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The distribution and cost-benefit analysis of eucommia planting

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ABSTRACT

The profile of Eucommia planting distribution was introduced in this paper, a cost-benefit for the object field Eucommia planting of Hunan analyzed, concluded that the planting is a relatively long process cycle, the fifth year it became profitable, from the seventh year, the amount of profit of Eucommia per hectare was basically stable at around 19,400 yuan / year, if Eucommia products are deeply processing, and then recycling, the amount of profit will be higher.

KEYWORDS

Eucommia planting; Cost; benefit; Input-output analysis.



INTRODUCTION

Eucommia ulmoides is the endemic economic species of China, which is a treasure, not only precious Chinese medicine resources and the most important national strategic resources, but also providing high-quality wood and increasing carbon sequestration, improving the ecological environment. We can use the active ingredient of *Eucommia ulmoides* to produce a variety of biological healthy and pharmaceutical products. *Eucommia* rubber extracted from *Eucommia* fruits, leaves, barks will become a serious lack of resources to substitute for natural rubber. Due to its unique functions, it becomes more and more important. At present, China gutta is approximately 350,000 hectares, accounting for over 95% of the world total *Eucommia* resources. In recent years, with the further development of the resource of *Eucommia* rubber, gutta cultivation area will be greatly increased, and the industrial prospects of the gutta resources is very broad. Currently, the researches focusing on cultivation techniques, breeding in China, *Eucommia* planting and input-output analyzes are still blank. Gutta planting and input-output benefit will be analyzed from economics perspective to lay the theoretical foundation for the study of gutta industry chain.

GUTTA PLANTING REGIONAL DISTRIBUTION AND CONCENTRATION

At present, China gutta of approximately 350,000 hectares, accounting for over 95% of the world total *Eucommia* resources, which is mainly widely distributed in 27 provinces of the subtropical and temperate regions. Many domestic regions are successfully introduced, indicating that *Eucommia* has strong ecological adaptability^[1].

Eucommia cultivation followed by the size: Shanxi (54,600 hectares), Sichuan (38,000 hectares), Henan (33,900 hectares), Hunan (33,600 hectares), Hubei (33,300 hectares), Chongqing (28,000 ha) Guizhou (26,100 hectares), Shandong (20,000 hectares), Gansu (16,700 hectares), Jiangsu (15,000 hectares), Shanxi province (12,000 ha). Among them, Shanxi Province, an area of 54,600 hectares of existing *Eucommia*, 15% of the total area; *Eucommia* area of 38,000 hectares in Sichuan, 11% of the total area; Henan, Hunan, Hubei *Eucommia* area of 33,900 hectares, 3.36 million hectares, 33,300 hectares, were 9% of the total area; Chongqing, Guizhou, Shandong, Gansu, Jiangsu, Shanxi province total *Eucommia* area of 117,800 hectares, accounting for 33% of the country *eucommia* area. It is 311,200 hectares of *Eucommia* cultivated areas in above 11 provinces, accounting for about 87 percent of the total cultivated area in the country gutta (Figure 1).

