

A Preliminary Study on Indicator System of Natural Rubber Security in China

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Abstract: Natural rubber, a kind of world bulk industrial raw material and one of the four important industrial raw materials, is scarce, deficient and strategic resource indispensable for national defense and industrial construction. Recent international gross demand for natural rubber has been steadily rising; international export resource of natural rubber has been decreasing annually. This paper analyses the status of output, consumption and import of china's natural rubber in the world market, and the relationship between domestic supply and consumption. On the basis of aforementioned, the paper mainly explores the definition of the indicator system of natural rubber security, and discusses the methods to calculate the security indicators, furthermore to discuss the criteria of the security indicators.

Key words: security of natural rubber; indicator system; national strategic countermeasures.

1. General Background

Based on our analysis of the relevant data of International Rubber Study Group (IRSG) and Food and Agriculture Organization (FAO), the consumption of natural rubber (N.R.) in China has increased continuously from 1981 to 2004. The average annual growth rate was up to 8.32%, while at the same period, the growth rate of natural rubber product has been only 7.14%, the growth rate of gap between consumption and product has been 9.92%, and the growth rate of import proved to be 10.37%, in addition, the basic quantity of consumption is larger than the product, all these factors caused the increasing gap, the import dependent degree is outstanding clearer.

The share of consumption of natural rubber in China accounted to world market has raised from 7.43% in 1981 to 19.56% in 2004, the growth range has reached as high as 163.26%; The product share of natural rubber to the world was 3.40% in 1981 up to 6.68% in 2005, which has increased 96.47%; The import share in the world has increased from 6.80% in 1981 to 20.63% in 2005, the percent of growth is up to 208.83%. At the same time, the price of natural rubber in China raised from RMB 5923 Yuan/ton in 1981 to the current RMB 22000 Yuan/ ton, increased 371.43%; Self-sufficient rate of natural rubber in China has fell from 46.44% in 1981 to about 25% in 2005, descending about 85.76%.

At the same time, the world leading production nations and consuming nations of natural rubber has intensified their efforts to control rubber resource, and attempts to dominate the whole world natural rubber market by using their rubber resources. For example, Thailand, Indonesia and Malaysia , whose output of natural rubber share 69% of the whole world natural rubber, have vigorously propelled rubber industrialization and restricted export of raw materials of natural rubber. Malaysia has changed from mass producer and consumer of N.R. to present import nation; Thailand has promoted its domestic consumption of N.R accounted for its gross output from 10% to present 30%; India has also dropped the subsidy to prompt its export to 50%, and strengthened limitation of rubber export; Sri Lanka has energetically developed tyre industry, therefore has no

longer exported its N.R. Along with producer's increasingly control their production and sale, monopoly organization of international rubber price will be engendered. Many rubber consuming countries have initiated to control resource, and initiatively invest and set up factories at the place producing NR. Japanese, Malaysia, Vietnam, France, Singapore, Australia and India have invested in primary nations to produce rubbers, and occupied abroad natural rubber resource as much as possible, Japanese government could even provide subsidy as loans to enterprises^[1].

According to the forecast of international rubber research organization, during the coming 10~15 years, the consumption of china's natural rubber will reach 3,000,000 ton to 4,000,000 ton accounted for 1/4~1/3 of the total consumption of world natural rubber. Besides it is difficult to get larger breakthrough on production and producing scale, while consumption has been increasing more and more quickly, which aggrandizes austerity of security problems of natural rubber. Therefore, it is important to scientifically recognize security status of domestic natural rubber and arduousness to achieve safety objective and task of natural rubber, and take strategic measures appropriate to the national circumstance.

2. Relevant meaning of security of natural rubber

Research on security problems of natural rubber is almost blank at present. Whether academic or industrial domain does not pay sufficient attention to security problems of china's natural rubber, what's more, we could find no problems propounded in related literature and information. We think that security of natural rubber is a nation's ability to meet the demand for natural rubber and withstand all sorts of possible eventualities; its decisive factors are capacity and level of production and consumption of natural rubber, and ties up with national economic development and status of foreign trade^[3]. For a nation, security of natural rubber means security of production of natural rubber, security of circulation of natural rubber and security of consumption of natural rubber. Based on the viewpoint, basic meaning about security of natural rubber should include two aspect of contend as following: the first is self-sufficient ability of production, import ability and reserved ability etc of natural rubber; the second is capacity and level of consumption of natural rubber^[4].

