

THE CHANGING TENDENCY OF LAND RESOURCES AND THE COUNTERMEASURES IN HAINAN PROVINCE IN 2000

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ABSTRACT: Hainan Province, with a land area of 34,170 km², is the largest economic district for external development in China. With the further deepening of reform and opening up, some new problems of land resource exploitation and use have arisen. The changing tendency of land use is estimated as follows: Land use in economic exploitation, city development and traffic will be increased rapidly; hydraulic construction will occupy a part of land; the use of wasteland is increasing; and the total farmland and per capital farmland will decrease continuously. In 2000, the occupied land should be controlled in 5 million mu (1 mu = 1/15 ha), in which farmland is 160,000 mu. The farmland should be maintained in 6.5 million mu. Some measures to implement the strategy and object of land use are put forward: enhancing land management and administration; executing land policy and making land management mechanism active; enhancing the efficiency of land use; and control the growth of population strictly.

KEY WORDS: land resources, land use, resource estimation, Hainan Province

I. THE ANALYSIS OF LAND ENVIRONMENT AND CONDITION

Hainan Island is the southeast province of China's territory. The Qiongzhou Strait is on the north of the island, and the east, south, and west sides of the island all face to the vast tropical ocean. The area of the island is 34,170 km², and making up about 0.35% of the total area of China and 42.5% of total tropical area of China. The sea area is 200 million km² and the length of coastline is 1,528 km. We can say that Hainan is a marine province with the smallest land area and the biggest sea area in China.

Hainan Island is located at 18° 10' - 20° 17' N, and 108° 36' - 111° 3' E. The

climatic characteristic of this island is high temperature and abundant rainfall. Its averagely annual temperature is between 22.7°C and 25.2°C, and its annual rainfall between 1,400 to 2,400 mm, the total of annual solar radiation between 4,768 to 6,173 MJ/m². There is no winter season but a long summer season (from April to October) in Hainan. The major disaster weathers are drought in spring, low temperature, typhoon, rainstorm, cold wind and dry wind. They often bring about abnormal water and heat, aggravation of soil and water loss, low utilization ratio of land and low economic benefit. The landform type is rather complicated in Hainan: medium and low mountains is 25.4%, hills and basins 13.4%, tableland 32.6%, terrace and plain 28.2%, and water body on the land 0.4%. There are 7 classes, 15 types, 30 subtypes, 193 sorts and 39 varieties of soils in Hainan Province. Among them the iron-aluminum class is the largest component and is 42.4% of the total area of soil in the province. Hainan is rather rich in water resources, and its annual runoff quantity is 29.7 billion m³. It means an average 5,380 m³ for one person being 88% higher comparing with the countrywide average. After exploitation, the water runoff can irrigate 15 million mu of farmland.

The population pressure is growing in Hainan. There were 6,557,400 people in 1990 census, being 1.85 times that of the year 1955. The population density was 193 people per square kilometer and the agricultural population made up 79.0% of the total.

Since the founding of special province, more than 40 economic and technical developing districts were created. They have an area about 300 km² and 280 investment construction projects (in capital of 5 billion yuan (RMB)).

II. THE CHARACTERISTICS AND PROBLEMS OF LAND EXPLOITATION AND USE

1. The Existing Situation of Exploitation and Use of Land Resources

There was 50,936,700 mu of land and per capita land area was 48 mu in 1950. There was 4,300,000 mu of cultivated land and per capita cultivated land was 17.4 mu in 1950. The exploitation of land resources has gone through three stages. The first stage was upsurge in wasteland reclamation from 1954 to 1966, and the rate of reclamation was 11.59%. The second stage was upsurge in breeding from 1970 to 1974, and the rate of cultivated land was 12.8%. The third stage was upsurge in exploitation from 1988 to 1990, the rate of exploitation was 16.05%. There had been 20,180,000 mu of exploited land by the end of 1990, and the cultivated rate was 39.61%. Based on the statistic of area of land use types in 1990, cultivated land was 24.8%, tropical rubber 14.7%, forest 34.4%, grazing land 3.0%, land for cities, towns, factories and mining 13.7%, transportation 0.9%, water body 3.8%, unuseage land 13.7%. The cultivated land is the leading property in land use and its area had increased up to 6,798,900 mu by 1978. But during 1978 to 1988 the occupied culti-

vated land had been more than the exploited land. The area of cultivated land was down to 6,470,000 mu in 1988 and about 30,000 mu of cultivated land decreased each year. In 1990 per capital cultivated land was only 0.98 mu, this has become a major restrict element of agricultural development. The reason to cause this problem is the non-agricultural construction and the regulation of property structure in agriculture itself have to occupy cultivated land.

