

# Research on organizing spatial production of economic models for agro - fisheries and processing industry in Diem Dien Town, Thai Thuy District, Thai Binh Province

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**Abstract.** The paper is focusing on the following topics:

- Assessment of natural conditions in Diem Dien Town, such as: location, relief, land, water and marine resources.
- Research, assess human and economic resources such as population, labor skills, infrastructure, political mechanism and consumption market.
- Analysis, assess efficiency of current producing situation and organizing agriculture, fisheries for economic structural transition oriented industrialization and goods commodity.
- Set up spatial models of agro - fisheries and processing industry with its natural, social - economic and human conditions and demand of goods economy, typical models of producing - processing fruits, vegetable, seaweed and alga, and especially marine economic models.

The development of Socioeconomic in the Diem Dien in the direction of these models will certainly yield high economic efficiency.

**Keywords:** Economic models; Spatial production; Agro-fishery; Diem Dien Town.

## 1. Introduction

In the attempt of driving Vietnam to be an industrial country by the year of 2020, one important problem is to develop highly-specialized agriculture, which should be combined with processing industry with advanced technology in order to produce consumer products, and export high quality products [4, 8].

Diem Dien Town, Thai Thuy District, Thai Binh Province has the Diem Dien Port which

is favorable for socio-economic cooperation, and rich soil resources and a wide variety of seafood; and, especially, has highly potential of water surface for sea and brackish aquaculture, with labor resource having an enriched mind oneself, but up to now these advantages haven't exploited effectively. The main reason is the lack of understanding and proper evaluation of potential of natural and human resources, lack of processing technology and especially disorganizing to set up suitable economic models, disconnecting closely between materials production and consumption.

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Consequently, researching and assessing the developing resources for the purpose of setting up suitable economic models on the basis of effective use of natural and socioeconomic advantages will help Diem Dien Town become an urban area having a structure of industry - agro - fishery and trade according to its potential, contributing to effective land use, income growth and economic development [4, 5].

## **2. Resources for organizing spatial production**

### *2.1. Geographic economic location*

Diem Dien Town is located at the Diem Ho river mouth, in the east of Thai Thuy District, Thai Binh Province. The town is surrounded with Thuy Trinh, Thuy Luong, Thuy Hai and Thai Thuong communes, which are well-known for having rich agriculture and aquaculture production. The river mouth of Diem Dien Town opened through the Diem Dien seaport which is very favorable for trading with China and domestic regions.

Diem Dien Town has the provincial road No. 218 and the district road No. 319 that link the town to Thai Binh and Hai Phong cities, which create favorable economic relations with domestic regions and foreign countries. The value of geographical-economic-traffic location of Diem Dien Town is investigated to study and use for the purpose of economic development, Diem Dien town will take off and become an urban with highly developed industry, commerce and services [5].

### *2.2. Climate resources*

The climate of Diem Dien Town has radiation system and local hydrographic features within the tropical zone and

circulation of atmosphere. The interaction between these two conditions created climate in this area that has a character of ocean monsoon with long cold winter. The monitored data at different weather stations around the town have shown that the annual average temperature is 23°C - 24°C. The average air temperature of the coldest month of year is 16.7°C, of the hottest month is 29°C and the average humidity fluctuated from 80% to 84%.

The tropic and monsoon climate system with the long winter season from November to April creates capability to grow various vegetation system with many tropical and temperate plants, such as: rice, bean, peanut, cucumber, casaba melon, and so forth. Winter, however, with low temperature and changeable weather rain and storms have reduced the productivity of the crops and domestic animals, especially, causing great damages to seafood exploitation and aquaculture.

### *2.3. Water resources*

The Diem Ho River (also called Diem Dien River) pours itself into Diem Dien Mouth which is one of seven main river-mouths of the Red River Delta and is also the main river that runs through Diem Dien Town. The hydrographic system has been opened through to be drained at early stages, new river routes are built for the service of watering, draining away and traffic, and so forth. Besides, Sing and Gu rivers are important sources of water for agricultural development. The water resources is plentiful, ensuring sufficient water supply to socio-economic development. However, it is necessary to have methods for preserving water sources, resistance of pollution, saltizing, aluming, etc.

