ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

WORKING PAPER SERIES

Working Paper No: APFSOS/WP/14

CHINA'S COUNTRY REPORT ON FORESTRY

by

Shi Kunshan, Li Zhiyong, Lin Fenming and Zheng Rui
Ministry of Forestry
Beijing

Forestry Policy and Planning Division, Rome
Regional Office for Asia and the Pacific, Bangkok

August 1997

The Asia-Pacific Forestry Sector Outlook Study is being undertaken under the auspices of the Asia-Pacific Forestry Commission.

This report comes under Workplan Number C16.

TABLE OF CONTENTS

INFORMATION NOTE ON ASIA-PACIFIC FORESTRY SECTOR OUTLOOK STUDY

At its sixteenth session held in Yangon, Myanmar, in January 1996, the Asia-Pacific Forestry Commission, which has membership open to all governments in the Asia-Pacific region, decided to carry out an outlook study for forestry with horizon year 2010. The study is being coordinated by FAO through its regional office in Bangkok and its Headquarters in Rome, but is being implemented in close partnership with governments, many of which have nominated national focal points.

The scope of the study is to look at the main external and sectoral developments in policies, programmes and institutions that will affect the forestry sector and to assess from this the likely direction of its evolution and to present its likely situation in 2010. The study involves assessment of current status but also of trends from the past and the main forces which are shaping those trends and then builds on this to explore future prospects.

Working papers have been contributed or commissioned on a wide range of topics. They fall under the following categories: country profiles, selected in-depth country or sub-regional studies and thematic studies. Working papers are prepared by individual authors or groups of authors on their own professional responsibility; therefore, the opinions expressed in them do not necessarily reflect the views of their employers, the governments of the Asia-Pacific Forestry Commission or of the Food and Agriculture Organization. In preparing the substantive report to be presented at the next session of the Asia-Pacific Forestry Commission early in 1998, material from these working papers will be an important element but will be blended and interpreted alongside a lot of other material.

Working papers are being produced and issued as they arrive. Some effort at uniformity of presentation is being attempted but the contents are only minimally edited for style or clarity. FAO welcomes from readers any information which they feel would be useful to the study on the subject of any of the working papers or on any other subject that has importance for the Asia-Pacific forestry sector. Such material can be mailed to the contacts given below from whom further copies of these working papers, as well as more information on the Asia-Pacific Forestry Sector Study, can be obtained:

Rome: Mr. Mafa Chipeta
Senior Forestry Officer
Policy and Planning Division
Forestry Department
Food and Agriculture Organization of the United Nations
Viale delle Terme di Caracalla
Rome, 00100, ITALY
Tel: (39-6) 5705 3506
Fax: (39-6) 5705 5514
Email: mafa.chipeta@fao.org

Bangkok: Mr. Patrick Durst
Regional Forestry Officer
FAO Regional Office for Asia and the Pacific
Maliwan Mansion
Phra Atit Road
Bangkok 10200
THAILAND
Tel: (66-2) 281 7844
Fax: (66-2) 2800445
Email: Patrick.Durst@field.fao.org

GENERAL: PRINCIPLES, DIFFICULTIES AND ACHIEVEMENTS WITH CHINA'S FORESTRY DEVELOPMENT

A. Principles and orientation

Environment and development is a major issue of general concern in the international community to which the Chinese government has always attached great importance. As a developing country, China has to give top priority unswervingly to the development of the national economy so as to raise social productivity, enhance the comprehensive national strength and raise continually the living standard of the people; all other activities shall be carried out centring around economic development. Economic development is not only a must for the survival and progress of the mankind *per se*, but also a physical guarantee for protection and improvement of the global environment. The Chinese government stresses that development must be in harmony with environmental protection.

Along with socio-economic development and continuous improvement of people's living conditions in China, functions of the forest have become particularly important and critical in such aspects of environmental protection as wind breaking and sand fixation, water and soil conservation, headwater conservation, air purification, biodiversity and habitat conservation, absorption of carbon dioxide and eco-tourism.

China is a large country, the major social and economic foundations of which include agriculture. During its modernization drive, prominence has to be given to the decisive issues related to agriculture, rural areas and farmers as they have direct impacts on the general situation of reform, development and stability. The key to the nation's prosperity lies in the rural areas. The priority for an affluent countryside is in the mountainous areas. Mountains and forests have the potential to promote development in the mountainous areas. In order to build up a new starting point for the 21 Century and a promising future, China intends to make greater efforts to speed up national forestry development, afforest the territory, increase the forest cover, secure a high and stable crop yield, vitalize the rural economy and help farmers shake off poverty and march towards prosperity. In this connection, the strategic importance of forestry in environmental protection and economic development has never been greater from both the historical and practical perspectives. As a matter of fact, the Chinese government has attached great importance to afforestation and rendered "planting trees for a green motherland and improvement of ecosystems and the environment" as a fundamental State policy, and reiterated "that planting trees for a green motherland" is a great undertaking which embodies contributions of the present generation and benefits for future generations.

As a large developing country, China is fully aware of its obligations and potential roles in protection of global ecosystems and environment and the Chinese government has given top priority to the global issue of environment and development. Premier Li Peng headed a delegation to participate in the United Nations Conference on Environment and Development (UNCED) held in Rio Janeiro, Brazil in 1992 and communicated China's commitment to fulfil all the documents adopted at the conference. Soon after the UNCED, the Chinese government put forward Ten Major Policy Measures to promote environmental protection and development in China. With support and assistance from UNDP, China's Agenda 21 and the Priority Programmes of China's Agenda 21 were formulated. In addition, the Ministry of

Forestry has worked out in succession such important documents as the Implementation Plan for the Forest Principles, the Forestry Action Plan for China's Agenda 21, Outline of China's Programme for Environmental Development, China Biodiversity Conservation Action Plan, China Wetland Conservation Action Plan, and China National Action Plan to Implement the United Nations Convention to Combat Desertification.

The Forestry Action Plan for China's Agenda 21 is a major document highlighting the spirit of China's Agenda 21 and promoting China's forestry to be in line with the international practice; it is a comprehensive, operational and directive document formulated in the light of China's specific conditions and its forestry status, and by absorbing and highlighting the experiences gained by the relevant action plans being or to be implemented by the Chinese government. It will play an important role in China's formulation of its mid- and long-term forestry development plans and its goals and components will be incorporated as major elements of the proposed Ninth Five-Year Forestry Plan and the Plan to the Year 2010.

B. Problems and difficulties

Due to historical and social reasons, the development of China's forestry has been relatively slow, which is far from satisfying the needs of national economic and social development. The present major problems facing forestry are as follows:

- the total amount of forest resources is insufficient, resources available for harvesting are almost exhausted, the structure is unbalanced and the capability for supplying forest products is rather low;
- management is too extensive, technology is backward, forest land productivity and integrated utilization rate of resources are not high with low efficiency;
- the secondary and tertiary industries of forestry are seriously stagnant, with low level of industrialization;
- the structure, scale, pattern of industries are not very rational, the integrated power of forestry is weak;
- forestry infrastructure development is weak which can not meet the needs of modern forestry development;
- the management system of state forest areas is not rationalized, enterprises shoulder heavy social burdens, with staff living in poverty, the survival and development of enterprises faces great difficulties;
- the awareness of science and technology is not strong enough, the utilization rate of scientific and technological achievements is low; and
- too much emphasis is laid on expansion of quantity and pursuit after speed, without giving enough attention to the improvement of quality and structural readjustment.

With the establishment of China's socialist market economy system and further opening up to the outside world, forestry is facing some sharp contradictions at a deeper level, seriously restricting forestry development and the realization of development goals. The major problems are:

- The tasks of eco-environment construction are heavy. Forestry shoulders heavy tasks of treating soil and water erosion, water source conservation, combating desertification,

conservation of wild fauna and flora, prevention and alleviation of disasters, etc.. With the gradual change of China's economic system and limited financial resources of the state, the new investment system is not yet formed while the old investment system is changing. If a new and stable investment system cannot be established, the development process of forestry ecological system will be seriously restricted.

- The competitiveness of forestry, especially forestry industries is rather weak under economic conditions of socialist market economy. The running mechanism of market economy demands optimization of all productive factors including forest resources. Forestry shoulders dual responsibilities of environmental and industrial development, with low comparative benefits, and is thus not very attractive for commercial investment; besides, forestry development in the past has been weak, with low level of self development and accumulation, which is very disadvantageous in the development of a market economy. So forestry is a weak industry in China's national economy. It is necessary to decide the appropriate positions and corresponding economic running mechanisms of the two major systems of forestry in national economy under conditions of market economy.

- The management of forestry is still rather extensive, with low overall quality. To realize the high yield, high quality and high efficiency of forestry, it is necessary to aggressively pursue greater economic production with a focus on quality and efficiency. Yet the production cycle of forestry is long, locations of forestry activities are usually remote, with insufficient access to information. The progress of forestry science and technology is slow, with low quality of employees, extensive management and weak awareness of reform, opening up and market economy. Thus, there is still a big gap between the present situation and requirements of changing the mode of economic growth.

- Forest resources cultivation is out of line with the utilization of forest resources. On one hand, the cultivation of commercial forest resources is still not oriented by market demands; the goal of non-commercial forest resources cultivation is too simple without much economic value; on the other hand, the layout and structure of forest product industry cannot adapt to the change of forest resources structure, the utilization of forest resources is out of line with cultivation. Insufficient overall quantity of resources coexists with their unbalanced structure, which has prevented the limited resources from providing the most integrated benefits.

C. Efforts and achievements

Resource development

In recent years, under the guidance of appropriate policies, forestry in China has witnessed an unprecedented trend of development. About 5 million hectares are planted on an average each year, of which over 1 million hectares are established by aerial seeding. By the end of 1994, the total area of mountain closure had reached 31 million hectares. The Fast Growing, High Yielding Plantation Base Development Programme has accomplished afforestation of 3.45 million hectares and the total accumulative established area of plantations has reached 34.3 million hectares so placing China first in the world. The total forest area in China amounts

to 134 million hectares with a standing stock volume of 11.785 billion[1] cubic meters and the forest cover rising up to 13.92%. The prolonged adverse situation in which forest stocking volume kept dropping has been reversed and consumption of forest resources been brought under control with forest growth having exceeded total consumption. Forestry development in China is entering a new era which sees the dual increases in both the forest area and the stocking volume.