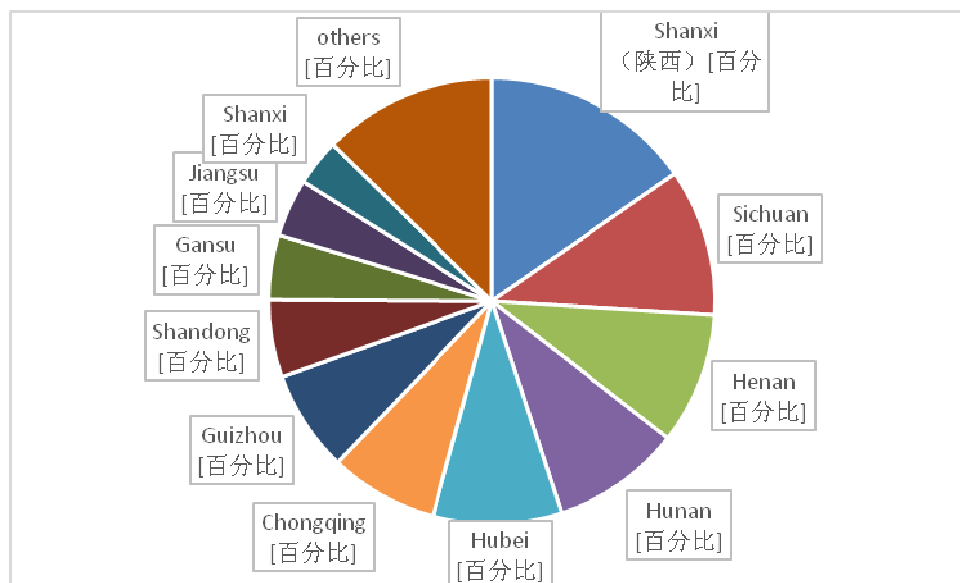


Figure 1 : Gutta planting area map; Note: Data from the “Report on development of China's *Eucommia* rubber resources and industry (2013)”

The gutta planted is widely distributed, mainly concentrated in 11 provinces shown in Figure 1, which is made decision of local ecological environment and people's cultivation of habits. In addition, our gutta products processing enterprises are mostly concentrated in the raw material bases.

INPUT-OUTPUT ANALYSIS OF EUCOMMIA PLANTING

Eucommia planting investment analysis

In this paper, input-output analysis from the perspective of economic efficiency gutta planted, costs of production (as material costs) were reflected. Taking into account the input-output relations and technological progress, scientific and technological progress of *Eucommia* planted can be preliminarily analyzed.

Eucommia production is based on the realization of the investment, which form the cost of production inputs. In the statistical calculations of costs and benefits of agricultural products, the production costs of agricultural products is usually divided into two parts, one is the cost of various inputs substance called cost; the second is the cost of living labor invested mainly called Intangible costs. Including the use of working price, period expenses, taxes and costs. Material costs mainly reflects the pre-industrial sector investment^[2].

A company in Cili County of Hunan is based to illustrate the input-output of gutta industry. Cili County is located in the northwest of Zhangjiajie city, located in the eastern edge of the Wuling mountain. Terrain northwest, southeast, diverse landforms, with mountains, based, 64% of the total area. The company is based in the south-mountain steep, usually around 10-20 °, northwest of steep mountains, more cliffs, mostly in the 30 slope above. The Forest area of 100 hectares, mainly limestone, soil with limestone soil, yellow soil based. Subtropical humid monsoon climate, with an average temperature of 16.7 °C, annual rainfall of 1383 mm, 270 frost-free days. Before planting base due to lack of management for many years, overgrown with weeds. Moreover, because of no effective protection of good soil tillage layer, the surface soil is poor and low organic content, the lack of fertility. Soil improvement of pre-planted increases input costs.

Current input costs of Eucommia planted includes rent fee, seedlings, planting cost, daily management fees. The total investment in the first year is 11,750 yuan / ha (TABLE 1), and the investment cost of 100 hectares totally 1.175 million yuan.

TABLE 1 : Budget table of Gutta planted (1st year)

Content	Requirements	Unit	Quantity	Unit Price (yuan)	Cost (yuan)
Rent	Rent fees	yuan / ha	1	750	750
seedling	Seedling fees	yuan / ha	1100	1	1100
planting	Planting costs	yuan / ha	1100	4	4400
Daily management	Daily fees	yuan / ha	1	5500	5500

Eucommia total investment of 100 hectares in the first year 1.175 million yuan

Eucommia input cost mainly includes rent and daily expenses in the second year and the third year, because of the relatively small gutta seedling, input costs of 5250 yuan / ha / year, investment cost of 100 hectares of 525,000 yuan (TABLE 2) per year.

TABLE 2 : The budget of table of gutta planted in the 2nd,3rd (per year)

Content	Requirements	Unit	Quantity	Unit Price (yuan)	Cost (yuan)
Rent	Rent fees	yuan / ha	1	750	750
Daily management	Daily fees	yuan / ha	1	4500	4500
Eucommia total investment of 100 hectares				525,000yuan	

In the 4th, 5th, 6th year, Eucommia input content of per year the same as the 2nd and 3rd years, due to the gutta seedlings becoming larger than the previous two years, you can make gutta fruit and leaf collection. The 4th annual input costs of 6750 yuan / ha / year (TABLE 3), and increasing the collection fee 1500 yuan / ha / year in the 5th and 6th years, corresponding input costs increased to 8250 yuan / ha / year. From the 4th to 6th year, annual investment costs of 100 hectares are 675,000yuan, 825,000 yuan, 825,000 yuan.