#### 2.4. Soil resources

There are the two main groups of soil: wetlands which is existed inshore; and alkaline soil which has been formed by influence of sea water or subterranean water from the sea distributing over entire area of Diem Dien Town. Agricultural land has been used to grow food crops and vegetation, such as: maize, lettuce, cucumber,... occupying only 21% of the total area. The uncultivated land remains a fairly large area, including 31% of new alluvial soil which equals to 86 ha, which is distributed over an even and flat terrain, and which can be improved to grow farm products and develop aquaculture.

Generally, the agricultural land and wetlands for aquaculture in this area is not large, but it has a possibility of further extension by improving acid soil, alkaline soil and building dikes encroaching the sea. Due to limited land resources, it is essential to have a suitable land use planning, and shift the structure of crops and domestic animal with highly intensive cultivation, diversify goods in order to serve the processing industry and exportation.

#### 2.5. Marine resources

The marine waves system changes seasonally. From December to March, the main wave direction offshore is northeast which is about 61% and the eastern is about 15%. Whereas inshore it is mainly east direction with a frequency of about 34%. Marine wave has average height of 1.2m (maximum of 6.6m). The altitude of inshore waves is from 0.5m to 0.6m. From June to September, the prevalent wave directions over the territorial waters of Diem Dien Town are the south, southwest, and east with the oscillating frequency from 40% to 75%.

Meanwhile, the northern wave predominates over about 37%. Conversely, the wave inshore has south-east direction with average frequency of about 24%. The highest altitude of waves offshore is from 7 to 8 meters and inshore is from 5 to 6 meters. The higher levels of waves occur only when having storms with all 8 basic directions and inshore it is mainly east, northeast and southeast. In the transition season from April to May, the wave direction offshore gradually moves from the northeast to the south, even from October to November the wave changes in the opposite direction, northeast direction offshore and east direction inshore. Especially, in the transitional stages, the intensity of waves is decreased considerably. The marine wave system here is favorable for boats to exploit seafood [2].

The tidal feature of the studying area is the tidal solar systems with high vibration amplitude. During the day there usually occurs the crest of tide (high water) and the root of tide (current water). During the month, there are two crest of tide with vibration amplitude of water level from 2 to 4, each period is lasted from 2 to 3 days. In the period of the current water, the property of tidal solar decreases obviously, but the property of half tidal solar is increased which leads to two crests of tide in a day. In general, the period of tide crest is not favorable for boat to exploit seafood offshore, but the tidal system has a role of dynamical hydro-petrography.

In general, the salinity of sea water is very low, which fluctuates from 9% to 17% in dry seasons, it rarely increases up to 25-30%. In dry seasons, the average salinity of sea water can also reach maximum 31-32%. The sea created the specific strength for Diem Dien Town, that is, the capability to develop producing branches based on the salinity of sea water and tidal such as salt production,

seafood rearing, exploiting and processing.

The seafood reserve in Diem Dien is from about 15,000 to 20,000 tons per year, and the possible exploiting capability is about from 12,000 to 16,000 tons per year. The marine resources of Diem Dien consist of whole high tides area, mean tides, low tides, continental shelf and economic zone which allows the town to develop synthetically marine economic branches closely connected with processing industry at small and medium scale [2, 5].

The sea potentiality is rich, but it is urgent to have an effective exploiting programs, and to invest modern equipment for exploiting offshore, and to apply technical science and technology in order to preserve the source of seafood, to increase catching productivity and output. Therefore, it is necessary to study seafood plan and processing industry in order to achieve the highest economic effect in order to raise income, create diversified jobs and shift the local economic structure according to industrialization motivation [4].

