

# COORDINATING DEVELOPMENT OF AGRICULTURAL RESOURCES AND ENVIRONMENT OF THE TROPIC REGION IN YUNNAN PROVINCE

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**ABSTRACT:** The tropic region of Yunnan is a treasureable land with rich resources and great development potentials. The natural environment and resources of the region are characterized by a complicated topography, great height deviation, monsoon climate as well as abundant biological resources. Therefore, the tropic region becomes an ideal place for developing agricultural production base, though it does exist such problems as adverse location, sparsely distributed land resources, poor traffic conditions and deterioration of ecological environment. In order to further exploit the tropical resources and to implement comprehensive harnessing, we should take the following countermeasures: Working out a comprehensive development planning; restoring ecological environment; establishing agricultural production base; tapping fully water resources; constructing the traffic line and developing the border ports and tourism spots.

**KEY WORDS:** tropic region, coordinating development, Yunnan Province

## I. INTRODUCTION

The tropical region of Yunnan refers to the areas of northern tropic and southern sub-tropic climate types within Yunnan Province. It is composed of two parts named "major part" and "exclave part". The former which is distributed in 8 prefectures, 46 counties, is located at  $21^{\circ} 09' - 25^{\circ} 10' \text{ N}$  and  $97^{\circ} 39' - 101^{\circ} 12' \text{ E}$ . Taking Ailao Mountain as a division line, east to the line, the mean elevation of the part is below 1100-1300 meters, west to the line, the elevation is below 1500 meters. The "exclave part" which is scattered in 8 prefectures, 30 counties, stretches northwards  $27^{\circ} \text{ N}$ , and the elevation is below

1100–1300 meters.

The total land area of the tropic region is 78,000 km<sup>2</sup>, accounting for 20% of the province's total land. Among it, the land area which belongs to the northern tropic climate type is 8,200 km<sup>2</sup>, making up 10.5% of the tropic land area, while the land area which belongs to the southern sub-tropic climate type is 69,800 km<sup>2</sup>, which is 89.5% of the total tropic land area. To the east and north, the tropic region is contiguous to Zhuang Autonomous Region of Guangxi and Sichuan Province, and to the south it borders on Viet Nam, Laos, to the southwest and to the west it adjoins Burma. There are 19 minority nationalities, with population of 9,868,700, amounting to 27.7% of the province's total. The population density is 64 persons per square kilometer, fewer than that of whole country's and the province's average. The tropic region is a treasurable land with rich resources and great development potentials.

## **II. FEATURES OF AGRICULTURAL RESOURCES OF THE TROPIC REGION IN YUNNAN PROVINCE**

### **1. Complicated Topography and Great Height Deviation**

The terrain of Yunnan tropic region slopes from northwest to southeast, the average height is over 1000 meters, elevation of big valleys is about 800 meters, while elevation of low reach of valleys is decreased to 300–500 meters. The eastern part of the tropic region belongs to the transition zone between East Yunnan plateau and Honghe River alluvial plain, with gentle undulation of topography. In the part, well developed valley hills and the Karst landforms are widely distributed. The west of tropic region is a spreading zone of Meigong broom-like mountain-system, and its river system appears radiation pattern of distribution. From west to east the extending range of Gaoligong Mountain, Nu River, Laobie Mountain, Amu River, Ailao Mountain and Yuan River are parallelly distributed. Also dispersed are many wide valley basins and mid-mountain gorges.

There are different terrain types of mountains, basins, razed plateaus and valleys in the tropic region. The height deviation of mountains and valleys is great, and the average height margin is over 600–800 meters. In mid-mountain gorge area, the figure is amount to over 1000–2000 meters. In terms of area, mountain is the largest landform in the tropic region, e.g. in Xishuangbanna, the mountain land accounts for 95% of the prefecture's total land, and in Lincang Prefecture, mountain area makes up 97.5% of the prefecture's total. In the mountainous regions also are scattered various valleys(named "Bazi"). The number of "Bazi" which has area of over 666.7 ha. is 45, and that of over 666.7 ha. is 23, that of over 10,000 ha. is 13. This presents a land resource distribution pattern of great majority of

mountain sand widely scattered basins.