Development of the eco-environment

While speeding up the pace of forest resources cultivation, the Chinese government gives priority to ecosystems development with remarkable achievements scored in the implementation of ecological forestry programmes. By 1994, over 13 million hectares of land had been afforested under the Three-North Shelterbelt Development Programme, 5.46 million hectares under the Shelterbelt Development Programme along the Upper and Middle reaches of the Yangtze River, 15,000 kilometres of framework shelterbelts under the Coastal Shelterbelt Development Programme, 0.58 million hectares of pilot afforestation area under the Taihang Mountains Afforestation Programme; 612 counties has reached the plain afforestation criteria under the Plain Farmland Shelterbelt Development Programme and 82% of the plain farmland suitable for shelterbelt networking has been protected by such networks; the total accumulative area established to combat desertification through afforestation has reached 1 million hectares which brings 10% of the desertified land under control, 44 million hectares of degraded grassland has been rehabilitated and protected, 11 million hectares of sand and/or wind prone low yield farmland are under protection, and over 1.33 million hectares of desert have been reclaimed into new farmland.

Protection of forest resources

Enhancing forest resource protection is one of the means to achieve sustainable forestry development in China. The Chinese government sets quotas for forest logging operations so as to bring resource consumption under strict control. In the light of the practical situation of the forest resource sector in China, the Government has formulated and promulgated relevant laws, regulations and policies which strictly enforce logging quotas as the central element of forest management and also set quotas for forest resource consumption. In line with the principle that consumption of the timber forest should not be higher than its growth, the State works out logging quotas once every five years and ensures that harvests are within the permitted quota for logging. In major forest regions, the State appoints forest resource supervisory commissioners and supervisory organizations and stations them in major forestry provinces and key forest industrial enterprises to strengthen supervision and control of the total volume of logging, total amount of timber transport and total quantity of timber sales and to ensure wise consumption of the forest resources. Implementation of this policy has effectively controlled forest consumption and protected the existing resources. The present goal of total forest growth exceeding total consumption has been preliminarily reached nationally and dual increases in both the forest area and the stocking volume is well underway.

Control of forest disasters

[1] 1 billion = one thousand million.

The "three preventions" are major components of forest protection: prevention of forest fires, prevention of forest diseases and pests, and prevention of indiscriminate logging and illegal poaching. The State has promulgated the *Regulations on Forest Fire Prevention* and local governments have formulated corresponding bye-laws to focus on such preventive activities as fire origin management. They have adopted the forest fire management target responsibility system and follow the guideline of prevention first followed by active elimination. The State has promulgated the *Regulations on the Prevention and Control of Forest Diseases and Pests* which seeks prevention first supplemented by integrated treatments, establishes and improves the networks for projection and forecasting, forest plant quarantine and preventive service, adopts the integrated artificial, chemical and biological approaches to prevent large scale occurrence of major forest diseases and pests. The State has promulgated the *Forest Law*, the *Wildlife Protection Law*, and *Regulations on Management of Forest and Wildlife Nature Reserves*, which provide a legal framework for the "three preventions" of the forest resources and for firmly cracking down on indiscriminate logging and illegal poaching.

In recent years, occurrence of forest fires has been reduced substantially with the damage rate dropping from 0.8% before the "May 6" tremendous forest fire down to 0.2% in 1994, which was the best record in history, lower than the world average. The prevention and control rate of forest pests and diseases has been rising remarkably. The area of forests over the whole country which suffered from pests and diseases in 1994 was 7 million hectares, and the controlled area reached about 5 million hectares, which means that the control rate reached 70%. New progress has been made in the curbing of indiscriminate logging and illegal poaching, large scale illegal cutting has been stopped and forest-related legal cases have been reduced.

Development of the forest products industry

After the founding of the People's Republic of China, the forest products industry has experienced rapid development which may be highlighted in two ways:

- Formation of a complete modern industrial system. As far as variety of products is concerned, in addition to sawntimber, plywood and ordinary paper products, production is also underway for fibreboard (MDF included), particleboard (OSB, cement-bonded particleboard and gypsum particleboard included), decorative materials for secondary processing and all kinds of special paper and paperboard products[2].

- Quantity and quality of products have been raised substantially: for instance, China's sawntimber production has increased from 3.437 million cubic meters in 1950 to 12.94 million cubic meters in 1994, plywood production from 16,900 cubic metes in 1951 to 2.606 million cubic meters in 1994, paper and paperboard production from 0.11 million tons in 1949 to 21.38 million tons in 1994, fibreboard and particleboard production from nil to 1.93 million and 1.682 million cubic meters in 1994 respectively. Furthermore, extensive substitution of synthetic resin for protein glue and application of adjustment and control automation in all wood-based panel and pulp and paper production lines have improved quality of related products to a great extent.

[2] Development of wood-based processing has been accompanied by machinery manufacture. The machinery and equipment manufacturing system has been established preliminarily for the forest products industry which can produce not only different kinds of saws, planing machines, milling machines and sanding machines, but also complete production lines for making plywood, fibreboard (including MDF), particleboard, OSB, decorative materials for wood-based panels and pulp and paper making.

Trade in forest products

Before the mid-1970s, China basically followed the routine of a self-sufficient economy and, as in other economic sectors, value of forest products trade was very low. Ever since 1980s, along with implementation of the reform and open-door policy, economic development has entered a high growth period. Simultaneously, population growth and decline of domestic forest resources further worsened the existing conflicts between wood demand and supply. Shortage of timber and other forest products became a major restraining factor hindering development of the national economy. Subsequently, under the guidance of the Government's trade policy, China's import and export trade in forest products has developed very rapidly.

The forest products China imports fall under 6 major categories, i.e. roundwood, plywood, pulp (including waste paper), paper and paperboard, sawntimber and veneer. Between 1981 and 1992, roundwood dominated the forest products China imported with its accumulative value of import for the 12 years reaching US$ 7.04 billion accounting for 32% of China's total import value of forest products, seconded by paper and paperboard: US$ 6.45 billion or 29%, followed by pulp and waste paper: US$4.1 billion or 19%, and finally plywood: US$ 3.97 billion or 18%.

During the same period, China's export of forest products was slow in development. The serious imbalance of trade in forest products and enormous trade deficit not are only a heavy economic burden for a developing country but also grievously hinder the overall economic development. In order to reverse the adverse situation and replace the one-way deficiency-supply trade by a two-way complementary trade, the Chinese government has formulated policies to encourage expansion of forest products exports.

Development of forestry legislation

The Chinese government gives top priority to forestry legislation. In February 1979, the Sixth Session of the Standing Committee of the Fifth National People's Congress of the People's Republic of China adopted the *Forest Law of the People's Republic of China* (for Trial Implementation). In September 1984, the Seventh Session of the Standing Committee of the Sixth National People's Congress of the people's Republic of China adopted the *Forest Law of the People's Republic of China* which came into force as in January, 1985. In November 1988, the Fourth Session of the Standing Committee of the Seventh National People's Congress of the People's Republic of China adopted the *Wildlife Protection Law of the People's Republic of China*. After the promulgation of the *Forest Law* and the *Wildlife Protection Law*, the State Council issued a series of supporting administrative regulations such as *Regulations on Forest Fire Prevention, Regulations on Prevention and Control of Forest Pests and Diseases, and Regulations of the People's Republic of China on the Protection of Terrestrial Wildlife*. By September 1994, China has promulgated 4 laws and 4 administrative regulations on forestry, more than 60 sectoral rules and regulations, and over 200 local by-laws on forestry and local governmental regulations which has constituted a basic legal framework to guarantee sustainable forestry development.

International forestry cooperation

Strengthening international forestry cooperation is a major component of China's open-door policy in the forestry sector and also a key policy measure to promote forestry development in

China. Exchange of official visits, academic exchanges, scientific an technical collaboration, advanced studies and training allow China to further comprehend the outside world and the world to know better about China. Through international cooperation, the Chinese foresters have widened their field of vision, learnt foreign experiences to improve their work, introduced foreign advanced and practical technologies, management experiences and biological materials, and attracted foreign investment to promote forestry development and environmental protection and improvement in China. By now, China's international cooperation has scored remarkable achievements highlighted by the technical exchange and economic cooperation partnership relations established with 1/3 of the countries and regions of the world including many Asia-Pacific countries, and with dozens of non-governmental organizations. China's international forestry cooperation has developed into over 10 professional fields such as afforestation and silviculture, resource management, forest fire management, prevention and control of forest diseases and pests, wildlife and nature reserve management, forest industry, forest economics, policy and legislation, and science and technology.

1. BACKGROUND, STATUS AND ROLE OF FORESTRY DEVELOPMENT IN CHINA

1.1 Introduction to the Socio-economic Development

Before 1949 when the People's Republic of China was founded, the Chinese socio-economy was that of a semi-feudal, semi-colonial society. Social upheaval, economic stagnation and frequent occurrence of natural calamities pushed the socio-economy towards the verge of collapse.

Within a short period of seven years between 1949 and 1956, the Chinese government accomplished the socialist transformation of the old semi-feudal economic system and established preliminarily a new industrial system based on heavy industry and a co-operative system in agriculture. By 1957, China's gross value of industrial and agricultural output had reached RMB 124.1 billion yuan, of which the gross output value soared from RMB 34.3 billion yuan in 1952 up to RMB 70.4 billion yuan for industries along with speedy industrial development, and RMB 48.4 billion yuan to RMB 53.7 billion yuan for agriculture. During the given period, the gross output value for forestry increased from RMB 290 million yuan to RMB 930 million yuan (absolute figure based on 1957 fixed prices) with its proportion in gross agricultural output value increasing from 0.7% to 1.7%.

Between 1958-1978, China was shocked by frequent political movements which brought about adverse impacts on the social and economic development of the country. Except in the period between 1961-1965 during which economic adjustment was carried out, the national economic development was seriously unbalanced. Due to the mistake of blind pursuance of high growth rate in production and grand magnitude of construction projects, the heavy industry took up over 30% in the national income creating an unbalanced national economic structure. The present goals were not met in production and construction, and people's living conditions could not be duly improved for a lengthy period.

In the winter of 1978, the Chinese government adopted a new policy for reform and opening to the outside world to promote social and economic development, corrected the Left Deviation mistakes in the previous economic activities, lowered the rate of industrial growth from 13.5% in 1978 down to 8% in 1979 (the actual rate was 8.5%), and cut down the investment in capital construction projects under the Central planning from RMB 45 billion yuan to RMB 36 billion yuan. Meanwhile, the purchasing prices of farm produce were increased which has gradually changed the ratio between accumulation and consumption in the national income. Subsequently a series of unprecedented major reform policies were implemented in the ten years between 1978 and 1987 to promote social and economic development in China, of which the reform of rural joint contract responsibility system was most prominent and successful. These policies laid a solid foundation for the rapid and healthy development of China's socio-economy in the late 1980s and 1990s.