#### 2.6. Labor resources

The development settlement in Diem Dien Town is closely related to the history of dykes building and land reclamation in order to change alluvial ground into cultivated areas in Thai Binh Province. Over the territory of Diem Dien Town, there were some places where the people were settled for hundreds of years and there are some places where people have just settled up villages and hamlets 10-15 years ago. Today, people who are living in the coastal zones still continue to build dykes and land reclamation to set up new villages and hamlets in order to carry out the strategy of new economic development and expand existing space to the sea.

According to statistical data of the Diem

Dien People's Committee of Town, by the year of 2005, the population is 10,200 with 2,589 households; all of them belongs to the Kinh ethnic. The households that rely on agricultural production makes up 6.9%, on aquaculture - 9.9%, on industrial production and construction - 3.8%, on commerce and service - 10%, and on handicraft - 4.4%. In 2005, the rate of labor of town made up 49.6% of the total population, but the number of labor having professional technical education is only 34.1%; of which 9.3% is at primary level, 13.8% is at the intermediate level, 3.7% is at college level, 3.7% is at university level, and 0.7% has master level. In general, the quality of labor in Diem Dien is not professional enough, and there is a lack of labor with high skill and high-grade workers. There is a need to train technical workers in order to meet the requirement of shifting economic structure.

#### 2.7. Infrastructure conditions

The district's traffic system has the main provincial road no. 218 and the district road no. 39B which links Diem Dien to Thai Binh city. The total length of roads in Diem Dien Town is 7.365 km, among those 5.375 km is asphalted, the rest is stone-paved road. Although the traffic network in Diem Dien Town has not good enough, it meets the requirements of transport and delivery of goods. Diem Dien seaport, the biggest seaport of Thai Binh Province, has a great attraction of import and export goods, especially with China. The town have installed electric system, supplying and drainage water system which ensures lighting and supplying electricity power and clean water for inhabitants.

Educational, healthcare and cultural networks of the town are being invested and

upgraded gradually. Up to the year 2003, primary education and junior high education are compulsory in the whole town with 12 classes of Kinder garden, 31 classes of primary education, 30 classes of junior high education, one high secondary school and one vocational training school. The hospital of Diem Dien Town is one of the best hospitals in Thai Binh with modern equipments and high medical professionalism. Information and culture system is quite developed; there are 15 telephones per 100 inhabitants, together with a fairly developed radio and television networks down to each household [2].

### **3. Status and producing effectiveness of economic sectors**

#### *3.1. Agriculture*

##### *3.1.1. Cultivation*

Up to 2004, agricultural land area of the whole town was 61 hectares whereas food-produced land was 56 ha, the other was to grow vegetables. Although productivity increased highly, up to 2005, the average productivity of rice is over 6 tons per hectare, the food yield and the average annual food per person a year is still low which haven't satisfied people's living. Under the trend of industrialization, the agriculture land is decreased gradually, so it is necessary to research in order to transfer from food production to the other crops which have economic effect not only for exporting value but also making raw materials for food processing, and to achieve turnover over 100 millions VND per hectare per year.

##### *3.1.2. Breeding industry*

In the agriculture structure, the livestock

played a main activity which made up 35% (in 2000), 40% (in 2003) and 42.5% (in 2004). The breeding of beeves, pig husbandry and poultry are developing, however, the productive scale remains small. The town's livestock and poultry branch have not met local consumption and export, hence it is necessary to choose suitable breeding animals within the limited sources of food.

#### *3.2. Marine economic sector*

The marine economic sector is key to production of Diem Dien Town, which accounted for 6.2% of GDP in 2004. The marine economic consists of the branches of catching and exploiting organism sources and seafood processing.