3. Influencing factors

3.1 Main factors affecting the production of natural rubber and their developed trend

Natural rubber industry is a typically resource-restricted industry. Besides of effect of overall macro-economy, production of natural rubber is principally influenced by following factors: land resource fit for rubber, natural factors, scientific advance factors, production of substitute, and other socio-economic factors and so on.^[5]

3.2 Main factors affecting our consumption of natural rubber and their developing trend

Besides effect of macro-economy, consumption of natural rubber is also influenced by following principal factors: economic development, product structure, crude oil price, advance of synthetic technology, income level and consume preference of relevant industry.

3.3 Import and export developed trend of natural rubber and their impact on security of natural rubber

Whether at present or in the future, it is hard to keep elementary balance between domestic and

foreign supply and demand for natural rubber, which decides that our natural rubber can only rely on import to meet demand. If we largely depend on import, it will arouse international market price of natural rubber significantly increases. If so, it will make the national security of natural rubber completely constrained by international market, which is not benefit for national economic security and economic development. If China is able to initiate to control import of natural rubber at a reasonable level, and have enough reservation of natural rubber to deal with eventualities, import will not exert great influence on national security of natural rubber. China should adopt cautious and positive attitude for the reasonable degree of import and export of natural rubber, because exorbitant dependence on foreign trade means high risk; if we control dependence degree on foreign trade within a sound level, initiate to seize opportunity and organize import at a seemly time and quantity, which probably means win-win.

4. Characters

Natural rubber is different from foodstuff and cotton etc; it has four characters as following:

- price elasticity of supply and demand of natural rubber is very small. According to measure and calculate relevant data from 1981 to 2004, we observe that price elasticity of supply of natural rubber is merely 0.1123, that is to say, lacks of elasticity; and price elasticity of demand of natural rubber is -0.078691, almost zero elasticity.
- Output period of natural rubber is long and its risk is high. Output period is at least 6~7 years, its production period is more than 30 years, and besides, its growth and harvest is considerably affected by natural factors such as weather.
- Policy of natural rubber has “lag” effect. Policy change on production of natural rubber has serious “lag” effect, often produces corresponding effect after several years.
- Natural rubber has “enlarge” effect. The fluctuation of natural rubber will lead to changes in related areas such as industry, agriculture, national defense, transportation, medicine and sanitation and daily life.
- land resource fit for planting rubber is extraordinarily limited. Finite land resource could not increase output of rubber at great extend due to change of price or policy.

5. Indicator system

On the basis of understanding of security of natural rubber, analysis of its effected factors and characters, we consider that measuring whether a nation’s natural rubber is safe or not should be based on security coefficient of stock of natural rubber, on the basis of which, should also take self-sufficient rate of natural rubber, coefficient about natural rubber depending on foreign trade and increased coefficient of consumption of natural rubber into account.

5.1 Security coefficient of natural rubber

Stock amount of natural rubber is a vital indicator to measure whether a nation’s natural rubber is safe or not. Generally use rate of carry-over stock amount of natural rubber accounted for forecasted consumption of natural rubber next year when a year of natural rubber is end as security coefficient of natural rubber.

Supposing security coefficient of stock of natural rubber as β ,

$$\beta = (S_t / C_{t+1}) * 100\%$$

In the equation, S_t indicates carry-over stock amount of natural rubber in t year; C_{t+1} denotes

forecasted consumption of natural rubber in $t+1$ year

As far as a nation, when conforming safe and reasonable stock scale of natural rubber, it should take factors such as quantity, economy and structure into consideration.

5.2 Self-sufficiency rate of natural rubber

Although China has become the first consumer of consumption of natural rubber in the world, its situation is different from United State, which is the second, and Japanese that is the third, China has certain capacity to produce natural rubber, but impossible to achieve self-sufficiency after efforts, thus it is necessary to set up the evaluation indicator of self- sufficiency rate of natural rubber.