Between 1978 and 1987, China's gross social output value increased from RMB 684.6 billion yuan to RMB 2,308.3 billion yuan and the gross value of industrial and agricultural output from RMB 563.4 billion yuan to RMB 1,848.9 billion yuan. The national income rose from

RMB 301 billion yuan to RMB 932.1 billion yuan and the social labour productivity from RMB 760 yuan to RMB 1,787 yuan (based on the fixed prices of the given years).

Entering into the 1990s, China's national economy reached a higher stage on the basis of its high and sustained growth during the 1980s. Industrial structure and product composition have been further adjusted, scope of opening to the outside world expanded, and people's living standards substantially raised.

China's economy in 1994 maintained the trend of development as in the early 1990s with new achievements scored. The national economy continued its rapid rate of growth which was projected to be around 11% for the gross national product and 16% for the industrial value added. Product composition was further adjusted. In the field of agriculture, the total grain output reached 445 billion kilograms, a bumper harvest in history, despite serious flood and drought damage in many localities and the volume of commodity grains purchased by the State was in general equivalent to that in 1993. The trend of over-rapid growth in investment on social fixed assets was brought under initial control with the growth rate dropping from 58% in 1993 down to 24.4%. Investment structure was improved in 1994 which witnessed successful implementation of major national construction projects. The domestic market is brisk, supply of daily consumables abundant and conflicts between supply and demand of production materials have been obviously mitigated.

New progress has been made in the implementation of the opening policy with the total value of import and export breaking US$ 200 billion for the first time in history. The cash balance of the State increased from US$ 21.2 billion at the end of 1993 up to US$ 50 billion by the end of 1994 and the inward direct overseas investment in 1994 surpassed US$ 30 billion. By 1996, China's foreign exchange reserves had exceeded US$ 100 billion. Along with the economic development, the living conditions of urban and rural residents have been further improved. In spite of inflation, the actual annual growth rate, compared to that of last year, was around 4% in farmers' average per capita net income and around 7% in the average per capita income for consumption of the urban residents. The bank deposits of the urban and rural residents reached RMB 1 900 billion yuan, an increase of RMB 500 billion yuan in the given year or a rise of over RMB 200 billion yuan compared to that of 1993.

In 1994, the total population in China was 1.1985 billion and the total number of employees exceeded 615 million. The annual net population growth rate was 1.4% between 1986 and 1994. The new national economic accounting system statistics revealed that the gross domestic product was RMB 4,379.9 billion yuan in 1994 and the annual average growth rate was 9.5% between 1986 and 1994. The total import and export in 1994 valued US$ 236.73 billion, of which export value reached US$ 121.04 billion and import value US$ 115.69 billion with an respective annual net growth rate of 14.6%, 18% and 11.8% between 1986 and 1994.

1.2 The Status and Role of Forestry in the National Socio-Economic Development

Forestry is a major component of the national economy in China. It is not only an industry but also a public undertaking; it falls into the category of agriculture in a broad sense, but also functions as a backbone industry and raw material supply sector incorporating economic, social and ecological benefits. The role of forestry in national economic and social development is highlighted by the fact that forestry provides ecological shelters to promote the high and stable yield in agriculture and animal husbandry, to secure conservation of water resources and guarantee the long-term functions of water conservancy facilities. Forestry is a major means to revitalize rural economy and in particular the mountain economy; to adjust the rural industrial structure, and solve the problem of energy shortage in rural areas. Forestry is also of great significance for speeding up development of the national economy, improvement of ecosystems and the environment, promotion of spiritual civilization and advancement of social progress. With proper forest rehabilitation and forestry development in China, forestry will play an increasingly important role in the national social and economic development.

1.2.1 Improving the Deteriorating Ecosystems and Environment

China has scored some achievements in environmental protection. However, the general trend of environmental deterioration has not been fundamentally reversed due to prolonged exploitation and unwise use of forest vegetation.

Soil erosion is a very serious problem in China. In present China, water eroded area alone totals 1.79 million square kilometres with an annual volume of soil loss reaching 5 billion tons, valued as high as RMB 7.16 billion yuan. Consequently, reservoirs, lakes and river courses are silted up and river beds heightened. Statistics show that, since 1949, the total lake area in the country has shrunk by 1.86 million hectares or 40% of the existing lake area; 22 major reservoirs have been silted up and abandoned, with a loss of water storage volume of 400 billion cubic meters. Functions of water conservancy facilities and flood control capacity of large rivers are weakened to a substantial extent.

Land desertification ranks the top among the ten major environmental problems challenging the world today. China is a country with large stretches of widely distributed deserts creating extremely adverse impacts. The total area of deserts, Gobi, desertified land and sandy stretches in China approaches 1.53 million square kilometres or 16% of the country's total land area. The desertification process has been accelerating, from an average annual rate of 1,560 square kilometres in the 1950s to 2,100 square kilometres in the 1980s, and has the potential risk of further aggravation.

According to preliminary estimates, since the beginning of the 90s, a total of 20-40 million hectares of farm crops are adversely affected by natural calamities throughout the country with a drop in grain yield of over 20 billion kilograms; the direct economic loss caused by all types of natural calamities reaches as high as RMB 50-60 billion yuan each year. In recent years, natural calamities have occurred more frequently but have had aggravated impacts. The annual calamity-stricken area in China in the 1980s was 1.7 times more than that in the 1970s and 2.1 times of that in the 1950s.

China is one of the countries in the world which host the most diverse species of fauna and flora. However, forest depletion, pasture degradation and environmental deterioration have resulted in shrinking of the habitats and decline in the populations of fauna and flora in China. China has 32,800 species of higher plants, and about 104,500 species of animals. According to an estimate, the number of fauna and flora species being threatened makes up 15-20% of China's total, higher than the world average of 10-20%. In the last 100 years, over 10 wild fauna species and more than 200 wild flora species have become extinct.

In this connection, speeding up the pace of forest ecosystem development and improvement of ecosystems and the environment to reverse the general trend of environmental deterioration is a great historical mission the society bestows on the forestry sector.

1.2.2 Securing the High and Stable Yield of Agriculture and Animal Husbandry and a Rise in Grain Yield by 50 Billion Kilograms

By the end of this century, population in China will reach 1.3 billion people. Based on the per capita share of grain during the Eighth Five-Year Plan period, calculations indicate that the grain yield by 2000 shall be no less than 500 billion kilograms, a net increase of 50 billion kilograms over the present production; this is an urgent strategic goal to accomplish. Within this context, the most important and practical strategic option shall be the development of woody plants which contribute food and oils, transforming deserts into farmland and opening up new ways of grain production while efforts shall be continuously made to strengthen development of farmland shelterbelts, improve farming conditions and guarantee high and stable yields in agriculture and animal husbandry.

Statistics reveal that a larger proportion of the existing 63.03 million hectares of plantable wasteland can be used to produce food and oils from woody plants; production in the existing 6.7 million hectares of woody grain/oil plantations is mostly low and can be increased substantially through integrated technical renovation, 1-2 times for woody grain crops and 4-5 times for woody oil plants; within the farmland shelterbelt networks, crop yield can be increased by 10-20%. By now, there are still 54.9 million hectares of farmland without shelterbelt protection half of which require the establishment of shelterbelt networks. Among China's desertified land stretches, 6.7-13.4 million hectares can be transformed into farmland with great potential. Furthermore, agroforestry shall be another means to increase grain production. Since the beginning of the 1990s, the area of new and young forest stands in China has been increasing by 2 million hectares every year, a part of which can be used for intercropping with crops to achieve the goal of dual harvests.

1.2.3 Meeting the Market Demand for Forest Products

Meeting the market demand for forest products and securing effective supply to the society is the fundamental requirement of the national economy on forestry practice.

Projection of the forest products market shows that, in the coming 15 years or even further into the future, timber demand (including commercial timber, timber for the self-use of farmers, and for cultivation) in China shall be on the increase. China's demand shall be

164 million cubic meters for **timber** (for both construction and processing industries, the same hereinafter) and 77.6 million cubic meters for **fuelwood** by the year 2000, rising to 180 million cubic meters and 80 million cubic meters respectively by the year 2010.

China's **wood-based panel** production in 1995 was 6.5 million cubic meters. Projections indicate that, by the year 2000, the demand will have risen to 9-10 million cubic meters, of which demand for plywood, particleboard, MDF and fibreboard shall be 2.9-3.2, 2.75-3.06, 2.05-2.28, and 1.3-1.45 million cubic meters respectively; by the year 2010, corresponding demand of wood-based panels shall be 13-14 million cubic meters, of which demand for plywood, particleboard, MDF and fibreboard shall be 3.82-4.12, 4.6-4.96, 2.9-3.12, and 1.67-1.8 million cubic meters respectively. The increase in output over 1995 will be 2.5-3.5 million cubic meters by the year 2000 and 3-4 million cubic meters by the year 2010.

At present, China's commercial **pulp production** capacity totals over 10 million tons, of which wood pulp accounts for merely 10%, far from meeting the demand for paper making in China especially the manufacture of high quality paper products. Every year China spends more than US$ 3 billion on the import of wood pulp, paper and paper products totalling almost 4 million tons. Projection reveals that China's pulp production will reach 23 million tons by the year 2000, wood pulp supply will be 4.14 million tons based on the calculation that wood pulp accounts for 18% of the total pulp production; pulp production will exceed 35 million tons by the year 2010 and wood pulp supply be about 8 million tons based on the wood pulp percentage of 22%.

China is a country in the world with rich bamboo resources and is a big bamboo consumer. According to projections, **bamboo demand** in China will reach 16 million tons by the year 2000 (compared to a production of 10.2 million tons) and 30 million tons by the year 2010.

Rosin is China's traditional exported oriented and foreign exchange earning product. Analysis indicates that the international rosin market will remain stable and the total supply to the domestic market be secured. It is projected that rosin demand will be 420,000 tons by the year 2000 of which 230,000 tons for the domestic market and 500,000 tons by the year 2010 of which 265,000 tons for domestic consumption. Hence, rosin production in China is facing the challenges of expanding scale and improving efficiency, development of new products, raising product quality, and strengthening its capacity for international competition.

