Potential and problems of ornamental fish farming development in Depok City (case study: neon tetra, cardinal and red nose ornamental fish farmer in Bojongsari District)

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Abstract. Ornamental fish is one of Indonesia's export commodities with destination countries dominated by Japan, Singapore, America, China, England, Korea, and Malaysia. This paper aims to provide an overview of the potential development, problems, and challenges of ornamental fish farming in Depok City. The research was conducted in August 2020 in Bojongsari District, Depok City, West Java Province. Data collected in the form of primary data and secondary data. The survey method was used in this research, with interview techniques using a questionnaire, in-depth interviews, and focus group discussion to stakeholders. Data analysis used simple statistical analysis and qualitative descriptive. The results showed that Depok City is one of the areas with the third-largest potential for ornamental fish in Indonesia, with its center in Bojongsari District. There are two types of ornamental fish farming in Bojongsari, namely hatchery, and nursery of ornamental fish. The dominant types of ornamental fish commodities are neon tetra, cardinal, and red nose. The problems in the development of ornamental fish farming include; a) technical problems, namely limited land; availability and quality of broodstock; limited fish seeds; quantity and quality of water (decrease in water quality); disease b) socio-cultural problems, namely the limited number of fish breeders; difficulty accepting new technology; marketing still depends on demand; access to price information at the exporter level; the workforce still comes from within the family and depends on the business owner; Human resources related to farming techniques; and financial management. So that it takes solutions related to problems and challenges through government policies in fostering and mentoring business actors, both technology assistance, as well as business management and socio-cultural behavior.

1. Introduction
Fishery resources owned by the Indonesian state are the basic capital in the development of the Indonesian nation. These resources are the main source of livelihood for the community. Not only do fishery resources exist in the sea, but freshwater fisheries are also a source of income for most people in Indonesia. One of the potentials of freshwater fisheries is ornamental fish.

The Ministry of Marine Affairs and Fisheries (MMAF) has been serious in developing ornamental fish farming for several years. It is hoped that ornamental fish will be able to become a leading sector in improving people's welfare through employment and increasing export value. The large potential of national ornamental fish resources is a strategic value for Indonesia in boosting state revenue from foreign exchange sources on ornamental fish exports.
The potential for Indonesian ornamental fish is very high, both freshwater and marine ornamental fish. The great potential has made Indonesia as the main exporter in the ornamental fish trade in the world, after Singapore, Malaysia, Japan, Thailand, and China [2]. MMAF data recorded at least 4,720 types of freshwater and marine fish and 650 of them are known as ornamental fish. The export volume of ornamental fish from 2015 to 2018 has reached 257,862,207 with export destination countries dominated by Japan, Singapore, America, China, England, Korea, and Malaysia. The number of ornamental fish traded in the world 1,600 types, of which 750 types is a freshwater fish [1].

The prospect of ornamental fish business in Indonesia is very bright [3]. Freshwater ornamental fish accounts for 80% of the ornamental fish trade in Indonesia. Twenty percent of the ornamental fish trade value is contributed from seawater ornamental fish. Most of the freshwater ornamental fish trading is obtained from farming (90%) and only 10% is obtained from the catch. This is inversely proportional to seawater ornamental fish where nearly 95% of the traded ornamental fish are caught in nature [2]. The export value of the Indonesian ornamental fish trade to foreign countries is quite high, reaching USD60 million or around IDR860 billion per year with 1.1 billion fish marketed. However, this value is still small considering the economic potential that can be generated by thousands of beautiful fish species from Indonesia [4].

One of the communities that make freshwater ornamental fish farming as their main livelihood is the community in Bojongsari District, Depok City, West Java. The community in Bojongsari District, Depok City has for several years been developing ornamental fish farming, particularly the neon tetra, cardinal, and red nose types as an alternative for their livelihoods [5]. The development of ornamental fish farming in the Bojongsari District, Depok City has a very big influence on changes in the socio-economic community. Gradually, many members of the community have turned into ornamental fish farmers.