Self-sufficiency rate of natural rubber reflects the rate of the national production of natural rubber accounted for the total demand for natural rubber. It likely reflects the security degree of our natural rubber at some extend.

Supposing self- sufficiency rate of natural rubber as α

$$\alpha=(Y_t/D_t) *100\%$$

In the equation, Y_t indicates actual output of natural rubber in t year, D_t denotes actual demand for natural rubber in t year.

5.3 Coefficient about natural rubber depending on foreign trade

Coefficient about natural rubber depending on foreign trade is the percentage of a nation's import (export) of natural rubber accounted for its gross demand for natural rubber.

Supposing coefficient about natural rubber depending on foreign trade as ξ ,

$$\xi= (G_t/C_t) *100\%$$

In the equation, G_t indicates the amount of the gap of a nation's natural rubber completely filled by net import, C_t denotes a nation's total demand for natural rubber.

5.4 Increased coefficient of consumption of natural rubber

Increased coefficient of consumption of natural rubber is a reflection of the ratio of our increased rate of consumption of natural rubber with growth rate of production of world natural rubber.

Supposing increased coefficient of consumption of natural rubber as δ ,

$$\delta= (H_t/W_t) *100\%$$

In the equation, H_t indicates that increased rate of consumption of our natural rubber in t year, W_t denotes growth rate of production of world natural rubber in t year.

6. Discussion and suggestion

According to our estimation and calculation about the relationship between consumption of natural rubber and GDP, its income elasticity of demand is 0.813038. Relevant information also reveals that the amount of rubber is 2~2.5 kg per \$1000 GDP in China at present. Thus, along with China's rapid economic development, demand for natural rubber will present a more thriving situation. It will be an irreversible fact that demand of natural rubber is greater than its supply, and this completion will be more and more drastic. In other words, the dependence on import of

natural rubber will be increasingly enhanced. It is unrealistic and impossible to boost output of natural rubber through arable acreage, which is subject to the limited land resource suitable for the cultivation of rubber in China.

We should draw on lesson of tremendous impact on China's economy caused by shortage and price increase of international crude oil market, from the perspective of national strategic high level, material high level and security of major economic industry of agriculture to protect our rubber. Comprehensively viewing China's reality of production of natural rubber, demand for natural rubber and its international circumstance, we consider that it is urgent to cope with the security of china's natural rubber from strategic level. For the above reason, we think that it could be dealt with as following strategic levels.

6.1 Reasonable self-sufficiency rate of natural rubber

There are a host of reasons to restrict rising of output of natural rubber, however, they could be summed up to be three aspects as followings: Firstly, constraint of finite tropical land resource. Industry of natural rubber is a typical resource-constrained industry. Secondly, constraint of skilled labor resource to cut rubber. Natural rubber production is a labor-intensive product activity, labor intension is large and time is long, with socio-economic development and living standard's promotion, rubber workers will huge lose and become scarcity. Thirdly, constraint of germplasm resource. China has currently possessed nearly 6,000 copies of germplasm resource, but is still less than 1/4 of world's total germplasm resource.

In light of analysis of our calendar year self-support rate of natural rubber, combined with our economic development and our reality of production of natural rubber, we consider that narrow self-support rate of our natural rubber should be maintained at 30%, and broad self-support rate should be kept around 40%.

6.2 Reasonable self-support rate of natural rubber

There are a host of reasons to restrict rising of output of natural rubber, however, they could be summed up to be three aspects as followings: Firstly, constraint of finite tropical land resource. Industry of natural rubber is a typical resource-constrained industry. Secondly, constraint of labor resource. Cutting rubber is a labor-intensive product activity, labor intension is large and time is long, with socio-economic development and living standard's promotion, rubber workers will huge lose and become scarcity. Thirdly, constraint of germplasm resource. China has currently possessed nearly 6,000 copies of germplasm resource, but is still less than 1/4 of world's total germplasm resource.