There are a diverse varieties of economic forest products in China. Analysis shows that the gap between demand and supply (total amount) for the fruit market is very small, whereas woody oil/grain products and raw materials for the chemical industry, various well-known, special, high-quality and new products are in short supply. The total demand for economic forest products will be 55 million tons (including 9.4 million tons of woody oil/grain products) by the year 2000 and 91.835 million tons (including 17 million tons of woody oil/grain products) by the year 2010. Therefore, the orientation of development for economic forests shall be control of fruit tree growing to a proper scale, vigorous development in the production of dry fruits, oil plants and raw materials for the chemical industry, varieties of various well-known, special, high-quality and new products in particular.

1.2.4 Poverty Eradication in Mountainous Areas

China is a country with innumerable mountains and the mountain population makes up 56% of the country's total. Due to historical, social and natural factors, economic development in mountainous China has been very slow, many farmers in the mountainous area are still living in poverty without necessary ability for upgrading. This has seriously hindered the State's economic and social development.

Poverty in China is particularly acute in the mountainous areas: in 1992, the average per capita income for mountainous farmers was 20% lower than the national average (40% lower for farmers in western China's mountainous areas); of the 592 poverty-stricken counties supported by the State's *87 Poverty Alleviation Programme,* 496 counties or 84% are in the mountainous area; 1,000 poverty-stricken State forest farms are all in the mountainous area. Every year many farmers have sufficient food and clothing only for part of the year. Of the 80 million poverty-stricken people in China in 1994, most lived in remote central and western mountainous areas with poor access, imbalanced ecosystems, poor natural conditions, backward means of production and stagnant economy. It is an arduous task to help these people get rid of poverty.

In the mountainous area, the per capita share of arable land is merely about 0.1 hectare, 10% lower than the national average, whereas the per capita share of forest land approaches 0.4 hectare, much higher than the national average of 0.1 hectare. In mountainous China, there are not only 90% of China's total forest land and 80% of the country's total stocking volume, but also many major production bases for woody oil/grain products, fruits, tea, bamboo, forest by-products, special and local produce and medicinal herbs. Forestry is therefore the basis and pioneer of other industries in the mountainous area. Without priority being given to appropriate forestry development, vigorous advancement of other industries cannot be promoted and achieved.

By 2000, efforts will be made, in line with the strategic goal for the State's second-step development and *the 87 Poverty Alleviation Programme*, to adjust the economic structure of rural mountainous areas, establish and develop forestry industries so as to give initial shape to integrated mountainous development led by forestry. It is intended that by the end of this century, the overwhelming majority of poor farmers in the mountainous area would have solved the problem of food and shelter. The per capita net income for rural farmers will increase from RMB 653 yuan in 1992 to over RMB 1,100 yuan in 2000, of which over 50% will be gained through integrated forestry development. Other targets are that the poverty-stricken counties will have been lifted out of poverty and the average per capita net income for farmers in the poverty-stricken counties will exceed RMB 700 yuan; around 1,000 State forest farms will have shaken off poverty; the integrated forestry activities dominating mountainous development will absorb 15 million (10% of the rural total), surplus rural labourers in the next five years. Forestry development with a growth rate of 15% will promote the development of mountainous economy at a rate of 10-11%. Between 2001-2010, efforts shall be made to widen, deepen and speed up the pace of integrated mountainous areas development, to achieve relatively balanced local economic development and to improve quality of the environment substantially so as to give initial shape to sustainable development.

1.2.5 Providing Employment Opportunities

Forestry in China has developed into an industrial sector with 2.5 million employees in over 38,000 organizations engaging in afforestation and silviculture, logging, timber processing,

forest products chemical industry and diversified operations etc.. In addition there are 150,000 rural collective forest farms and a great number of specialized forestry households and priority forestry households. The continuous development in forestry activities have increased the economic benefits in the forest areas, promoted migration of surplus rural labour force and provided the society with enormous employment opportunities.

1.3 Status and Role of China's Forestry in Forestry Development of the Asia-Pacific Region

As a large country in the world with a population of 1.2 billion (1994) and a territory of 9.6 million square kilometers, the Chinese government attaches great significance to and actively carries out friendly exchanges and cooperation with countries in the Asia-Pacific region, and has played its due role in and made great contributions to the promotion of forestry development and environmental protection in Asia and the Pacific through the development of national ecological programmes and large scale afforestation and greening activities.

1.3.1 Forest Resources

According to information released by FAO in 1995 (data of Taiwan Province listed under P.R. China), there were 859 million hectares of forest land in 1990 in Asia and the Pacific[3] and 162 million hectares in China (of which the mainland has 129 million hectares) accounting for 18.9%. Of the 578 million hectares of forest land in the region, 134 million hectares or 23% are in China. The forest cover in China is 14% and there is a long way for China to go compared to other countries such as Japan (66%), Malaysia (54%) and Indonesia (64%). As far as forest stocking volume is concerned, the total stocking volume in the region is 62.12 billion cubic meters of which 9.79 billion cubic meters (the official figure being 10.137 billion) or 15.8% are in China and the stocking volume per hectare is 96 cubic meters. Comparing to other countries in the region, quality of the forest resources in China is fairly low.

China is a populous country with enormous consumption of fuelwood ranking the second (200 million cubic meters) in the Asia-Pacific region just behind India (263 million cubic meters). Its consumption makes up 22.9% of the regional total. By 2010, fuelwood consumption in China is expected to reach 221 million cubic meters or 21.2% of the Asia-Pacific regional total of 1 044 million cubic meters.

1.3.2 Production and Trade of Timber and Forest Products

Demand for industrial timber will increase substantially in China along with its economic development. As per the up-dated material released by FAO in 1996 (data of Taiwan Province listed under P.R. China, the same situation hereinafter), **China's industrial roundwood**

[3] Totals of "Asia and the Pacific" may vary according to countries selected. Details are best checked with FAO Forestry Paper No. 124 "Forest Resources Assessment 1990 - Global Synthesis" Rome, 1995. This publication (Table 3) gives a developing Asia-Pacific total of 660 million ha of "forests and the wooded land" and 497 million ha for forest alone. To these must be added forest areas for developed countries of the region. The use of the term "forest" requires care and definitions are presented in the FAO publication to avoid confusion (Editor).

production for 1994 was 101.9 million cubic meters, consumption 104.1 million cubic meters, import 4.587 million cubic meters and export merely 2.41 million cubic meters. It is projected that China's industrial roundwood consumption will reach 194 million cubic meters by 2010. In 1994, the Asia-Pacific regional industrial roundwood production was 310.2 million cubic meters, consumption 345.5 million cubic meters, import 65.881 million cubic meters and export merely 30.545 million cubic meters and China's share was 33%, 30%, 7% and 8% respectively. It is projected that the regional industrial roundwood consumption will reach 584 million cubic meters by 2010 of which China will have a share of 33%.

According to the statistics of FAO, China's **sawntimber** production for 1994 was 25.162 million cubic meters, consumption 26.865 million cubic meters, import 2.4 million cubic meters and export merely 0.737 million cubic meters. In the same year, the Asia-Pacific regional sawntimber production was 105 million cubic meters, consumption 122.7 million cubic meters, import 26.152 million cubic meters and export merely 8.455 million cubic meters and China's share was 24%, 22%, 9% and 9% respectively. It is projected that China's sawntimber consumption will reach 44.26 million cubic meters by 2010 accounting for 20.5% of the Asia-Pacific regional total consumption.

In 1994, the Asia-Pacific regional total production of **wood-based panels** was 52.035 million cubic meters, consumption 52.535 million cubic meters, import 15.183 million cubic meters and export 14.683 million cubic meters. In the same year China's total production of wood-based panels was 21.59 million cubic meters or 33% of the regional total, consumption 25.119 million cubic meters or 41%, import 3.954 million cubic meters or 26% and export 0.425 million cubic meters or 3%. It is projected that the regional wood-based panel consumption will reach 105.448 million cubic meters by 2010 and 32.855 million cubic meters in China which accounts for 31% of the regional total.

China's consumption of **paper and paperboard** will increase from 29.789 million tons in 1994 to a projected 71.728 million tons by 2010 while the Asia-Pacific regional consumption will increase from 84.6 million tons in 1994 up to 189.241 tons by 2010 and China's share from 35% in 1994 to 38% by 2010. As far as import and export are concerned, China is a major importer of paper and paperboard with an import quantity of 4.044 million tons and an export quantity of merely 1.158 million tons in 1994 accounting for 26% and 16% of the regional total import/export respectively.

In 1993, the total output value of forest products in China was US$ 34.659 billion making up 29% of the Asia-Pacific regional total of US$ 117.713 billion and the output value of forest products in China accounts for only 2% of its GDP. China's import of forest products was equivalent to US$ 4.648 billion making up 13% of the Asia-Pacific regional total import value of US$ 35.242 billion, while its export value of forest products exceeds US$ 1.121 billion or 6.4% of the regional total of US$ 17.548 billion.

1.3.3 Protection of Ecosystems and the Environment

The on-going grand ecological forestry programmes initiated by the Chinese government and the achievements of these programmes have set up good examples for the countries in Asia and the Pacific region. With unremitting efforts in the past two decades, the ten ecological forestry programmes in China have scored remarkable achievements and such environmental

problems hindering the sustainable social and economic development in China as desertification, water and soil erosion and farmland degradation have been obviously mitigated. The timely completion of the first phase of China's Three-north Shelterbelt Development Programme has effectively brought desertification in this region under control which will play an active role in environmental protection and improvement not only for China but also for its neighbouring countries such as Japan and Mongolia.

The shelterbelt systems being established along the upper reaches of China's major rivers have produced remarkable social and ecological benefits. In particular, the establishment of a shelterbelt system along the upper and middle reaches of the Yangtze River has promoted the gradual rehabilitation of the forest vegetation and initial control of water and soil erosion which not only have mitigated to a great extent the damage caused by flood and drought in south-western China but also will bring about positive effects on the Southeast Asian countries which are subject to the influence of the Yangtze River system. The success of China's ecological forestry programmes highlights the necessity and significance of joint governmental and social involvement. Its successful practice will provide sound experiences for the protection of ecological environment and sustainable social and economic development in countries of the Asia-Pacific region, Southeast Asia in particular so as to achieve simultaneous progress and development.