##### *3.2.1. The catching and exploiting sources of the marine organism*

The number of fishers of the town is 800 people with hard-working nature, rich nautical and catching and processing seafood experiences. The system of catching boats has 40 boats with power of 15 to 45 CV, 100 boats with 46 to 90 CV, 90 boats with 90 to 320 CV and 120 pairs of drift-net. Due to poor equipments, fishers are impossible to exploit seafood offshore. The main catching object is floating fish. The output of seafood just achieved over 6,000 tons per year (equivalently to a half of the total capacity). Nowadays, the town has four co-operatives with 96 specialized workers, a private catching company with 20 workers and 3 offshore-fishing groups with 380 workers. The offshore fishing output achieved 1,750 tons (in 1999), 2,100 tons (in 2000), 2,500 tons (in 2004). Although the output of seafood increases gradually at the annual average rate in the period of 1999 to 2004 about 8.5% per year, the effectiveness of catching offshore by

boats are not high yet. The main cause is that the fishing knowledge is still limited, the catching net and equipment is primitive, catching technique is backward, the serving boat is not yet to provide cold ice, raw materials and transport seafood to consume. Boats with small power of motor are limited to inshore catching, the effect is more reduced so the fishing ground is narrow, there are exploiting many boats, the environment is polluted, the source of income of seafood is exhausted. The spending on fuel, raw materials, working wages, to repair catching means and the time come back the offshore and inshore catching that still is too high, and so forth.

### 3.2.2. Aquaculture production

Aquaculture production is one of traditional professions of inhabitants in Diem Dien Town. Up to 2003, the town's seafood aquaculture area was 8 ha, covering 2.81% of natural land area, however, aquaculture production is still potential and its capability can be expanded further based on the potential of exploitation and utilization of tidal peak and medium zones. The aquaculture area of water surface can be developed up to 40 ha.

The existing aquaculture production is natural exploitation, therefore the productivity is low. The average productivity achieved about 50 to 300 kg per hectare (shrimp, and fish) and 500 to 2,000 kg seaweed per hectare. Today, the extensive cultivation form is gradually changing to improve intensive cultivation form, and a small part changed to half intensive cultivation. The main cultivation objects are sugpo prawn, crab and edible seaweed. The average income per cultivated hectare is at 14 - 15 millions VND per year. The aquaculture production output achieves at 0.8% of the gross output of the marine industry.

## 3.3. Processing industry, handicraft and service

### 3.3.1. Food processing

Capacity of processing industry consumed about 50% of aquaculture production output. The main processing product is fish sauce which achieves from 1.5 to 2 millions liters per year, dried fish above one million ton per year, shrimp paste above 700 tons per year. The total value of processing output achieved about 15 billions VND per year. The annual average seafood processing product achieved more than 100 tones of frozen shrimp and fish, and 15- 20 tones of aga.

The seafood catching, cultivating and processing are the strong points of Diem Dien Town in the market economy. If these branches are invested, they will make a lot of export products, create new jobs and help to carry out rural industrialization and promote other economic branches.

### 3.3.2. Handicraft production

A sedge mat weaving is a traditional handicraft in Diem Dien Town. Its products have been popular in the domestic market for a long time because of high quality and reasonable price, high skilled labor source. In the recent years, due to backward technology, lacking of invested capital and unstable consumed markets, it has not running effectively.

### 3.3.3. Maritime transport and Marine business

Since the middle of 1998, the boats have been stopped transporting to China, some boats shifted to domestic transportation, but goods source was scare, and transporting cost was low that led to low turnover the maritime transport. The turnover of maritime transport in 2004 reached only 3,500 millions VND, covering 11% of the total value of sea-

economy sector. The main reasons of ineffectiveness of maritime transportation and marine business through Diem Dien seaport are due to procedures of transporting activities to China highly-taxed commodities through the seaport.

Besides maritime transportation, commercial service is also developing. In 2004, there were 250 households working services activities, covering 12 percent of the total number of households with turnover above 120 billions VND annually. In general, consuming services of industrial and agricultural commodities have not been developed yet because of low consumption, which results in the town's low economic growth rate.

