrepreneurship.

4. CONCLUSIONS AND SUGGESTIONS

So far, the relevant conclusions obtained in response to the aforementioned research purposes and questions are as follows:
Q1: What are the challenges and difficulties in introducing ecological aquaculture? This results shows that the food science, aquaculture, production process, product packaging and recreational fishery, etc. are all important issues to ecological aquaculture.

Q2: How to introduce ecological aquaculture to increase market competitiveness? This results shows that using high-quality aquatic ingredients from various aquaculture areas in Taiwan, in line with the development trend of fishing village leisure, to promote the new operation strategy of " local production and local sales". From the development of aquatic commodity models, the introduction of an ecological aquaculture production system, to the management of local high-quality aquatic products brands, etc., in conjunction with the planning of diversified sales models and shortening of transportation and marketing costs, a local fishing village development system is established.

Q3: What are the key success factors for introducing ecological aquaculture? Taiwan's high-quality aquatic products' "local production and local sales" business model has attracted much attention. The model combines multiple strategies such as ecological aquaculture, local recreational fishery, e-commerce and online sales, and aims to promote the sales and marketing of aquatic products.

It is recommended that researchers who follow up on this thesis take the following themes as their core.

(1) Innovative operation promotes technological innovation: In ecological aquaculture, technological innovation is one of the key elements. Farmers should encourage and support the research and development of new technologies, such as smart monitoring systems, automated feed supply, remote operations, etc. These innovative technologies can improve farming efficiency and reduce costs while reducing environmental impact.
(2) Establish a traceable supply chain: Ecological aquaculture operators should establish a traceable supply chain, and every link from the farm to the consumer's table should have clear

records. This can provide consumers with transparent information about the source of the products, production conditions and environmental impact. At the same time, it also helps farmers track and improve their own operating practices.

(3) Promote sustainable farming standards and certification: Ecological aquaculture operators can consider complying with and promoting sustainable farming standards and certification mechanisms, such as Aquaculture Stewardship Council (ASC) or Global GAP. These standards and certifications can help build a strong reputation, attract sustainability-conscious consumers, and access broader market.

(4) Strengthen environmental management and risk assessment: Ecological aquaculture operators should implement strict environmental management measures and regularly assess and monitor the environmental risks of farms. This includes regular testing of water quality, reducing pollutant discharge, and ensuring reasonable breeding densities. By responding to and reducing environmental risks in a timely manner, the chance of adverse events can be reduced while improving the sustainability of the farm.

(5) Establish cooperative alliances and industrial cooperation: Ecological aquaculture operators should actively participate in cooperative alliances and industrial cooperation to jointly solve the challenges faced by the industry. This can promote knowledge sharing, technical cooperation and resource integration, and improve the sustainability level of the entire industry. At the same time, cooperation can also strengthen the influence in marketing and brand building.

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