1.3.4 Forest Protection

As a country deficient in forest resources, China encounters much greater challenges in forest protection during its process of forestry development compared to many other countries in the Asia-Pacific region. Nevertheless, the Chinese government has made unremitting and effective efforts in protection of its forest resources and prevention and control of forest diseases, insect pests and forest fires.

In the light of the status quo of the domestic forest resources, the Chinese government has formulated a series of laws, regulations and policies which take logging quota management as the central element of forest resource management and adopt overall management of the forest resource consumption. Based on the needs for forest resource management in major forest regions, the State has appointed forest resource supervisory commissioners and established supervisory organizations to work in major forestry provinces and key forest industrial enterprises to exercise supervision and control of the total volumes of logging, transportation and timber sales so as to guarantee wise consumption of the forest resources.

With regard to prevention and control of forest fire, forest diseases and insects, the State has promulgated Regulations on Prevention and Control of Forest Pests and Diseases and Regulations on Forest Fire Prevention. The guideline is to focus on prevention first and to complement this by integrated control measures for fires as well as pests and diseases. A forest diseases and pests projection and forecast system and a forest plant quarantine and preventive service networking system have been established and improved. Integrated artificial, chemical and biological approaches have been adopted to prevent the large scale and frequent occurrence of major forest diseases and pests. The percentage of forest diseases and pests under prevention and control (biological and chemical control) has been raised and the rate of integrated prevention and control increased from 36.7% during the Sixth Five-Year Plan period to 40% in the early 1990s. In recent years, the rate of damage caused by forest

fires (the percentage of damaged area to forest area) in China has dropped substantially from around 8 per thousand before 1987 to 2 per thousand in 1994 which is lower than the world average and the best practice recorded in history.

1.3.5 Development of Forestry Legal System

The Chinese government gives top priority to forestry legislation. In February 1979, the Sixth Session of the Standing Committee of the Fifth National People's Congress of the People's Republic of China adopted *the Forest Law of the People's Republic of China (for Trial Implementation).* In September 1984, the Seventh Session of the Standing Committee of the Sixth National People's Congress of the People's Republic of China adopted *the Forest Law of the People's Republic of China* which came into force as in January, 1985. In November 1988, the Fourth Session of the Standing Committee of the Seventh National People's Congress of the People's Republic of China adopted the *Wildlife Protection Law of the People's Republic of China*. After the promulgation of *the Forest Law* and the *Wildlife Protection Law*, the State Council issued a series of supporting administrative regulations such as *Regulations for Implementation of the Forest Law of the People's Republic of China, Regulations on Forest Fire Prevention, Regulations on Prevention and Control of Forest Pests and Diseases,* and *Regulations of the People's Republic of China on the Protection of Terrestrial Wildlife*. By September 1994, China has promulgated for forestry 4 laws, 4 administrative regulations, more than 60 sectoral rules and regulations, and over 200 local bye-laws and local governmental regulations - this has constituted a basic legal framework to guarantee sustainable forestry development.

1.3.6 International Cooperation

As a developing country, China is fully aware of her obligations and major role in protection of ecosystems and the environment of our Mother Earth. Not long after the United Nations Conference on Environment and Development held in 1992, the Chinese government put forward *the Ten Major Policy Measures* to promote environmental protection and development. With the support of UNDP, China has completed the formulation of such major documents as *China's Agenda 21, the Implementation Plan for the Priority Programmes of China's Agenda 21, the Forestry Action Plan for China's Agenda 21, Outline of China's Programme for Environmental Development, China Biodiversity Conservation Action Plan, China Wetland Conservation Action Plan,* and *China National Action Plan to Implement the United Nations Convention to Combat Desertification*. The Forestry Action Plan for China's Agenda 21 is a major document highlighting the spirit of China's Agenda 21 and promoting China's forestry to be in line with the international practice; it is a comprehensive, operational and directive document formulated in the light of the specific Chinese conditions and its forestry status, and by absorbing and highlighting the experiences gained by the relevant action plans being or to be implemented by the Chinese government.

2 THE *STATUS QUO* AND TREND OF FORESTRY DEVELOPMENT IN CHINA

2.1 Forest Resources

The Chinese government attaches great importance to forest resource management. Four nation-wide forest resource inventories were carried out between 1949 and 1993. The last resource inventory was completed between 1989 and 1993. During the Fourth National Forest Resources Inventory, a total of 227,244 ground sample plots were surveyed and another 106,320 sample plots were studied through interpretation by satellite images and aerial photos. Resource inventories were carried out throughout the country except the large stretches of deserts, Gobi, pasture, and high mountains above the timber line. The total area surveyed were 5.7805 million square kilometers, accounting for 61.2% of the country's total land area. Some 15,000 people participated the Fourth National Forest Resources Inventory, the State allocated special funds for this undertaking, and local governments and forestry authorities rendered great support in all aspects of man power, material supply and financial assistance which guaranteed the reliability and authority of the inventory findings.

2.1.1 The Status Quo of Forest Resources

The findings of the Fourth National Forest Resources Inventory (1989-1993) published by the Ministry of Forestry in 1994 reveal that out of China's total area of 960.2716 million hectares, land for forestry use was 262.8885 million hectares (27.38%). The total actual forest area was 133.7035 million hectares with a forest cover of 13.92%. Of all China's forest resources, the total growing stock in China was 11.736 billion cubic meters and the growing stock in forests was 10.137 billion cubic meters.

2.1.1.1 Land Resource for Forestry

Of China's total 256.774 million hectares of land available for forestry (excluding the forest resources of Taiwan Province and that beyond Tibet control line, the same situation hereinafter), 128.5278 million hectares or 50.06% are forested land, 18.0257 million hectares or 7.02% open woodland, 29.7063 million hectares or 1.57% shrub land, 7.1383 million hectares or 2.78% young plantations, 0.1149 million hectares or 0.04% nursery, and 73.261 million hectares or 28.53% wild land.

Table 1 - Land Area by Category Unit: million hectares

Category	Forest land		of which: Economic forest land		of which: Bamboo forest land	
	Area	%	Area	%	Area	%
State Ownership	58.1986	45.28	1.6035	9.96	0.2626	6.93
Collective Ownership	70.3292	54.72	14.4953	90.04	3.5282	93.07
Total	128.5278	100	16.0988	100	3.7908	100

Source: Forestry Yearbook of China, 1994.

Of the Forested land area, 108.6382 million hectares or 84.52% are natural forests, 16.0988 million hectares or 12.53% are economic forests, and 3.7908 million hectares or 2.95% bamboo forests (see Table 1).

Of the wild land (73.2597 million ha), 63.0253 million hectares or 86.03% are to be afforested, 2.7568 million hectares or 3.76% are the logged areas, 0.9128 million hectares or 1.25% the burnt-over area, and 6.5661 million hectares or 8.96% desertified wasteland suitable for forestry purposes.

2.1.1.2 Forest Tree Resources

The total standing stock volume in China is 10,735.6532 million cubic meters (excluding the forest resources of Taiwan Province and that beyond Tibet control line), of which 9,087.1671 million cubic meters or 84.64% are stock volume in forests, 544.9017 million cubic meters or 5.08% are stock volume in open woodland, 771.4424 million cubic meters or 7.19% are stock volume of single trees, and 332.142 million cubic meters or 3.09% are stock volume of "four-side" plantings.

2.1.1.3 Forest Resources by Ownership

The State forest covers 58.1986 million hectares or 45.28%; the collective forest covers 70.3292 million hectares or 54.72%. Among the total area of economic forests, 1.6035 million hectares are State owned, and 14.4953 million hectares or 90.04% fall under the collective ownership. The total area of the bamboo forest is also dominated by collective forests covering 3.5282 million hectares or 93.07%.

As far as the stocking volume is concerned, the total standing stock volume of the State forests amounts to 7,514.0373 million cubic meters or 69.99%, and the collective forests is 3,221.6159 million cubic meters; the stock volume of state forests is 6,705.574 million cubic meters or 73.79%, and the collective forest 2,381.5931 million cubic meters or 26.1% (see Table 2).

Table 2 - Stock Volume by Type of Forest Land Unit: million cubic meters

type	standing stock volume		forest stock volume	
	quantity	%	quantity	%
State ownership	7,514.0373	69.99	6,705.5740	73.79
Collective ownership	3,221.6159	30.01	2,381.5931	26.21
Total	10,735.6530	100	9,087.1671	100

Source: Forestry Yearbook of China, 1994.

2.1.1.4 Increment and Consumption of Forest Resources

Comparison of the total increment and consumption of the standing stock volume reveals that the annual average net growth is 419.1235 million cubic meters with a net rate of increment of 3.98%; the annual average net consumption is 319.9237 million cubic meters with a net rate of consumption of 3.04%; and the annual average dead and loss rate is 55.9143 million cubic meters with a rate of 0.53%. The corresponding data for the volume growth and consumption of timber forests are respectively 219.9634 million cubic meters or 3.78%; 199.7943 million cubic meters or 3.43%; and 42.0686 million cubic meters or 0.72%.

2.1.1.5 Forest Category

As far as forest type is concerned, the area and stocking volume of the timber forest are respectively 84.9286 million hectares and 6,743.3869 million cubic meters accounting for 78.18% and 74.2% of the total. The corresponding data for other forest types are respectively: 16.0729 million hectares and 1,777.977 million cubic meters or 14.70% and 19.57% for the protective forest, 4.2886 million hectares and 69.1674 million cubic meters or 3.95% and 0.76% for the fuelwood forest, and 3.3481 million hectares and 496.6358 million cubic meters or 3.08% and 5.47% for the special purpose forest (see Table 3).

With regard to the age class, the young forest covers an area of 41.3331 million hectares or 38.05% of the total with a stocking volume of 1,023.1764 million cubic meters accounting for 11.26%. The corresponding data for other age classes are respectively: 36.1314, 33.26%, 2,660.342, 29.28% for the middle age forest; 11.061, 10.18%, 1,221.4214, 13.44% for the nearly matured forest, 12.6886, 11.68%, 203.7089, 24.25% for the mature forest; and 7.4221, 6.835, 1 978.5184, 21.77% for the overmatured forest (see Table 4).

Table 3 - Forest Type Statistics by Area and Stocking Volume Unit: million hectares, million cubic meters

Forest type	Area	%	Stocking volume	%
timber forest	84.9286	78.18	6,743.3869	74.20
protective forest	16.0729	14.79	1,777.9770	19.57
fuelwood forest	4.2886	3.95	69.1674	0.76
special purpose forest	3.3481	3.08	496.6300	5.47
Total	108.6382	100	9,087.1613	100

Source: Forestry Yearbook of China, 1994.