#### *3.4. General assessment of resources and the developing status of economic sector*

The Diem Dien Town has more favorable geographical location than other administrative units in Thai Binh Province. Rich soil, especially aquaculture area of salty and brackish waters are advantageous to economic exchanges, agricultural growth, seafood catching and cultivating, and maritime transportation, etc.

Together with innovation trend, Diem Dien's economic structure is shifting in the direction of goods which conforms market mechanism.

The great advantage of geographical location of Diem Dien seaport have not been thoroughly exploited yet. Cultivating, breeding and processing industry did not develop adequately to their potential, therefore, its economic effect and value of merchandising product are low.

The potential of water surface, agricultural land have not been used effectively yet. It lacks suitable forms economic models agro-

fishery that prevents manufacturing products which can complete domestic and foreign products.

Out of date technology is caused by lacking of investment, high skilled labor, consuming market, especially, unexpended export market.

It is necessary to shift economic structure according to industrialization and mechanization, to organize suitable economic models in order to effectively exploit the potential of natural and socio-economic resources.

#### **4. Setting up models of spatial production organization in Diem Dien Town**

- The model of producing and processing cucumber and vegetables. Because rice cultivation has low productivity, it is recommended to shift the structure of cultivated crops by reducing area of rice and increasing area of cucumber and vegetable from 10 ha at present up 30 ha, to make a raw materials for cucumber and vegetable processing enterprises with average productivity of 32 tons per hectare. That will create an opportunity for surrounding communes such as Thuy Ha, Thuy Khe, Thuy Luong, Thuy Hai to form the areas specializing in vegetables and supplying raw materials for processing industry, and help to shift agricultural structure according to the direction of industrialization, and create more employment and raise income (Fig. 1).

- The models of edible seaweed cultivation and Agar processing. Edible seaweed cultivation area up to the year 2004 was exploited with 800 ha, the area can be increased by 20 ha by changing low effective areas of mangrove, and shrimp pond. The yield of edible seaweed can reach to 30,000.

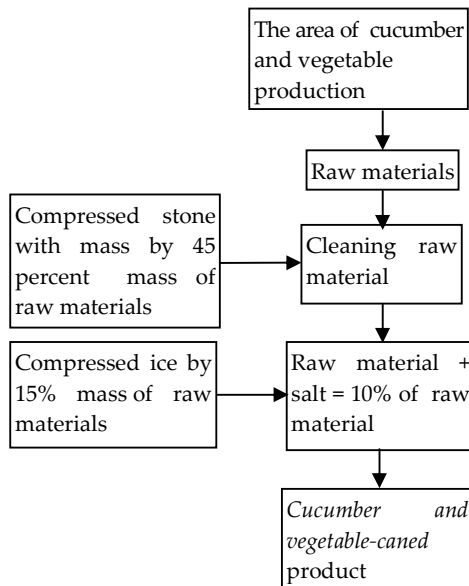


Fig. 1. Production relational model of cucumber and vegetable caned processing.

- 40,000 tons per year (not including source of edible seaweed in communes like Thai Thuong, Thuy Hai and so forth). The yield of edible seaweed harvested during a year guarantees sufficient supply raw materials for Aga assembly line with of 100 tone per day, which makes the capacity high value of export product (Fig. 2).

- Marine economic model: Based on marine resources, large seafood reserves, favorable conditions for catching and cultivating and, processing and maritime transportation, Diem Dien are able to set up and develop a comprehensive marine-economic model.

Integrated marine economic model will stimulate investment on aquaculture, catching, seafood processing and maritime transport for the purpose of thorough exploitation of marine potentials, getting high profits, preserving marine resources and protecting environment. One of typical marine economic models that has been organized and

developed effectively in Dien Diem was cooperation of catching and fish sauce processing [1, 3] ( Fig. 3).