## **2. Marginal, Seasonal, Continental and Non-Regional Climate**

Climate in the tropic region has marginal, continental and non-regional characteristics owing to geographic location and special terrain. The major part of the tropic region has a high mountainous defence preventing cold air flow from the north, thus alleviating the unfavorable effects of cold wave disaster for tropic crops. From the south, a warm-wet air flow of Beibu Gulf and Bangladesh Gulf drives straight into the hinterland along the eastern and western valleys, developing a warm-leading great environment for the region. Added with vertical-zone climate, the tropic region, therefore, has a favorable conditions of cultivating tropic and subtropic crops according to different elevations. The Ailao mountain divides the tropic region into two different tropic sub-regions in terms of different monsoon influence in summer and of different cold air flow influence from the north. The complexity and variation of topography construct various types of local-scale climate. Climate resources in the tropic region are characterized by rich sunlight and uneven areal distribution, i.e. sunlight in the western part is rich than that in the eastern one. It represents high temperature and dry in the same season, which is helpful to growth of tropic crops as well as their growing during the winter. Heat allocation is horizontally complicated and is remarkably identified in terms of vertical zones. Precipitation in the region is fair but is uneven within a year. According to regional difference of precipitation, it has more rain in southern part than in northern one. In an average year, mean wind speed is relatively small, but occasionally there is windstorm disaster. Besides, in mountain areas of western part of the tropic region, the inversion layer frequently evolves in winter, which is a treasurable climate resource. According to the criterion for dry degree of the whole country's climate regionalization, the dry degree in Yunnan tropic region is generally between 0.5-2.8, i.e. between wet and semi-arid extent. It has, therefore, an identification of wet tropic region, semi-wet tropic region and semi-arid tropic region. Relatively wet regions are counties of Jiangcheng, Hekou, Lancang, Zhenkang etc., and such semi-arid and relatively dry regions as Yuanmou, Nanjian, Qiaojia has dry degree of over 2.0.

## **3. Rich Biological Resources, Treasurable Animal and Plant Varieties and High Biological Productivity**

Yunnan is known as "plant kingdom" and "animal kingdom". In the tropic region are concentrated the varieties of animals and plants. According to surveys, there are about 8000 higher plants, among them there are 5000 in Xishuangbanna. The number of peculiar varieties, rare varieties, heredity varieties, wild cultural plants and its close relative varieties are more than 340. There are 51 treasurable, rare, and in-danger plants which have been listed

in the first group of the stress protection varieties of China. The number of varieties which have various economic values are over 1000.

Xishuangbanna is a central distribution zone of China in terms of South Asia Peninsular tropic animals, it is also an important base of tropic animal resources of China. The number of terrestrial vertebrates and amphibious animals are over 580. These animals have more varieties, less number and high economic value. This region also has the biggest number of insects of the country. In the natural protection region, e.g. there are over 1300 varieties of insects.

#### **4. Great Potentials of Resource Development and Stable Base of Agricultural Production**

As for agricultural resource development, Yunnan tropic region has basically formed a certain production scale. At present, it has over 1 million ha. of arable land thus forming a optimal base for grain production. Main tropic and subtropic cash crops are 3-leaf rubber, coffee, sugarcane, tea, tropic fruits, medicinal materials and perfume.

The area of 3-leaf rubber is over 367,000 ha with 60,000 yearly output of dry rubber slices, and the average output per ha is more than 1,200 kilograms in terms of the area of going into operation, thus forming the second rubber production base of China. In Xishuangbanna, there are 16,667 ha rubber plantation, the average output is over 1,500 kilograms per ha, ranking advanced level in the world. The planting area of coffee is up to 4,667 ha, and its mean output per ha is about 1,350 kilograms. The Yunnan high-quality small-grain coffee now has been traded in the international markets. The planting area of sugarcane is over 120,000 ha, and there are 75 organic sugar factories which produce more than 700,000 t per year. Planting area of tea is over 160,000 ha, its yearly output is over 40,000 t. Other major tropic fruits as banana, pineapple, mango and orange have their total planting area of over 30,000 ha, with yearly output of 90,000 t. Planting area of medicinal herbs is 6,667 ha, with yearly output of 500,000 kilograms. Planting of herbaceous and woody perfume has formed a preliminary production scale. Wild perfume resources are also well exploited, and perfume has become major exporting product of the region. New industries and their products have played an important role in the economic development of the whole province through exploitation of agricultural resources in the tropic region. The exploitation quantity and exploitation rate is, however, rather small and exploitation potentials are great in respects of both width and depth. Among the arable land, paddy field accounts for 37.3%, dry land 62.7%, and among the dry land, fallow land makes up 39.8%. According to soil surveys, the land with high and stable yield is only about 20% of the total arable land, and land with mid- to- low output accounts for 80% of the total. Besides, there are still large amount of uncultivated hill-land suitable for forest and animal husbandry.

Other resources available for tapping are low-output forest, low-output water body and water body having not been used for exploitation.