The potential of freshwater ornamental fish owned by Indonesia is still not optimally developed [6]. The government of Depok City has been working to develop ornamental fish farming by establishing Bojongsari District as a center for ornamental fish farming [7], however, various obstacles have been found in developing freshwater ornamental fish farming, both technical, financial and socio-cultural. To make ornamental fish producing and exporting countries in the world, it is necessary to pay attention to the potentials and problems both technically and socio-culture. This paper aims to provide an overview of the potential and problems in the development of ornamental fish farming with a case study in Depok, West Java.

2. Material and methods
2.1. Time and Site
The research was conducted in August 2020 in three sub-districts in Bojongsari District, Depok City, West Java, namely Pondok Petir, Curug, and Bojongsari, which are centers for the development of ornamental fish farming.

2.2. Collecting data method
This paper is part of the research results of the Micro-Socio-Economic Indicator Panel in Support of the Development of the Marine and Fisheries Sector, conducted by the Center for Marine and Fisheries Socio-Economic Research. The research used qualitative methods with survey methods, with data collection techniques using questionnaires to 42 ornamental fish farming businesses, in-depth interviews, and focus group discussions (FGD) with related stakeholders. Secondary data were collected to enrich primary data and for data analysis purposes.

2.3. Data analysis method
The data analysis method used to describe the potential and problems in the development of ornamental fish farming is a qualitative descriptive analysis in which the authors describe the existing conditions of ornamental fish farming and business actors by describing the technical and
socio-cultural aspects. Data analysis used simple statistical analysis to describe the socio-economic characteristics of the business actors.

3. Result and Discussion

3.1. Description of ornamental fish farming in Bojongsari District

One area that has the potential for freshwater ornamental fish farming is Depok City, West Java Province. In Indonesia, the ornamental fish production in Depok is in the third position after Bekasi and Jakarta City. Ornamental fish farming has become the main source of livelihood for some people in Depok City.

![Map of Depok City, West Java](image)

Figure 1. Map of Depok City, West Java

Depok city has 11 districts which are 10 of them as ornamental fish producers, with Bojongsari District as the largest. Bojongsari District is located in the westernmost area of Depok City with an altitude of 70-100 meters above sea level. Bojongsari District is directly adjacent to Bogor Regency and South Tangerang City. Bojongsari District has 7 villages, namely Duren Seribu, Duren Mekar, Bojongsari Lama, Bojongsari Baru, Curug, Pondok Petir, and Serua. In terms of economic activity, there is one public market and 2,695 shops. Meanwhile, for industry, there are 45 large and medium industries which employ 7,525 workers [5]. Data for 2019 shows that Depok City has an area of 9,250 hectares of ornamental fish ponds. In 2019, the number of ornamental fish production was 91,633,036 fish. Decorative fish ponds are a solution to the limited land available in Depok [8].

Based on data from the Department of Agriculture and Fisheries Food Security (DKP3) Depok City, there are 35 ornamental fish farmer groups (Pokdakan) in Depok City, 12 of which are in Bojongsari District. There are 185 ornamental fish farmer households (RTP) in Bojongsari District with 7,780 aquariums. Ornamental fish farming in Bojongsari District is considered to have tremendous potential because it strengthens community empowerment from an economic perspective. Ornamental fish farming can be developed and involve the community to boost the economy, to increase family resilience. Ornamental fish has the potential to be marketed domestically and abroad.

Ornamental fish are a cluster in the economic development of the community and are very popular as a livelihood for the people in Bojongsari District. The development of ornamental fish farming in Depok City is carried out in line with the mission of developing the economy. The development objective is to improve the welfare of the marine and fisheries community through strengthening human resource institutions, being sustainable and increasing knowledge-based productivity and competitiveness as well as expanding access to domestic and international markets. Where currently there is market demand from Singapore, Germany, Japan and Australia, and others.
Ornamental fish is not only for entertainment but has a multi-function function so that ornamental fish is one of the people's favorite pets today [9]. Ornamental fish trading in Indonesia is growing due to the increasing demand from domestic and foreign markets.