Table 4 - Age Class Statistics by Area and Stocking Volume Unit: million hectares, million cubic meters

Age class	Area	%	Stocking volume	%

young forest	41.3331	38.05	1,023.1764	11.26
middle age forest	36.1314	33.26	2,660.3420	29.28
nearly matured forest	11.0610	10.18	1,221.4214	13.44
mature forest	12.6886	11.68	2,203.7089	24.25
over matured forest	7.4241	6.83	1,978.5184	21.77
Total	108.6382	100	9,087.1671	100

Source: Forestry Yearbook of China, 1994.

Table 5 - Area and Stocking Volume of the Broad-leaved and Coniferous Forests, Unit: million hectares, million cubic meters

Item	Area	%	Stocking volume	%
coniferous forest	55.0326	50.66	5,112.1593	56.26
broad-leaved forest	53.6056	49.34	3,975.0078	43.74
Total;	108.6382	100	9,087.1671	100

Source: Forestry Yearbook of China, 1994.

Table 6 - Area and Stocking Volume of the Timber Forest by Age Class, Unit: million hectares, million cubic meters

Age class	Area	%	Stocking volume	%
young forest	32.4815	38.24	831.0657	12.32
middle age forest	30.6148	36.05	2,212.1848	32.81
nearly matured forest	8.3449	9.83	907.6417	13.46
mature forest	8.4964	10.00	1,401.3095	20.78
over matured forest	4.9910	5.88	1,391.1852	20.63
Total	84.9286	100	6,743.3869	100

Source: Forestry Yearbook of China, 1994.

Table 7 - Area, Stock Volume and Percentage of Each Category of Native Forests, Unit: million hectares, million cubic meters

Forest type	Area	% native	Stocking volume	% native
timber forest	67.4100	79.40	6,165.0384	91.4
protective forest	13.0037	80.9	1,657.7184	93.2
fuelwood forest	3.6826	85.9	65.3986	94.6
special purpose forest	3.1691	94.7	487.0321	98.1
Total	87.2654	-	8,375.1875	-

Source: Forestry Yearbook of China, 1994.

The coniferous and the broad-leaved forests covers 55.0326 million hectares or 50.66% and 53.6056 million hectares or 49.34% with a respective stocking volume of 5,112.1593 million cubic meters or 56.26% and 3,975.0078 million cubic meters or 43.74% (see Table 5).

2.1.1.6 Plantations

The area of established plantations totals 34.2515 million hectares in China accounting for 26.65% of its total forested land area. Of this, forests for timber production, protection, fuelwood and special purposes total 21.3728 million hectares or 62.4% of the total plantation; the economic plantations cover 111.8296 million hectares or 35.54%; the bamboo forest 1.0491 million hectares or 3.06%; and the under established plantations cover 7.1883 million hectares.

2.1.1.7 Harvestible Forest Resources

The harvestible forest resources are further declining in China and inventory results show that both the area and stocking volume of the matured timber forests continue to shrink. In the period between the latest two inventories, its area declined by 709,000 hectares with an annual drop of 271,000 hectares or 1.56%; its stocking volume decreased by 253.3721 million cubic meters with an annual drop of 54.7317 million hectares or 1.41%. Meanwhile, resources of the matured timber forest are unevenly distributed with the majority of stands being in the remote and steep mountainous areas with difficult access. In addition, large areas of such forests grow along the upper reaches of big rivers. In consideration of their important protective roles, exploitation and utilization shall be very difficult.

Table 8 - Area of All Types of Economic Forests, Unit: hectare; %

Forest types	Area	Percentage
oil production plantation	6,058,900	37.64
special economic forests	1,334,000	8.29
fruit trees	5,296,100	32.90
other economic forests	3,408,800	21.17
Total	16,097,800	100

Source: Forestry Yearbook of China, 1994.

Table 9 - Diameter Class Distribution of Nearly Matured, Mature and Overmatured Forests, Unit: million cubic meters; million trees; %

Diameter class	Stocking volume		Number of trees	
	Volume	%	No. of trees	%
small diameter (6.0-12.0 cm)	411.4731	11.12	104.1802	57.43
medium diameter (14.0-24.0 cm)	811.5443	21.93	54.6358	30.12
large diameter (26.0-36.0 cm)	808.6872	2.86	15.0235	8.28
extremely large diameter (over 38 cm)	1,668.4318	45.09	7.5613	4.17
Total	3,700.1364	100	181.4008	100

Source: Forestry Yearbook of China, 1994.

Table 10 - Forest Resources Distribution by Region, Unit: million hectares; million cubic meters; %

Region	Standing stock volume		Forest area		Forest stand stocking volume		Timber forest stocking volume	
	Volume	%	Area	%	Volume	%	Volume	%
north-east/Inner Mongolia (4 prov.)	3,476.4732	42.7	36.5746	28.5	3,002.6898	33.1	2,683.7962	39.8
Sichuan and Yunnan	222.8439	2.7	20.9360	16.3	2,410.5927	26.5	1,398.7955	20.7
collective forests in 10 southern prov.	1,826.6227	22.4	46.6432	36.3	1,457.6952	16.0	1,225.9040	18.2
Tibet except areas outside control line	1,262.0614	15.5	3.9637	3.1	1,231.0584	13.6	878.3316	13.0
other provinces/ municipalities	1,347.6520	16.6	20.4103	15.9	985.1310	10.8	556.5596	8.3
Total	8,135.6532	100	128.5278	100	9,087.1671	100	6,743.3869	100

Source: Forestry Yearbook of China, 1994.

2.1.2 Development Trend of Forest Resources

The gap between demand and supply will become increasingly larger. The total social production and market demand projection indicates that, by the year 2000, the total timber demand will be 205 million cubic meters. The average per capita consumption of timber is 0.68 cubic meters in the world, over 1 cubic meter in the United States and the Russian Federation, 6 cubic meters in Sweden, and merely 0.12 cubic meters in China (see Table 11). According to projections, the average per capita timber consumption in China will maintain the current level by the end of this century.

Table 11 - Major Indexes on the Forest Resources in Selected Countries

Country	Land area (1000 km^2)	Forest area (million ha)	Volume (billion m^3)	Forest cover (%)	Population (million)	Per capita forest (ha/p)	Per capita volume (m3/p)
China	9,600	133.700	11.785	13.92	1,133.7	0.12	10.39
U.S.A.	9,363	226.454	20.100	32	249.2	0.84	80.66
Japan	377	23.889	2.860	67	123.5	0.20	23.16
Canada	9,922	264.100	23.000	28	26.5	9.32	867.92
Sweden	412.3	24.400	2.288	59	8.3	2.85	275.66
Finland	337	19.885	1.445	65	5.0	4.03	289.00
Norway	324	7.635	0.512	25	4.2	2.05	121.90
Brazil	8,512	518.335	58.445	61	150.4	3.06	388.60
Indonesia	1,904	118.813	8.300	65	180.5	0.78	45.98

Source: Forestry Yearbook of China, 1994.

There are large areas of plantable forest land in China awaiting for development and utilization. Statistics show that the total afforestable land in China amounts to 63.03 million hectares, of which 14.09 million hectares are suitable for establishment of timber plantations of which 4.84 million hectares are suitable for establishment of fast growing and high yield timber plantations.

By early next century, forest resource development will occur in the following five fields: expansion of forest area and increase in the quantity and quality of the forest resources;

improvement of the age structure, forest category and species composition; improvement of the productivity and rate of utilization of the forest land; mitigating in a phased way the conflicts between timber demand and supply and solving the problem of fuel shortage in rural areas to meet the need of the national economic development for timber; so as to establish a multi-strata, multi-functional forest resource system with sound regional layout and high productivity. The planned targets are:

- Wild land and wasteland will be eliminated in 21 provinces/autonomous regions/ municipalities by 2000, in the whole country at large by 2010;

- By 2000, the forest cover in China will increase from 14% in 1994 to 15-16%, timber forest area 99.92 million hectares, and fuelwood forest area 5.69 million hectares; and by 2010, the forest cover will reach about 17%, timber forest area 107.8 million hectares, and fuelwood forest area 7.66 million hectares; and

- By 2000, the total timber production will reach 130.87 million cubic meters.

- *Resource Development:* 20 large stretches and 5 small patches of timber plantation bases will be established over the whole country, making the total area of newly established and already existing timber forests reach 40.35 million hectares will be established in China, of which 14 stretches covering 15.78 million hectares in 254 counties will be established in southern China and 6 stretches covering 23.6 million hectares in 82 State forestry bureaux and 306 State forest farms in northern China. By 2000, 7.98 million hectares of fast growing and high yield timber plantation will be established in selected localities with good site conditions and easy access. Integration of new plantings with tending of young and middle aged stands, and regeneration with transformation of low yield forests shall be promoted to speed up the development of potential forest resources. As far as species arrangement is concerned, priority will be given to species with short rotation and producing small and medium diameter roundwood while a certain proportion will be the large diameter and valuable species so as to generate short term, mid-term and long term benefits.

- *Tending of young and middle aged stands:* The objective is to adjust the composition of forest stands, increase forest growth and improve stand quality. It is planned to complete tending of 16.66 million hectares during the Ninth Five-Year Plan period and 30 million hectares between 2000 and 2010.

- *Mountain closure:* Mountain closure activities will be carried out to increase the forest resources. Special efforts will be made to strengthen project-type mountain closure undertakings, and solve properly the conflicts between mountain closure and local grazing and fuel consumption.

- *Tending and Transformation of secondary growth:* Efforts will be made to gradually adjust the species composition, enhance management and improve quality so as to achieve the goal of high yield, high quality and high efficiency.

- *Development of the bamboo resources:* Priority will be given to tending supplemented by planting activities to expand the bamboo resources and increase their production. Between 1996 and 2010, 14 large stretches of oriented bamboo forest bases will be established in

126 counties of which 1.93 million hectares will be either planted or transformed during the Ninth Five-Year Plan period.

2.2 Afforestation and Greening

2.2.1 Development of Timber Plantations

Establishment of fast growing and high yield plantations and development of timber plantations is a strategic approach in China's forestry development. As early as in the late 1950s and early 1960s, the Ministry of Forestry put forward the guideline for establishment of timber plantations: that timber plantations should be established in selected bases and managed by forest farms for high timber yield; 240 stretches of timber plantation bases were planned. Due to the interference of the subsequent Great Leap Forward in 1958 and the Cultural Revolution, the plan was not implemented.