TABLE 3 : The budget of table of gutta planted in the 4th year (per year)

Content	Requirements	Unit	Quantity	Unit Price (yuan)	Cost (yuan)
Rent	Rent fees	yuan / ha	1	750	750
Daily management	Daily fees	yuan / ha	1	4500	4500
Collection fees	Collection fees	yuan / ha	1	1500	1500
Eucommia total investment of 100 hectares				675,000yuan	

From the 7th year, daily management, fruit collection fees, leaf picking costs are 9000 yuan, 9000 yuan, 10,500 yuan, 10,500 yuan, 12,000 yuan, plusing the annual rent cost, the input costs are 9750 yuan / ha / year, 9750 yuan / ha / year, 11,250 yuan / ha / year, 11,250 yuan / ha / year, 12,750 yuan / ha / year. The annual investment costs of 100 hectares are 975,000 yuan, 975,000 yuan, 1.05 million, 1.05 million yuan, 1.2 million yuan.

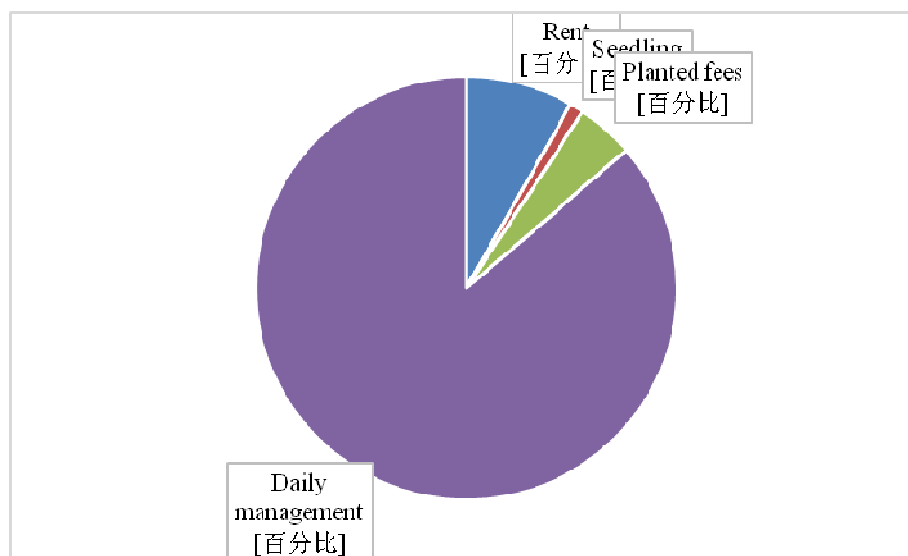


Figure 2 : Gutta planted costs

Above all, the costs of *Eucommia* planted are gradual increasing and become stable after the first drop. For the 1st year to the 11th year, the cost of synthesis can be indicated that input costs mainly consist of planting costs, daily management fees, collection costs, namely the proportion of labor costs up to 91%(Figure 2). It is concluded that gutta industry is a labor-intensive planted industry and labor efficiency can be improved through promoting techniques. Occupying a certain proportion of the cost of seedlings, gutta seedling research and construction needs to be strengthened.

Output and profitability analysis of gutta planted

Eucommia primary outputs include fruit planted production and leaf yield. Due to gutta skins traditionally taken for medicines, relatively long growth cycle of *Eucommia* and generally 15-20 years bark being used, with the rise of *Eucommia* and rubber resources, the use of *Eucommia* leaf fruit has been sufficient attention. From the TABLE 4, the gutta planted, from the beginning of the first five years to bear fruit, but the yield is relatively low. In the 7th year, gutta planted fruit and leaf yield are 120 kg, 5270 kg per hectare, the total output value of 19,411 yuan per hectare. Gutta grown from 7 onwards, enters the high yield per hectare of GDP stabilized at 19,000 yuan from 7th years. TABLE 4 *Eucommia* fruit yield in accordance with the current market price of 30 yuan of per kilogram, *Eucommia* leaf 3 yuan according to the current market price of per kg.