The number of ornamental fish farmers in Bojongsari has increased. In 2014, there was approximately 143 farmer in Bojongsari District with an area of 3,12 hectares with farming facilities in the form of an aquarium of 6,790 units and a storage tank for ornamental fish as many as 270 units. Based on the statistical report of ornamental fish farming, the ornamental fish produced in Bojongsari District is Cardinal Tetra. In May - July 2014, the production value of Cardinal Tetras reached 5,610,690 with the largest value of IDR 1,402.672,500. Other types of ornamental fish that are cultivated in the Bojongsari District include manvis, annulus, platis sword, silver dollar, and others [9].

There are three commodities of ornamental fish are being marketed in Bojongsari District namely Neon Tetra (Paracheirodon innesi), Cardinal Tetra (Paracheirodon axelrodi) and Red Nose Tetra (Hemigrammus rhodostomus). Cardinal Tetra is a type of freshwater ornamental fish produced by ornamental fish farmers in the Bojongsari District. Tetra fish is one type of ornamental fish that has a good market or demand prospects from domestic and foreign [10]. The Cardinal Tetra has a bright color and can be seen in dark inland river waters and this is one of the reasons for its popularity as an ornamental fish. The fish move in groups, their scales will flash a neon blue red, so the fish looks beautiful and bright even in the dark. Also, Cardinal Tetra fish have the potential to be developed because fish farmers have been successful in cultivating Cardinal Tetra fish in their area [11].

Since 2015, the ornamental fish farming in Depok City has received support from the BKPP Government and Development Coordination Agency (BKPP), IPB University, the Cooperative Office (marketing), the PUPR Service (infrastructure), the Tourism Office (educational tours). The history of the development of ornamental fish in the city of Depok, West Java, has been developing since the 1980s. At that time, Bakti Street in Curug Village, Bojongsari District, Depok City, became the center for ornamental fish in Indonesia. At that time a large exporter had developed, with many farms on either side of the road, including the Banyubiru exporter company. Since 2000, the regeneration of business among young people has decreased. The effort is difficult to pass down from generation to generation. However, there is a phenomenon of regeneration since 2014 where young people have started to pursue ornamental fish business (the current generation of business actors). They are generally oriented towards seeing the success of a supplier who has succeeded in becoming a national champion, business profits, and business development (concrete).

3.2. Description of ornamental fish farming in Bojongsari District

The ornamental fish farming in Bojongsari District has been developing since 2000. Ornamental fish has become the main income because it is profitable. The phenomenon in year 2014/2016/2017 occurred in group development. The center for ornamental fish farming in Bojongsari District is located in Curug, Pondok Petir, and Bojongsari Villages. In Bojonsari District, ornamental fish farmers are incorporated into a group. There are 6 groups in Curug Village, 1 group in Pondok Petir Village and 7 groups in Bojongsari Village, where 1 group has 10 to 20 members. At school age, he started to take interest in ornamental fish business Young business actors are oriented towards successful business actors. One of the functions of groups is for coaching. It is undeniable that there is motivation to get help.

Most of the ornamental fish farmers in the Bojongsari District are Betawi ethnic groups who have been living for generations. The land they use as a residence and business land is generally inherited from their parents. Most of the respondent education ranges from junior high and high school, however, there are also respondents with higher education. The business experience of the respondent is generally more than ten years so that it is sufficient to understand technical ornamental fish farming.
Most of the respondents in the study were owners. They generally do everything themselves without the help of other people's labor. Several respondents have workers but the numbers are very small. The partnership system carried out in the business can be seen in 3 types. First is a partnership between farmers and suppliers, second is a partnership with investors, and the third is a partnership with labor. The profit-sharing system with a cooperative system, namely the owner provides the aquarium capital, pond, facilities, and the broodstock gets 30% profit sharing, while the partner's issue operations and get 70% profit sharing. The types of ornamental fish farming in three villages are hatchery and rearing. The maintenance time depends on the exporter's request, the S M L XL size depends on the exporter's needs.