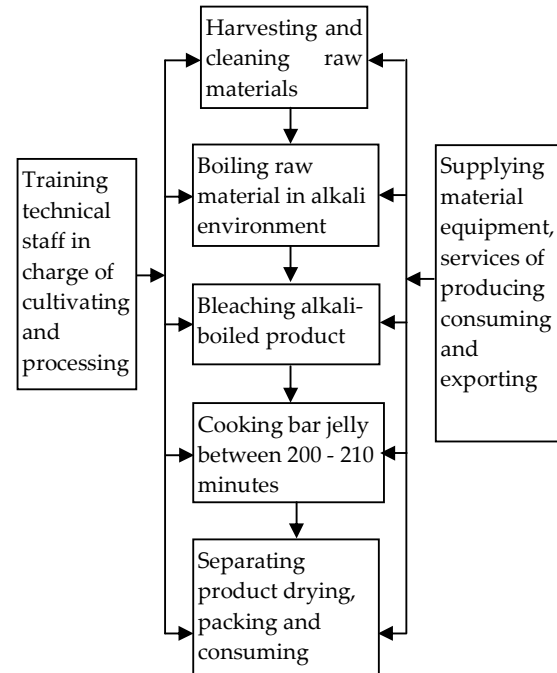


Fig. 2. Model of edible seaweed processing.

## 5. Effectiveness of economic models

### 5.1. Economic effects

- Models of seafood catching and fish-sauce processing promoted offshore seafood catching and raised yield of seafood from 6,000 tons per year up to 8,000 tons per year. Seafood catching can reach turnover between 600 millions VND per year and 1 billion VND per year. Meanwhile, the fish sauce processing can process from 2 to 5 millions liters per a year, the turnover of 20 to 50 millions VND per year, the average income per person from 1,000,000 to 1,500,000 VND per month.



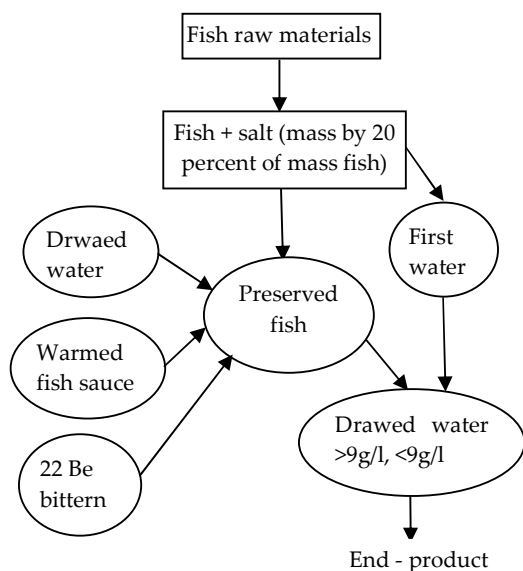


Fig. 3. Model fish sauce processing.

- The model of Aga production from edible seaweed materials have made high value consuming products, replacing Aga materials which is imported for food and medicine processing industry, and collected on foreign currency for the country.

- The model of producing cucumber and vegetable that has manufacturing factories

have processing capacity of 5,000 – 6,000 tons of casaba melon and 1,000 tons of canned vegetable with the turnover of 100-200 millions VND per year and the average income per person 850,000 –1,000,000 VND per month.

### 5.2. Social effects

- The organizing agro-fishery processing models have been exploited the advantages and economic strength of the coastal communes of Thai Thuy District, Thai Binh Province. Economic models have brought about a new turning-point within economic structure by shifting purely agricultural form to diversified and industrialized and high value goods structure. They helped to develop rural industrialization, create a great variety of employment, raise income for the unemployed and eliminate hunger and reduce poverty for the farmers.

- Developing spatial organization of high effective economic models have created new awareness, and goods and market understanding for inshore farmers of Thai Thuy District, Thai Binh Province.