### **III. THE RESTRICTS AND PROBLEMS FOR TROPIC-REGION'S DEVELOPMENT**

Yunnan tropic region has rich natural resources, complicated environment, favorable conditions and great exploitation potentials, which are suitable for planting various tropic crops. However, owing to disadvantageous traffic condition and border-area geographic location as well as relative backward social-economic-technical level, resource development at present is restricted by some unfavorable conditions and remains some problems.

#### **1. Unfavorable Location, Short History of Exploitation and Uneven Development of Economy and Civilization**

Yunnan tropic region is located at southwest corner of China. In mountainous areas, some minority nationalities are still living on shifted cultivation. Some regions remain certain area of slash-and-burn cultivation. Even in the basins where relatively advanced minority nationalities live, because of poor water conservancy facilities, irrational use of agricultural fields and extensive planting, agricultural production level is low. Economy, science technology and civilization in these places are not yet well developed, and their economic development is still in the transition phase from natural economy to commodity one.

#### **2. Sparsely Distributed Land Resource Unfavorable to the Large-Scale Development and Management**

Yunnan tropic region mainly lies in 6 big river basins, and mountains interlock with valleys. Area of mountain land is large than that of plain and land is cut into small plots. The land of whole province's tropic region is dispersed in 76 counties or cities of 16 prefectures, and limited in basin valleys and the edges of the basins with different scales, which leads great difficulties in organizing large-scale development and implementing infrastructure construction and modernized management.

#### **3. Poor Traffic Conditions and Energy Resource Shortage**

The prefectures in the main tropic region of Xishuangbanna, Dehong, Lincang and Simao are all in the border areas, traffic and information accessibility are very poor, some counties or cities are located as far as 1000 kilometers from Kunming without any railway or waterway available. All the transportation of goods and persons depends on highway.

Being lack of advanced highway construction, the production base of agricultural products cannot be accessible because of disadvantageous weather conditions.

Water energy resource in the region is extremely rich, but its exploitation level is low. Most of the tropic region is short of coal resource, requiring import from far distance. In many rural areas and some towns, due to lack of energy, production and modern life are all depend on cutting wood for energy use, bringing about a quick reduce of area of forest land.

#### **4. Deterioration of Ecological Environment and Frequent Occurrence of Natural Disaster**

Over accelerating population growth and irrational exploitation of natural resources lead to a quick reduce of forest area, and percentage of forest cover is also decreased. With the destroy of some part of tropic rain forest and monsoon evergreen broad-leaf forest, natural vegetation began to evolve in inverse direction, gradually has developed shrub grassland—high grassland—low grassland, some become arid sparse—woods grassland and even uncovered land. In some area, climate varies, such disasters as arid, flood, insect pests, poisonous—grass harm, loss of water, erosion of soil, landslide and mud—rock flow occur frequently.

#### **5. Irrational Resource Management and Exploitation as well as Serious Wastefulness of Resources and Low Multi-Use Rate of Resource.**

### **IV. COUNTERMEASURES FOR DEVELOPMENT**

According to present utilization of the tropic resources and existing problems, we should combine exploitation with harnessing, promote development through opening to the outside world for the future development in terms of variation of tropic resources and deterioration of environment, and implement comprehensive development and harnessing.

The main countermeasures are as follows:

1. On the basis of the agricultural resource survey and the agricultural regionalization, working out comprehensive development planning in terms of different administrative levels and different areal types, and performing well the fundamental work of pre-development according to scientific decision program before implementing them step by step.

2. Regarding the mountain area and the valley basin as a complex system, restoring ecological defence with the fundamental work of setting up 8 natural protection zones (to-

tal area is 4,670,000 ha of primeval forest), proceeding forest restoration and forest protection in a planned way, increasing forest cover rate and combining biological measures and engineering ones. In order to make water-soil conservancy and control of mud-rock flow disaster and to gradually prevent deterioration of ecological environment, the ecological defence in the tropic region should be restored and reconstructed.

3. Constructing the agricultural fields with high and stable yields, reforming mid-low yield land, Changing primitive cultural mode into modern one, raising comprehensive agricultural productivity, setting up agricultural products base in the tropic region and developing exporting and exchange-earning agriculture.

4. Through construction of large-to-middle projects, fully tapping water power resource, exploiting various energy resources by multi-means.

5. Developing and constructing traffic lines of air, land, and water in a planned manner, changing backward face of traffic conditions.

6. Speeding up construction of infrastructure of border ports and of tourism spots, carrying out the policy of opening to the outside world, developing the frontier trade and tourism characterized by tropics' and minority nationalities' styles, stably coordinating the primary, secondary and tertiary industries in the rural countryside, vigorously developing rural economy in the tropic regions.

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