In the mid-1970s, it was proposed to establish fast growing and high yield timber plantation bases mainly with *Cunninghamia lanceolata* in southern China with support of special funds from the State government and, by 1980, 3.2 million hectares had been recorded in statistics. On March 5, 1980, the CPC Central Committee and the State Council promulgated the Directive on Vigorously Carrying out Tree-planting and Afforestation Activities which states that in order to speed up forestry development in China and mitigate as soon as possible shortage in supply of timber and economic forest products, all local authorities shall select favourable sites and suitable tree species for establishment of fast growing and high yield timber plantations, and guarantee monetary and material supply for integrated management. In a bid to obtain experience to guide the national undertaking for establishment of fast growing and high yield plantations, the Ministry of Forestry set up, in succession, joint trial plots with provincial/autonomous region authorities in 111 counties and 106 State forest farms in 20 provinces/autonomous regions. By the end of 1986, over 100,000 hectares of such trial plantations had been established with major species including *Cunninghamia lanceolata, Eucalyptus*, *Populus* and *Pinus elliottii*. Meanwhile, many provinces/autonomous regions started to establish fast growing and high yield plantations and over 1.5 million hectares of such plantations have been established throughout China as per incomplete statistics.

Survey results of a few years in the trial plantations provided practical growth data according to which China has preliminarily worked out criteria for timber yield for major fast growing and high yield species. For instance, the annual average increment is over 10.5 cubic meters per hectare for a 20-year-old Chinese fir stand, 15 cubic meters per hectare for 15-year-old *Buxus microphylla*, and over 22.5 cubic meters per hectare for 10-year-old Poplar clone I-72. These indexes, although still low compared to those in the developed countries, are much higher than the growth of the existing plantations and fit in with the current technical and management level in China.

Table 12 - National Statistics on Area of Afforestation by the State*, Unit: 1,000 hectares

Year	State afforestation area	Year	State afforestation area
1949-1952	138.2	1975	944.8
1953	27.4	1976	948.5
1954	65.9	1977	802.1
1955	113.4	1978	728.4
1956	249.0	1979	831.2
1957	198.9	1980	684.4
1958	440.0	1981	571.3
1959	630.5	1982	498.7
1960	751.3	1983	644.9
1961	322.3	1984	698.3
1962	262.7	1985	770.6
1963	292.8	1986	477.6
1964	508.3	1993	5,932.9
1965	660.7	1994	6,022.6
1966	781.6	1949-1952	138.2
1967	633.2	1953-1957	654.7
1968	519.9	1958-1962	2,306.8
1969	565.1	1963-1865	1,461.8
1970	505.4	1966-1970	3,005.2
1971	718.0	1971-1975	4,665.9
1972	1,032.3	1976-1980	3,994.6
1973	1,067.5	1981-1985	3,250.7
1974	903.3	1949-1986	20,055.4

* The figures in this Table only refer to new area planted except where cumulative totals are given.
Source: Forestry Yearbook of China, 1949-1986, 1993, 1994.

As per statistics, the area of timber plantation established between 1980 and 1987 was 28.92 million hectares accounting for 33.5% of the total plantation area established since 1949, of which 3.83 million hectares were fast growing and high yield timber plantations accounting for 13.2% of the total area of timber plantation in this period. Between 1988 and 1992, 16.17 million hectares of timber plantations were established of which 2.5 million hectares were fast growing and high yield timber plantations making up 15% of the total timber plantations in this period. In recent years, the area of fast growing and high yield timber plantations has been increased by 0.5 million hectares each year and the actual area of established timber plantations was 34.5 million hectares in 1994 in China.

In the light of the emerging issues and problems challenging timber plantation development in the new era, especially the development of fast growing and high yield timber plantations, the Department of Silviculture and Forest Management of the Ministry of Forestry carried out an overall survey and review of the national development of fast growing and high yield plantations in 1994. The findings show that, since the State Council's consent and the State Planning Commission's approval of the plan to establish fast growing and high yield timber plantation bases of 6.7 million hectares, over 3.446 million hectares of such plantations (2.871 million hectares newly planted, 0.161 million hectares improved young stands and 0.414 million hectares regenerated plantations) or 43% of the planed area had been established by year 1994 nation-wide with a stock volume of 45.819 million cubic meters and an annual growth of 10.17 million cubic meters. As far as species is concerned, conifers dominate

China's fast growing and high yield timber plantations accounting for 76%, of which *Cunninghamia lanceolata* makes up 46% and pine species 30%.

In 1994, the national afforestation area for timber plantations totalled 2.504 million hectares making up 41.8% of the State's total afforestation area of that year but 11% less than the timber plantation area established in 1993, of which 0.463 million hectares were fast growing and high yield timber plantations, 8.32% less than that of 1993.

In order to secure the smooth development of timber plantations, the State has utilized the following channels to guarantee financing needed for timber plantation development:

- Investment under the State planning. In recent years, the Ministry of Forestry has allocated RMB 20-30 million yuan to support the joint establishment of fast growing and high yield plantations by the Ministry and provinces. Between 1980-1986, RMB 83 million yuan was invested and 100,000 hectares planted.

- Local investment. Some provinces/autonomous regions and counties allocate funds every year from the local finance to establish timber plantations. For instance, in Guangdong Province, the provincial Finance Department has allocated RMB 12.91 million yuan each year in recent years for establishment of plantation bases; in Hubei Province, RMB 13 million yuan (5 million from the provincial Planning Commission and 8 million from the provincial Finance Department) were allocated between 1980-1985 for fast growing and high yield plantations.

- Forestry loans from State banks. In recent years, many provinces and counties have allocated from agricultural loans a certain amount of fund as forestry loans, and the forestry sector pays interests by using the regeneration funds of collective forests and the afforestation subsidies from the State. This practice has been adopted in Fujian, Guangdong, Guangxi, Liaoning and Hubei. Guangdong Province releases RMB 10 million yuan of forestry loans each year and Hubei Province has released RMB 20 million yuan of discount forestry loans every year from 1984. Since 1986, the State has decided to release discount loans worth RMB 300 million yuan for forestry projects of which 42% is for establishment of high yield plantations.

- Collection of refundable levies for regeneration funds. In Fujian Province, 20-50% of the log price is deducted by the forestry sector as regeneration fund which will be returned to the payers after regeneration is completed. In Sanming Prefecture, where such practice has proved successful, 80% of the afforestation financing is provided by production units from their log sales. In Chongyi County of Jiangxi Province, RMB 10 yuan per cubic meter is deducted from the log sales as the regeneration fund of the forest owner which is deposited in a special bank account and managed by the county Forestry Station for silvicultural purposes. Misappropriation is forbidden. Since such a system is adopted, about RMB 1.2-1.5 million yuan can be withdrawn every year as silvicultural fund.

- Investment by the timber demanding sectors. Since 1980s, some timber demanding regions or sectors have undertaken joint afforestation activities with rural collectives by means of compensation trade or joint forest farm ventures. In most cases, the timber demanding sector provides investment and techniques while the rural collective contributes labour; the timber thus produced shall supply mainly the investor. This is a

mutually beneficial practice which not only can supply timber for the demanding sector, but also helps farmers to vitalize forestry and become rich.

In order to boost State investment, the World Bank Forestry Development Project (Credit 605-CHA) was introduced in 1985. This project aimed to support mainly the 92 State forest farms in Guangdong, Sichuan and Heilongjiang to establish and transform commercial timber plantations, construct forest roads and procure accessory equipment. Implementation of this project not only demonstrates the ability of State forest farms in project implementation but also provides a good opportunity for the Ministry of Forestry to accumulate experience in management of multi-provincial involvement in projects of the International Development Association.

In June, 1988, the Chinese government requested the World Bank to provide financing and cooperation to introduce advanced techniques for establishment of fast growing and high yield timber plantations in 16 provinces/autonomous regions. The scale of afforestation in the first phase of the project is 985,000 hectares with a total investment of RMB 2,357 million yuan of which the World Bank loan is US$ 300 million. In 1989, the State Planning Commission, in its document coded Nongjing (1989) No. 245, approved the Proposal of the Ministry of Forestry Concerning the First Phase of the Project to Establish 6.7 Million Hectares of Fast Growing and High Yield Plantation Bases by Using the World Bank Loan and Domestic Counterpart Funds. In May, 1990, technical negotiations were conducted between the two sides and consensus was reached. On May 29, 1990, the Board of Executive Directors of the World Bank approved the on-going China National Afforestation Project (CR. 2145-CHA). In December 1991, the Ministry of Forestry submitted to the World Bank, in accordance with the comments and recommendations of the World Bank experts, the Proposal for the Forest Resources Development and Protection Project (FRDPP). The Ministry of forestry compiled the Feasibility Study of the Forest Resources Development and Protection Project and submitted in February 1994 to the State Planning Commission for approval. The scale of FRDPP is 900,000 hectares with a project duration of 6 years (including 2 years for tending of young stands) and a total investment of RMB 2,900 million yuan of which the World Bank loan is US$ 200 million. It is proven that establishment of fast growing and high yield timber plantations is a practical and strategic measure to build up forest resources, reduce from resource and economic crises, mitigate the mismatch between wood demand and supply, maintain and improve ecosystems and the environment at large.

The overall objective for development of timber plantations in China takes the existing forest regions and key forestry counties as the basis, gives priority to regeneration, transformation and improvement of the existing low quality stands, integrates regeneration with tending of young and middle age stands, adopts approaches of intensive and oriented management. Areas with favourable site conditions are selected to be the fast growing and high yield timber plantations. The overall scale as per planning shall be 40.35 million hectares of timber plantations, of which 27.66 million hectares are fast growing and high yield timber plantations. The new fast growing and high yield timber plantation development programme will be implemented in 3 periods:

- During the Ninth Five-Year Plan period (1996-2000), 3.34 million hectares are planned of which new plantations shall be 1.55 million hectares, cultivation of young and middle age stands 1.13 million hectares, regeneration of logged sites 0.66 million hectares;

- Between 2001 and 2010, 6.39 million hectares are planned, of which new fast growing and high yield timber plantations shall be 3.45 million hectares, transformation of the existing forests into fast growing and high yield plantations be 1.06 million hectares, and cultivation of young and middle aged stands for fast growing and high yield plantations be 1.88 million hectares;

- Between 2011-2050, 13.29 million hectares are planned.