As being seen from TABLE 5, gutta planted is a relatively long process cycle. In the first four years, investment is deficit, the 5th year beginning a profit. on the analysis of each year, and in the 7th year *Eucommia* amount of profit per hectare basically is stable at around 19,400 yuan / year, if gutta products being deep processed, and then being recycled, the amount of profit will be higher. If being used gutta deep processing and recycling, such as the use of *Eucommia* leaves, take Shanxi Changlin *Eucommia* Company for a model, which can be taken a two-stage development, first *Eucommia* leaf extracted for medicinal ingredients and health components, and then leaf residue extracted gutta percha or functional feed to reduce the gutta percha extraction costs and increase farmers' net income.

TABLE 4 output table of *Eucommia* primary product (1-11 years) Unit: yuan (kg) / ha

years	Fruit production	leaf yield	fruit output	Leave output	GDP
1	0	780.50	0	2341.5	2341.5
2	0	910.00	0	2730	2730
3	0	2750.04	0	8250.12	8250.12
4	0	3489.05	0	10467.15	10467.15
5	75.10	4400.00	2253	13200	15453
6	86.05	4450.05	2581.5	13350.15	15931.65
7	120.03	5270.06	3600.9	15810.18	19411.08
8	102.00	5280.05	3060	15840.15	18900.15
9	125.04	5230.08	3751.2	15690.24	19441.44
10	120.05	5502.03	3601.5	16506.09	20107.59
11	130.01	5340.05	3900.3	16020.15	19920.45

TABLE 5 : Input-output analysis of gutta planted (1-11 years) Unit: million / ha

year	inputs / million	output / million	total investment / million	cumulative output / million	profit/ million
1	1.18	0.23	1.18	0.23	-0.95
2	0.53	0.27	1.70	0.5	-1.20
3	0.53	0.83	2.23	1.33	-0.90
4	0.68	1.05	2.90	2.38	-0.52
5	0.83	1.55	3.73	3.93	0.21
6	0.83	1.59	4.55	5.52	0.97
7	0.98	1.94	5.53	7.46	1.94
8	0.98	1.89	6.50	9.35	2.85
9	1.05	1.94	7.55	11.29	3.74
10	1.05	2.01	8.60	13.3	4.70
11	1.20	1.99	9.80	15.29	5.49

CONCLUSIONS AND IMPLICATIONS

This paper is based on common gutta species (non-breeding) and traditional medicinal cultivation mode. Seedlings are the most basic and important means of production, as carriers of a number of technical measures to produce benefits, according to statistics, China's output of gutta breeding per unit area is more than the non-breeding 2-3 times^[1]. Because of China's economic system and historical change, our gutta industry has not been attached great importance, resulting in unsustainable work, especially after 1998, most of the research institutes and technology promotion units have interrupted gutta experimental research and extension work, breeding resources destroyed and irreparable damage caused. The status is still relatively small species, the national seed greening rate of less than 5%. Currently, the research of gutta breeding industry are mainly carried out by Forestry Research Institute of Forest Research universities represented by Chinese Academy of Forestry, but few companies are involved in research and breeding sectors. Research funding comes majorly from the investment of national science and technology, so that these technological achievements conversion rate is not high. The lack of seed and the promotion causes poor yields and low planting efficiency.

As China's rubber market supply and demand intensified and better understanding of Chinese medicine products, gutta products market is gradually becoming warmer, especially in the main producing areas gutta Shanxi, Hunan, Hubei, Henan and other provinces establishing a number of *Eucommia* field bases. In future, it is inevitable that gutta production will be developed in the direction of breeding.

In recent years, Du hongyan team of Economic Forest Research Centre in Chinese Academy of Forest has developed a variety of orchard cultivation, leaf *Eucommia* Park patterns of substantial increase in economic efficiency, while gutta fruit orchard cultivation mode is more 40 times than traditional medicinal mode.^[1] Orchard cultivation mode of gutta natural rubber resources for training and best utilization of cultivation mode, is our main way of the future gutta cultivation.

In summary, combination of breeding and orchard cultivation modes of gutta planting industry will bring out that future economic benefits of gutta will be greatly increased.

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