2. The Fundamental Features of Exploitation of Land Resources

The land use structure remarkably changed. Before 1985 cultivated land in the percentage of land use was 31.6%, by 1990 it was down to 24.9%. The tropical rubber land had increased from 11.8% in 1955 to 14.8% in 1990. Land use in towns and cities, transportation, and irrigation works has increased since 1988, being 4.7%, 0.9%, and 3.8% respectively.

The way of land use is changing from extensive cultivation to intensive farming. The sunlight, heat, water and soil are getting rational use, the agricultural ecological system has been found, and the mode of multiple levels or multiple sorts of land use has been created.

The agricultural management is changing from monocultural and dispersive to comprehensive. Seven agricultural comprehensive experimental districts, and economic, technologic, estate, financial trade, and industrial districts have been established in five counties.

The land use in different regions is distinct. From the view of intensity of land use, productivity and distribution of land, the utilization ratio is decreased from the coastal plain, tableland, hills to the central mountain. The ratio of reclamation and cultivation in the north and the east is larger than that in the west and the south. From the view of structure of land use, rice and cash crops are major in the plain and the basin, the nonirrigated farmland agriculture is major in tableland, the tropical rubber is mainly in hills, and the forest is chiefly in mountain area. From the view of cultivated technology and mode, the coastal plain area is better than hill and mountain areas. The residential spots and industrial land use are concentrated in northern or coastal plains, and sparse in tableland, hills, and mountains.

The mode of land use is changing to market economy and export-oriented economy. Especially, the land commodity is the new distinguishing feature of land utilization in Hainan Province from now to the future.

3. The Major Problems in Exploitation of Land Resources

The land resources are not fully used. In 1990, multiple crop index is only 189%, the area of low and medium yield farmland is 200 million mu, the utilization ratio of forest field is only 47.4%, only 1,520,000 mu of pasture was made in use, the use ratio of water area for

fresh water aquiculture is 27.7%, and the use ratio of sea beach area for farming is 20%.

The population carrying capacity of cultivated land is being just critical state. In 1990, the per capital cultivated land is decreased down to 2/3 of country's level. With the economic exploitation and population growth in this special economic district, the problem of carrying capacity will become more rigorous in the coming years.

The land use is not coordinated and fitted well with water resources and irrigation works in geographical distribution. In the eastern and northern areas, cultivated land and gardens have a large percentage, and the climate is warm, water resources are rich and the water conservancy facilities are well. Contrary, in western and southern areas, the cultivated land and gardens are less, and the water resources are, the water conservancy facilities are worse and not complete.

The intensity of land exploitation is heavy, ecoenvironmental quality is deteriorated. Hainan Island began to be exploited and constructed since 1949. Because of a heavy intensity of land exploitation and ruining the forest to reclaim wasteland, there are the land are still leave 3,000,000 mu of land of extensive management, accounting for 15.2% of hills and mountains in the whole province. The prim forest has been over felled and the barrier effect of natural ecological system decreased severely. The area of soil erosion has reached 1,670,000 mu, making up 8.2% of the total area of barren mountain and wasteland. The urgent task is to manage the mountains, water courses, hillsides, and roads comprehensively.

There are quite a few problems in land use administration. The right of land owners is confused, land authorization, land transfer, land purchase and sale, land occupation and cultivation are less lawful which leads to farmland destruction and decrease.

III. ESTIMATION OF THE POTENTIALITY OF LAND USE

The estimate of land use in this province shows that: for farmland and wasteland suitable for farming, the first class land makes up 25.9% and 27.3%, the second 43.2% and 47.9%, the third 30.9% and 24.8% respectively; as for tropical rubber land and tropical wasteland suitable for rubber, the first 27.9% and 31.9%, the second 40.1% and 40.9%, the third 31.0% and 27.2% respectively; as for woodland and wasteland suitable for woods, the first 38.4% and 43.2%, the second 26.6% and 25.5%, the third 35.0% and 31.0% respectively; as for pastureland and wasteland suitable for stock raising, the first 10.4% and 7.8%, the second 43.3% and 37.1%, the third 46.3% and 55.1% respectively.

Except the first class land of the pastureland and wasteland suitable for stock raising has a small percentage, the first and second class land of the other kinds of land makes up more than 60%, especially that of the farmland and tropical rubber land over 70%. These high class lands are mostly distributed continuously. This is very favorable for comprehensive and extensive exploiting.

The per hectare yield of cultivated land is low, so there is a great potentiality to in-

crease yield. In 1990, the yields of grain, rice and oil crop are 201, 232 and 67 kg per mu respectively, being lower than those of national average. The yield of sugarcane is 28,500 kg per mu. According to the harvesting land area, the yield of dry rubber is only 55 kg per mu. This figure is very low in comparison with the highest yield in the same area, although Hainan has favorable climatic conditions. For the whole province, there are more than 10 million mu land which has a low utilization rate, the cultivated land with middle or low yield is about 2 million mu. So the potentiality of increasing yield is great.