In light of analysis of our calendar year self-support rate of natural rubber, combined with our economic development and our reality of production of natural rubber, we consider that narrow self-support rate of our natural rubber should be maintained at 30%, and broad self-support rate should be kept around 40%.

Although at present, China's self-support rate of natural rubber is difficult to attain this goal, especially with our rapid economic development, however, it is exceedingly likely to fulfill the objective through certain efforts from four specific aspects as followings: The first is to effectively and sufficiently utilize land resource that is suitable for cultivation of rubber that has not been used. The second is to increase research investment for natural rubber. In light of our analysis of model of increased output during 1981~2004 in china, annual growth rate of natural rubber is

4.23%, among which scientific and technical contribution is up to 92%, therefore, it is vital to augment research investment for yield per unit of China's natural rubber. We should adopt corresponding policy support for research investment from the source, establish wholesome and effective and research and innovation system and achievement transformation system, keep on policy support for exploitation and use of rubber germplasm resource, cultivated technique for continuously high and stable production, new technique to cut rubber, procession and exploitation primary product of natural rubber, usage of rubber and wood, exploitation and utilization of waste water of manufacturing rubber and so on. Also, we should adopt corresponding policy support such as subsidy for difference; protect measure for land suitable for cultivation of rubber, and agricultural insurance and subsidy for disaster, before production, during production and after production.

But it is needed to draw on concentration that there exists a problem about policy lag of production of natural rubber, in other words, even if policy is in place, due to inherent rule of production of natural rubber—it takes around eight years from cultivation to beginning to cut, which is a fatal weakness for security of natural rubber; and besides, there is a problem about easiness to destroy production of natural rubber, for example, several years ago when price of natural rubber was in downturn, quite a few rubber trees were devastated. Whereas production of natural rubber exists policy lag, support for production of natural rubber should be not only forward-looking and advanced, but also timely, otherwise it is considerably difficult to effectively ensure security of self-support rate of natural rubber, naturally no way to achieve objective of security of natural rubber.

6.3 Reasonable stock of natural rubber

Reasonable stock of natural rubber not only guarantees security of our natural rubber, but also safeguards sustainable development of our economic and national defense construction. Regarding to this problem, we can use United States, whose consumption of natural rubber is only less than China and rank second in the world, for reference, American's least annual stock of natural rubber basically maintains around 500,000 ton. Considering the fact that our consumption of natural rubber actually ranks No.1 in the world, more important reasons that our consumption of natural rubber speedily rises, which is higher than world increased rate of consumption of natural rubber, and also higher than No.2 American and No.3 Japanese, however, due to our advantages of annual production around 600,000 ton comparing to United States and Japanese, we suggest that our least stock of natural rubber should keep around 500,000 ton.

Such stock should be the lowest standard. That is because, according to international tradition, stock usually is measured with a year-end as the base point, but due to the fact that production of natural rubber is influenced by season, commonly not beginning to cut from January to March, so that there is no production of natural rubber, nevertheless, with regard of our current consumption, 500,000 is merely enough for consumption of two to three months, and in the next few years, our consumption of natural rubber will greatly rise.

That is to say, security coefficient of stock of natural rubber should be kept around 30%.

6.4 Reasonable import of natural rubber

Reasonable import is outcome not only of international distribution but also of each other's share of benefits. We analyze our import of natural rubber in current ten years, on the basis of our

economic development; we think that our coefficient about natural rubber depending on foreign trade should be controlled around 60%. Over-high coefficient about natural rubber depending on foreign trade will make our economic and national defense construction restricted by others, which is not conducive for sustainable development of our economic and national defense construction; over-low coefficient about natural rubber depending on foreign trade is hard to be realized when our current research on natural rubber has no significant breakthrough, which is also economically disadvantageous, particularly from long-term interests, which is even more so.

6.5 Reasonable increased coefficient of consumption of natural rubber

Reasonable increased coefficient of consumption of natural rubber is not only effective support for security of consumption and circulation of natural rubber, but also effective protection for production of natural rubber. On account of our actual situation of production, consumption of natural rubber and national economic development, increased coefficient of consumption of natural rubber should be controlled around 100%.

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