The activity of ornamental fish farmers starts at 4 am. The activity carried out is looking for food in the form of water fleas. This was done until 8 am. After returning from looking for a feed, the morning activity carried out is feeding. This activity is carried out until 10 am. An overview of the activities carried out from morning to finish can be seen in table 1.

**Table 1.** Ornamental fish farming activities

| Period (Hour) | Activity | Information |
|---------------|----------|-------------|
| 05.00 – 08.00 | Looking for food (water fleas) | To Ciaseeng by using motors (trip 2 hour – PP with petrol IDR 10,000. Looking for food in the pond catfish are empty. There are 30 ponds. Looking in kolekan 20 people. Paying IDR 50,000 / month (to guard fishpond). Getting lice water as much as 1 scoop. Giving feed per 1 cup in the morning and afternoon by using sheel special |
| 08.00 – 10.00 | Feeding fish | as many as 150 aquariums |
| 10.00 – 12.00 | Lift the egg of fish | Using aquarium fish net (seser) |
| 12.00 – 13.00 | Rest | |
| 13.00 – 15.00 | Drain the aquarium and sorting | |
| 15.00 – 04.00 | Break | |

Source: primary data processed, 2020

In general, when it comes to ornamental fish farming, the time allocation for business must be focused. Ornamental fish farming requires patience and a sense of happiness to raise fish [12]. In one year, business actors can experience a day off, namely during Eid al-Fitr. A large amount of time spent in the ornamental fish farming means that ideally there is a division of roles between husbands and wives when they do not have workers. The roles of men and women in business activities can be seen in Table 2 below.

**Table 2.** Roles of Men and Women in Ornamental Fish Farming Business

| Male Roles | Role of Women / Wives |
|------------|-----------------------|
| Look for food | Sorting fish |
| Drain the tank | Packing |
| Packing | Recording (improvised) |
| Sales | Drain the tank |
| Counting money | Buying fish (contacting the seed seller) |
| Contact the buyer | |

Source: primary data processed, 2020

The income for neon hatcheries reaches an average of IDR 1,200,000 while the income accommodates cardinal IDR 400,000 / week, the revenue sharing system is IDR 1,500,000 / week (if
it is good) the total income received by business operators ranges from IDR6,000,000 to IDR12,400,000. However, if you are not doing well, it can be half of the income above. Several business actors have side income from livestock and plantations. Sources of capital for business actors include self-financing loans, inheritance, financing loans from banks such as BRI, BNI, financing loans from other financial institutions (Pegadaian), financing loans from family, relatives, and friends, financing loans from investors/suppliers.

Fishkeeping time depends on the type of ornamental fish. Time 24 harvest days for fluorescent seeding, while 40 days harvest (cardinal seeding). The number of cycles per year continuously with the following cycles:

| Cycle        | The place           | Information  |
|--------------|---------------------|--------------|
| 0 – 18 days  | in the aquarium     | (for two weeks) |
| 19 days – 27 days | in the aquarium     |              |
| 27 days – 35 days | in the pond        |              |
| 1 day        | 2 aquariums (eggs)  |              |
| 18 days      | 36 aquariums        |              |
| 19 days      | 20 aquariums        |              |

Source: primary data processed, 2020

The allocation of business profits obtained by business actors includes:
1. Business development/increasing business/adding celebrations/seeds/renovating drums that were originally cast iron
2. Adding assets/buying vehicles/buying land. The advantage of selling cardinal fish with an ML size of 10,000 can buy a motorbike.
3. Build a house
4. Funding for children's education/household needs

Several aspects that must be considered in freshwater ornamental fish farming are production aspect, institutional aspect, marketing aspect, financial aspect, technical aspect, managerial and administrative aspect [13]. Technical aspects in freshwater ornamental fish farming, namely determining the location, production capacity, layout, and production process including technology selection, completeness of technical.