The reserved land resources have a huge developing potential. The whole province has approximately 6.93 million mu of wasteland, making up 13.6% of the whole province land. Almost 90% of wasteland can be used as woodland, farmland, fish ponds or construction land. Only 1.4% of wasteland is difficult to be used under conditions of the current science and technology.

IV. THE CHANGING TENDENCY OF LAND USE

As Hainan is in the high tide of the deep reform, wide opening, extensive exploitation and rapid construction, the economic construction is rapidly developing and the population is greatly increasing. This must occupy some farmland, but the reserved farmland is much limited. It is surely necessary to control this occupation strictly. During the 7th Five-Year Plan period, non-agricultural construction had occupied farmland totally 50,000 mu. Compared to the 6th Five-Year Plan period, it is in decreasing as a result of the implementation of planned control of farmland occupation. Hence, in the coming 10 years, it is possible to control the occupied land by non-agricultural construction below 560,000 mu, in which farmland should be controlled less than 160,000 mu.

1. Land Use in Economic Exploitation, City Development and Traffic Will Be Increased Rapidly

With the rapid development of economy, continuous growth of population and accelerating industrialization, the increase of land use in economic development, urbanization and the traffic and hydraulic constructions must be above the national level, even surpass the coastal open cities and zones. After the 7th Five-Year Plan period, the economy and urbanization have rapidly developed. Three cities have been established. The urban population are 561,000. The cities and towns' inhabitants are 1,140,000, making up 17.9% of the total population of the province.

In 1995, there will be 11 cities and 222 towns, and urbanization level will reach 23%. In 2000, urbanization level will be 33%. In 1990, the industrial land was 233,400 mu. In 2000, the industrial land will be 339,000 mu. The increase rate is 4.54% per year.

In 1990, the traffic land was 470,000 mu. In 2000, the traffic land will be 640,000 mu.

The increase rate is 3% per year.

In 2000, The urbanized land, industrial land and traffic land will be totally about 3,460,000 mu.

2. Hydraulic Construction will Occupy a Part of Land

Hainan Island is topographically high in center and low in margin. This is disadvantage for the water conservation. Rain is mainly centralized in May—October, annual temperature is high and evaporation is great. Especially in the west area, northwest area and south coastal plain, rainfall is less than 1200 mm per year, There is a dry season in these areas. so the industry and agriculture are greatly affected by the lack of water. In order to raise land use efficiency and land productivity, a large amount of water should be supplied and a lot of hydraulic engineering should be constructed. In 2000, the construction will occupy land of 650,000 mu among which the farmland will be 20,000 mu.

3. the Use of Wasteland Is Increasing

As the various demands of land use increase, wasteland is a new exploiting land resource. Now the waste land which can be developed in Hainan is about 7.5 million mu, in which 580,000 mu is shallow sea beach. The wasteland, which has rich water and good relief, can be cultivated as farmland. The wasteland, which can prevent wind, cold wave and drought, can be used as rubber plantation. The wasteland with steep slope can be used as woodland. Dry land and tableland can be cultivated as pasture land. In 2000, 70% of wasteland can be used. It is about 5 million mu.

4. Total Farmland and per Capita Farmland will Decrease Continously

As has been noted, the new cultivated land will be in balance with the occupied land by the urban construction, public communications and hydraulic engineering. In regard to the direction of the market economy, a part of land will be converted to the land of higher efficient vegetable, wood and fruit. Thus, the farmland will be decreased. As the population increase, per capita farmland will be fall down greatly. In 2000, the population will be 8,100,000. The per capita land will be decreased from 7.65 mu in 1990 to 6.2 mu in 2000, and per capita farmland will be decreased from 0.98 mu in 1990 to 0.7 mu in 2000.

In conclusion, in 2000, the occupied land can be controlled in 5 million mu in which the farmland is 160,000 mu. The farmland can be maintained in 6.5 million mu. But we can not be optimistic. We must use the every inch-square piece of land carefully and effectively, conserve the farmland strictly and enhance the land management, This task is ver huge. It is necessary to take strong strategy countermeasure and steps.

V. THE STRATEGIES AND MEASURES OF LAND USE

1. The Strategy, Object and Policy of Land Use

1.1 Strategic Ideas

According to the general strategy of China's land use and the land use demands of Hainan special economic zone, from now to 2000, the general strategic ideals are: to use the open policy to improve the exploitation, to exert resource advantages, to enhance the basic functions, to improve the investment environment, to introduce the domestic and foreign funds, to develop the continuous plot of land energetically, to speed up the advance of science and technology, to adjust land use structure and enlarge the comprehensive cultivation, to take the advantage of the market economic policy and make the land management active, to combine the land exploitation with land reclamation, to make the spatial distribution reasonable and ensure the ecological balance.