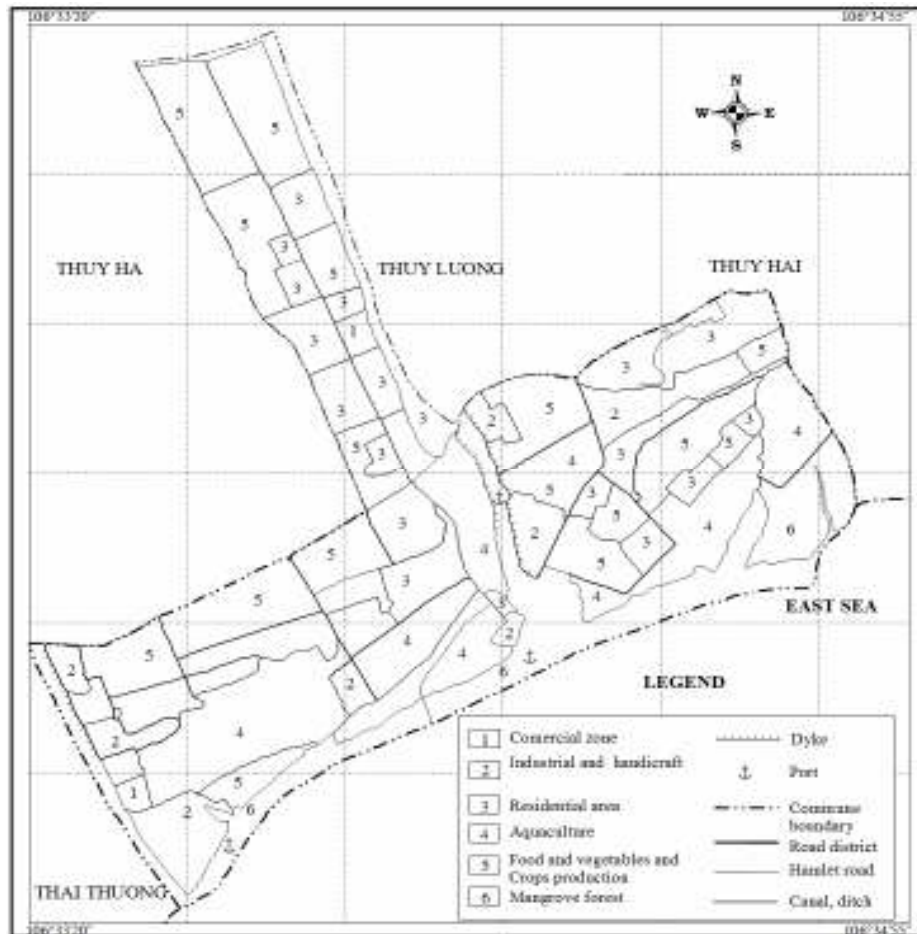


Fig. 4. Plan of spatial producing organization Diem Dien Town, Thai Thuy District, Thai Binh Province.

## 6. Conclusions

- The Diem Dien Town has great advantages of natural resources and economic growth. The most natural strength of this area is the geographic location of maritime transport, an flat alluvial ground, fertilized soil, diversified seafood resources which allow to set up and develop economic structures as Agro - Industry - Fisheries and high goods services.

- The most difficulty of the town is the irregular climate, a lot of storms, tropical low

pressure, surplus population, un-skilled labors, lack of investment, poor infrastructure, out of date technology and poor export outlets for agricultural and marine products.

- The producing status and economic structure have been already changed to market-oriented economy, but its economic structure is not really suitable. The production still bears pure agriculture, goods are not plentiful, and income of employee is low.

- Shifting economic structure by reducing food production, to growing vegetables,

cucumber and canned vegetable for the processing industry and exports, and by strengthening cultivating salty and brackish aquaculture, catching, seafood processing and maritime transport are suitable with objective conditions in the area and under the trend of the rural industrialization and raising income for farmers.

- The research of organizing economic models such as cucumber and vegetable processing, cultivating edible seaweed exporting, processing and shrimp fish hatching, seafood catching, processing industry of fish sauce, and so forth, will prove high economic effect, eliminate hunger and reduce poverty to farmers and help to carry out the rural industrialization and modernization.

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