3.3. Ornamental fish farming technology
The ornamental fish farming system in Bojongsari can be divided into two, namely using water recirculation technology and partially still traditional (direct disposal). Introduction of the Recirculating Aquaculture System (RAS) method. RAS is an intensive fish farming system, using infrastructure that allows continuous water utilization (water recirculation). The function of the oxygen generator in the RAS system is to control natural environmental conditions, reduce the amount of water used, and increase fish survival. The basic principle of RAS is to use water as a medium for repeated maintenance by controlling the water quality indicator so that the PH and water temperature remain stable. The advantage of this RAS system lies in productivity which is much higher than conventional systems. So that it is expected to increase the income of farmers [14].

3.4. Optimization of Land
In assessing community livelihoods, it is important to pay attention to land use. The changes that occur in land use will affect the livelihoods of the people [15]. The development and expansion of urban areas have caused farmers to lose their livelihoods. Data from the Central Bureau of Statistics
in 2007 show that the narrowing of agricultural land has reached 148 thousand hectares per year. Agricultural workers also fell from 42.32 million to 40.14 million or 2.18 million for 2006 and down again to 25 million farmers in 2008.

Currently, agricultural land in Indonesia is only around 20 million hectares or the area of one livestock area in a province in Brazil. With 25 million farmers, a farmer in Indonesia has an average of only 0.3 hectares of land. From a livelihood perspective, an area of 0.3 ha will not be able to contribute to meeting the needs of a decent life for farmers. The narrowing of agricultural land has also led to changes in farmers' livelihood patterns in maintaining survival. Farmers' unpreparedness for the transformation of their livelihood patterns can cause farmers to fall into a life vacuum. According to the United Nations, at the end of 2008, it is predicted that half of the world's 6.7 billion people will be in cities, especially in Asia and Africa. This happens because of two things, namely (1) rural areas have turned into urban areas due to the intervention and expansion of cities to rural areas, and (2) the mobility of farmers from villages to cities due to the loss of resources and agricultural livelihoods. World Bank (2002) predicts in 2025 later [15].

Although urban development has resulted in high economic growth, the social costs borne by the suburban community are very expensive. In an economic and sociological view, people who are victims of the conversion of agricultural land will have difficulty finding new jobs that can ensure their survival. Social interactions, which have been based on social homogeneity and equal distribution of income, have now shifted towards functional and positional principles. Changes in social interaction patterns like this will have the potential to cause conflict because of a mismatch in the social process [15].

One of the potentials that are possessed in this ornamental fish farming business is that most of the business actors are of Betawi ethnicity so that they have ample land to build a business place. However, the question is what are the challenges in the future regarding land? This is related to the construction of housing, toll roads, and so on, which are currently being carried out in Depok City. Another problem is the government's commitment to protecting water sources (because groundwater sources are used in ornamental fish farming, it is very important, the quality of groundwater will have an impact on ornamental fish farming). Climate also affects ornamental fish. Environmental changes will have a direct impact on ornamental fish. Regional Development is very influential. Water engineering technology is very important.

Media for ornamental fish using aquariums is very potential to be developed in urban communities with limited land. This makes ornamental fish farming potential to be used as a women's business. Currently, some women are entrepreneurs in ornamental fish farming.