1.2 Strategic Objects

According to the population prediction, in 2000, the natural growth of the population will be 142,000 per year, the mechanical increase will be 13,000 per year. The total population in Hainan will be 8,110,600, in which the city and town's population will be 2,101,500 and the rural population will be 6,009,100. The total amount of used land will be increased to 25 million mu by 2000 from 20 million mu in 1990. In 2000, the unused land will be decreased to 2 million mu from the 6.9 million mu in 1990.

The farmland should be maintained in 12.5 million mu to realize the self-sufficient in food grain. In order to adapt the tropical ecological environment, the fruit plantation should be increased, the tropical crop plantation will be increased to 8.2 million mu. In order to prevent the soil erosion and improve the ecological environment, the wood land will be increased to 20 million mu, the percentage of forest cover will be raised to 40%. In order to improve the people's living level, the pastureland should be increased properly.

As the urban population is increasing and the market economy is developing, the land demands for various constructions should be satisfied, especially the important constructions. The residential land, traffic land, hydraulic land will be increased totally to 3.46 million mu, but the occupation of the farmland must be controlled in 160,000 mu strictly.

In 2000, the additional farmland to be exploited will be 4.55 million mu, which is 8.9% of the total land the province and is 89.0% of the total additional exploited land. The additional construction land will be 567,000 mu, which is 1.1% of the total land and is 11.0% of the total additional land of the province. Depending on scientific and technology development, the unused land should be exploited actively, in consequence, the unused land area will decrease to 3.8% total land.

In 2020, land will be used efficiently and rationally. The population will be increased to 11.5 million, of which the city and town's inhabitants will be 40%–50%. Farmland will be

maintained in 12 million mu. The per capita farmland will be 0.69 mu. The construction land will be increased much more. The artificial pastureland and the tropical crop plantation will be obtained great achievements.

1.3 Basic Policies

In order to realize the general strategy and object of land use, we should implement China's basic policy of using the every inch-square piece of land carefully and rationally, and conserving the farmland strictly. Based on the tropical agriculture, a variety of land uses should be overall planned with due consideration for all concerned. According to the actual circumstances of the special economic zone and with the demands of the wide open policy, the farmland should be conserved strictly, the necessary construction land should be guaranteed, and the direction and the target should be clear and defined. With the optimization of the land use structure, the productive functions of various land use should be developed harmoniously. With the practice of land thrift, land uses should suit the productive forces. The way of suiting measures to local conditions, making the spatial distribution reasonable, enlarging the comprehensive cultivation and developing the continuous plot of land should be taken.

2. The Ways and Measures to Implement the Strategy and Object of Land Use

2.1 Enhancing the Land Management and Administration

According to the laws and regulations of land use formulated by the state and Hainan, approval macroscopic land control and microscopoc land readjustment should be enhanced. Land tenure and the land use right should be made sure. Land approval and management system should be taken seriously. The implementation of land use plan should be controlled by administrative supervision. The responsibility system of the land's objective management should be carried out. The functions of the land administration for managing the various kinds of land development as a whole in the whole province should be exerted. A macroscopic administration organization of the province should be established.

2.2 Executing the Land Policy and Making the Land Management Mechanism Activeing

First we should make a preferential land policy for the special economic zone, search for a new way for the development of the continuous plot of land to speed up the development of Hainan's economy, abandon the old model of the closed, limited and dispersed land management, establish the ideals for inhaling merchants and the flexible land management mechanisms. Then, under the market economy, we should draw more domestic and foreign investment, develop land on large scale and run it in various non-gratuitous forms, such as land rent, land contracting, land use right transference, etc. Finally we should make it as a important point to draw investors and to run large scale land use projects seriously, and we should make the land use at a higher level by planning.

2.3 Enhancing the Efficiency of Land Use

As the land use and readjustment is complicated and its construction period is long, a great deal of fund and material resources are needed. First of all, we should invest more fund and material resources to create a fund support system. There are many channels of collecting the funds for development and construction. The comprehensive exploitation and development of continuous plot of land is mainly targeted at drawing the foreign investors. Meanwhile, raising funds, investing and selling stocks and bonds, etc. should also face to the domestic society. The canals of the development of science and technology, the investment of science and intelligence should be enhanced.

2.4 Strict Controlling Population Growth

As the population is increasing gradually, the land area per person and the farmland per person are decreased continuously. It is predicted that this tendency is hardly to be reversed in a quite long time. The seriousness of contradiction between the human and land must be realized. With the practically efficient measures to control the population growth, in 2000, the total population in Hainan will be controlled in 8.11 million.