3.5. Marketing
The pattern of marketing channels in ornamental fish farming can be divided based on segmentation. Marketing channels for the farmer - Enlarger farmer - Brokers - Suppliers - Exporters. Marketing channel I am a channel involving 3 Cardinal Tetra fish breeders, 4 rearing farmers, 3 brokers, 1 supplier, and an exporter. This marketing channel is the only marketing channel for Cardinal Tetra ornamental fish for export activities implemented in the Tetra Abadi POKDAKAN. Marketing Channels II: Hatchery Cultivators - Enlarged farmers - Brokers - Market Traders - Retailers - End Consumers. Marketing channel II is a channel involving 3 Cardinal Tetra fish breeders, 4 rearing farmers, 1 broker, 1 market trader, 1 retailer, and end consumers.

This marketing channel is a marketing channel that has the longest marketing chain. Marketing Channel III: farmer - farmer - Broker - Retailer - End Consumer Marketing channel III is a channel involving 3 Cardinal Tetra fish hatchery farmers, 4 rearing farmers, 1 broker, 1 retailer, and the final consumer. In this marketing channel, brokers directly sell Cardinal Tetra fish of various sizes to retailers after they are distributed to the final consumer. Marketing Channel IV: Hatchery farmers - Enlargement farmers - Market Traders - Retailers - End Consumers The IV marketing channel involves 3 Cardinal Tetra fish hatchery cultivators, 2 rearing cultivators, 1 market trader, 1 retailer, and a final consumer. In this channel, enlargement farmers directly distribute the harvest of various
sizes of Cardinal Tetra fish to market traders and then to retailers after which it is distributed to the final consumers. The ornamental fish business activities are inseparable from several problems that cause inefficiency in the marketing system. One aspect of the problems experienced is marketing activities. The distance between farmers and consumers in the marketing process of ornamental fish does not rule out the risk of decreasing the quality of ornamental fish, given that ornamental fish are easily damaged and incur costs to market these ornamental fish to keep them alive and reach consumers of good quality. A marketing system is said to be efficient if all marketing activities which include collecting commodities at the farmer level (spread over a large area), commodity packaging, transportation, processing, and distribution (wholesaling and retailing) run with minimum costs [9].

Based on the explanation above, the marketing of ornamental fish products carried out by farmers is dominated by offline-based marketing. Marketing of ornamental fish in the research location is dominated to fulfill the demand for ornamental fish from exporters, not for local people. This pattern will be problematic when demand from exporters stops. The Covid-19 pandemic in early 2020, hampered marketing of ornamental fish in the period March to June. The ornamental fish products produced can also be marketed to the people of Indonesia. However, the offline-based marketing system has a weakness, namely the ornamental fish products produced are not known by the public. Marketing of ornamental fish online (e-commerce) needs to be taken into consideration for increasing the welfare of fish farmers. The use of ornamental fish applications that are widely circulating can be used by cultivators because most cultivators are generally accustomed to using Android-based mobile phones. Some of them are the Marketing Instrument System of Ornamental Fish or Mis-Ofi developed by the Ornamental Fish Farming Research Institute - MMAF, the agromaret.com web site, onlinefishshop.com, and so on [16,17].

3.6. Socio-Cultural Aspects
Socio-cultural aspects, including in ornamental fish marketing, management system, quality improvement, and women's empowerment. In the marketing aspect, ornamental fish production has not been marketed directly but still through other areas such as Parung, West Java. Even though Depok access itself is better if it is marketed directly in the city of Depok. Improving the quality of ornamental fish is aimed at meeting market demand so that prices will also increase. Improving the quality of ornamental fish is closely related to the socio-economic characteristics of the community who are involved in ornamental fish farming fisheries. Business management is still mixed with family management. Business capital is still combined with children's spending, buying family needs, etc. So that the business is difficult to develop. Desire and hobbies are very great. Friends are very influential. And this friendship is very potential in Depok, especially Bojongsari. Ornamental fish are difficult because they must be sold in living conditions, of good quality. his business is contagious, his business is hereditary.

A business management system where the calculation of natural food that has not been included as a cost component is also a problem in itself. Many fish farmers are still looking for food from the river (worms) and water fleas, for example, have not been counted.

3.7. Ornamental fish farming development problems
There are some problems in ornamental fish farming in Bojongsari district, Depok City, West Java:
1. Availability of fish, the seeds are lacking. In Bojongsari there are 3 breeders, one group enlargement consists of 17 people. The factor for the small number of seeders because of the farmer’s skill, spawning facilities/media. In China, aquarium hatchery is like a drawer, higher risk, broodstock availability, capital, but not the main problem. Capital is more for business expansion/expansion of business land. Capital problems because they are not bankable (bookkeeping/business records do not exist due to human resources; production targets are more about profit, not the certainty of production (what production). Less capital.
2. Land-use change
3. Decreasing water quality due to settlement growth. This cannot be avoided because of many interests.

4. Quality master. This problem stands out the most. Technically, the knowledge possessed by the farmers is already good, but it is difficult to accept the new technology "wants the standard already used".

5. There are many sibling marriages. The parent comes from Amazon.

6. Disease, usually white spot disease due to weather changes (transition), at this time it is usually difficult to find neon tetra. Disease, rust / red usually in S size, change of weather, water quality.

7. Size problem, the exporter does not want to resize. The knowledge possessed by the farmer is hereditary, traditional then enters the exporter.

The problem that faced ornamental fish farming in the future is land-use change. Use of aquarium shelves to get around limited land or narrow land. One 3x3m size room, for example, can be filled with an aquarium of 30 units. Regarding access to price information at exporters, the local government has created a website to provide price information to farmers. But it turns out that pricing information is very difficult. The ornamental fish industry is an industry that is closed because of the players alone. Many actors have nailed their nails in the business. The government has not made it into exporters and there are many barriers. A bonded bond system has also been developed to limit price information to farmers. For example, the relationship between suppliers and companies. There was a case when a new player wanted to immediately export when he arrived at the export destination country, the goods (ornamental fish) were returned. This is because the person is not a player who usually exports.

To discuss the availability of feed input land, because between regions it can be done by BKPP. Due to the challenges ahead, the land for foraging (catfish ponds on Mount Sindur is decreasing due to settlement development).

4. Conclusions and Recommendations

Depok City is one of the areas with the third-largest potential for ornamental fish in Indonesia, with its center in Bojongsari District. There are two types of ornamental fish farming in Bojongsari, namely hatchery, and nursery of ornamental fish. The commodities that are cultivated are dominated by neon tetra, cardinal, and red nose. Investment capital comes from inheritance (for land), own capital, formal banking credit, informal credit from investors, and government grants. The feed used was artemia, water fleas, silkworms, and pellets. Marketing of ornamental fish through local collectors, suppliers, and exporters.

Problems in the development of ornamental fish farming can be divided into two, namely technical and socio-economic. Technical problems, namely (1) limited land due to conversion of land use to housing land, (2) availability and quality of broodstock, (3) limited fish seeds, (4) quantity and quality of water (decrease in water quality), and (5) diseases caused by changes in weather and water quality. Socio-cultural problems, namely (1) the limited number of fish breeders, (2) difficult attitude to accept new technology "want the standard that has been used", (3) marketing still depends on demand, (4) limited access to price information at the exporter level (5) the workforce still comes from within the family and depends on the business owner, (6) Human resource accuracy related to the calculation of the number and size of fish, (7) business financial management is still not separated from household finances. Socio-economic problem, including in ornamental fish marketing, management system, quality improvement, and women's empowerment.

It takes additional farming technical knowledge to increase the number of ornamental fish production, technology to increase the quantity and quality of water and disease management. Government intervention is to increase the transparency of price information at the exporter level so that the selling price will increase. The socio-cultural transformation of human resources in ornamental fish farming businesses is related to the improvement of the quality of ornamental fish products in terms of quantity and size, financial management, and business sustainability. Lastly, it takes commitment from various related stakeholders and across regions from policymakers to...
ensure business sustainability, especially in terms of water quantity and quality, availability of mains, and land availability.

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