As far as regional distribution is concerned, the existing plantations will be considered as the basis for development. Afforestation activities will be carried out in eastern and southern China from the Great and Minor Xing'an mountains to Fujian and Guizhou provinces with priority given to the collective forest regions in southern China where water and sunshine are abundant for the development of fast growing and high yield timber plantations while moderate consideration shall be given to north-east China and the Altay Region in Xinjiang. Class I and II forest land with favourable site conditions and easy access will be selected in the 20 large stretches and 5 small patches of timber bases to adopt focused and intensive management to supply the State, within a short time period, with large volume of timber. By 2000, the overall distribution of the proposed 7.98 million hectares of fast growing and high yield timber plantations will be that, by management unit, 6.67 million hectares or 83.6% shall be established in 292 plantation base counties and 905 State forest farms, and 1.31 million hectares or 16.4% by 82 forest industrial enterprises.

2.2.2 National Compulsory Tree Planting Campaign

On December 13, 1981, the Fourth Session of the Fifth National People's Congress adopted *the Resolution on National Compulsory Tree Planting Campaign* which states that "afforestation and territory greening is a holy undertaking for socialist development and benefits of future generations, and also a major strategic measure to harness rivers and mountains, and safeguard and improve the environment. In order to speed up the realization of the great goal of greening our motherland, promote the good Chinese tradition of tree planting and forest loving, and further set up the morality and custom of collectivism and communism, the Session decides to carry out a national compulsory tree planting campaign". It further states that "wherever possible, each and every Chinese citizen, 11 years old and over, excluding the old, weak, sick and disabled, should plant 3-5 trees per year in the light of the specific local conditions, or accomplish equivalent amount of work in seedling production, forest management and protection and other greening activities".

The Fourth Session of the Fifth National People's Congress urged the State Council to formulate, as per the spirit of the Resolution, the Regulations for Implementation of the National compulsory Tree Planting Campaign which states that " every citizen of the People's Republic of China, 11-60 for male and 11-55 for female, except those who have lost ability to work, shall undertake the commitment of compulsory tree planting and all working units should report the actual number of employees to the local greening committee as a basis for allocation of workload," and that " for youngsters between 11 and 17 years old, physical labour shall be arranged nearby in light of their practical conditions". And it further stipulates that "this compulsory labour is confined to the scope under jurisdiction of a given county/city for establishing State and collective forests".

Between 1981-1985, over 5 billion trees were planted under the National Compulsory Tree Planting Campaign. In the urban area, about 100 million trees are planted each year which doubled the annual planting before the National Compulsory Tree Planting Campaign, and the green commons in urban China increased by 50% compared to the period before national compulsory tree planting. The statistics of 324 Chinese cities show that the number of cities with over 20% green cover has increased from 37 prior to compulsory tree planting up to the current 89; the number of urban parks has increased, from the previous 728, by 70 each year; the number of cities with 3-5 square meters of per capita green commons has increased from 45 to 101. In cities, people's bias against grass growing is vanishing and increasingly higher priority is given to lawn development. In Beijing, the total area of lawn increased from 0.39 million square meters in 1979 up to over 6 million square meters in 1986, a rise of 16 times.

In rural China, compulsory tree planting has been carried out along with the process of rural reform in light of specific local conditions. In some localities, farmers are organized to plant trees on the barren mountains and along river banks under State ownership or collective tenure. In most cases, funds are raised from diverse channels, farmers contribute their labour in soil preparation and planting; the planted area is then divided into sections or patches and contracted to farmers for long-term management and protection in a bid to establish all kinds of greening projects such as shelterbelt forests, highway and railway greening, river bank greening, gully or mountain afforestation, establishment of a landscape zone or a farmers' park, etc.. Under the impetus of the National Compulsory Tree Planting Campaign, the national target of tree-planting and grass sowing during the Sixth Five-Year plan period was over-fulfilled. The "four-side" planting develops rapidly in plain agricultural zones and in the regions with little forest. During the Sixth Five-Year Plan period, compared to the Fifth Five-Year Plan period, aerial seeding covered 4 million hectares, a rise of 1.7 times; aerial sowing of grass seeds covered 0.584 million hectares, a rise of 14 times; the area of fruit orchards increased by 26.9% and the production of citrus, apple and pearl increased by 47.7%.

Great progress was scored in 1994 in the National Compulsory Tree Planting Campaign and the national undertaking of afforestation and greening. The Ministry of Forestry worked out and promulgated the *Provisional Regulations on National Inspection and Acceptance Techniques for Afforestation of Plantable Barren Mountains and Wasteland* and *the Major Indicators and Requirements for Elimination of Plantable Barren Mountains and Wasteland (for trial implementation)*; the National Greening Committee and the Ministry of Forestry jointly issued the *Circular on Furthering Afforestation and Greening of Plantable Barren Mountains and Wasteland* which have guided China's afforestation and wasteland elimination on to the right track of standardized management. Since 1990, time equivalent to over 2.2 billion persons each contributing once have participated in the compulsory tree planting activities with 11 billion trees planted. In 1994, time equivalent to 490 million of the same time inputs participated in compulsory tree planting activities with 2.52 billion trees being planted; the urban green commons increased by 36,000 hectares with the per capita share reaching 4.4 square meters.

2.3 Development of Ecological Forestry Programmes

China is one of the countries in the world with fragile ecosystems and environment. Despite of the efforts of many years, the overall adverse trend of environmental deterioration in China has not yet been reversed fundamentally and is not in harmony with the rapidly developing economy. In this connection, the principles of eco-economics and optimal systematic design shall be used to establish an ecological forestry system which is wisely designed, perfectly

structured and fully functional so as to provide an ecological shelter for China's industrial and agricultural activities and people's living, and help mitigate the effect of natural disasters.

Since 1978, the Chinese government has been implementing such large scale inter-regional and comprehensive ecological forest programmes as the Three-north Shelterbelt Development Programme, the Yangtze Shelterbelt Development Programme, the Coastal Shelterbelt Development Programme and the Taihang Mountains Afforestation Programme in a bid to increase vegetation cover and improve regional environment with remarkable ecological, social and economic benefits reached. Meanwhile, implementation of these programmes is building up rich experience for the establishment of a wisely designed, perfectly structured and fully functional ecological shelterbelt system in China around the turn of this century.

During the Ninth Five-Year Plan period (1996-2000), the Chinese government shall continue the implementation of the Shelterbelt Development Programme along the Upper and Middle Reaches of the Yangtze River, the Coastal Shelterbelt Development Programme, the Taihang Mountain Afforestation Programme and the Plain Afforestation (Agroforestry) Programme, and start implementation of the third phase of the Three-north Shelterbelt Development Programme, shelterbelt development along the middle reaches of the Yellow River and in the valleys of the Pearl River, Huaihe and Taihu Lake, and Liaohe River, with an objective to bring under initial control the water and soil erosion of China's major rivers and improve substantially the environment in these regions by the mid-21st Century.

2.3.1 The Three-North Shelterbelt Development Programme

The Three-North Shelterbelt Development Programme encompasses 551 counties/districts/ cities of 13 provinces/autonomous regions/municipalities in north-west, central north and north-east China covering 4.069 million square kilometres or 42.4% of the country's total land area. This world's largest ecological programme commenced in 1978 and shall be completed by 2050 with a planned programme area of 35.08 million hectares.

By 1994, over 13 million hectares had been planted under the first and second phases of this programme which has protected 11 million hectares of farmland with shelterbelt networks, rehabilitated 8.93 million hectares of pastureland, and brought under control to a certain extent 30% of the soil and water erosion area in the Loess Plateau reducing the volume of sand/mud flow into the Yellow River by 10%.

During the Ninth Five-Year Plan period, efforts will be made to reinforce the achievement scored in the first and second phases of this programme. On the basis of sound protection of the existing forest resources, the third phase will be commenced with priority to be given to 6 provinces/municipalities, namely Liaoning, Jilin, Heilongjiang, Beijing, Tianjin and Hebei, 5 large stretches (the Kerqin Desert, the Mu Us Desert, the Loess Plateau to the north of Weihe River, the southern part of Luliang Mountain and the Hexi Corridor) and 100 counties. The total afforestation area shall cover 6.18 million hectares.

Between 2001-2010, priority will be given to the control of water and soil erosion in the Loess Plateau. Areas with most serious erosion problems such as gullies in the loess hilly area, the Loess Plateau to the north of Weihe River and in Longdong region and mountain valleys in Shanxi and Shaanxi provinces will be selected for establishment of bank protection forests,

farmland shelterbelts and water and soil conservation forests. The total afforestation area will be 4.04 million hectares.

2.3.2 Shelterbelt Development Programme along the Upper and Middle Reaches of the Yangtze River

The Yangtze River is the largest river in China with a total length of 6,300 kilometres, its drainage area and population account for respectively 18.8% and 33% of the country's total.

In 1989, the Chinese government approved the Master Plan for the First Phase of the Shelterbelt Development Programme along the Upper and Middle Reaches of the Yangtze River which aims to increase the forest area by 6.67 million hectares by the year 2000 and by 20 million hectares in a time span of 30-40 years on the basis of sound protection of the existing forest vegetation.

At present, the programme is in full swing in 271 counties of 12 provinces/autonomous regions with priority given to ten major programme areas such as the Three Gorges Dam area, the middle and lower reaches of Jinsha River and the drainage area of Jialing River. In the last 6 years since 1989 when the programme commenced, 5.46 million hectares have been afforested, of which 1 million hectares were planted in 1994. Water and soil erosion in over 100 counties has been brought under initial control.

During the Ninth Five-Year Plan period, 271 counties shall meet the present afforestation criteria and all programme activities for the first phase will be completed. Efforts will also be made to adjust the programme design, complete programme activities in the ten major programme areas and set up programme models and ten central economic forest bases managed primarily by the State and rural collective forest farms. The total afforestation area will be 2.859 million hectares.

Between 2001 and 2010, priority will be given to the establishment of a wisely designed, perfectly structured, fully functional and highly efficient protective shelterbelt system along the upper and middle reaches of the Yangtze River. The total afforestation area will be 6 million hectares.

2.3.3 The Coastal Shelterbelt Development Programme

The Coastal Shelterbelt Development Programme covers 18,000 kilometres of the coastline from the mouth of Yalujiang River in the north to the mouth of Beilun River in the south.

In 1988, the Chinese government made a decision to establish coastal shelterbelt system in 195 counties/cities/districts of 11 coastal provinces/autonomous regions/municipalities. According to plan, 3.56 million hectares will be planted by the year 2010 so as to raise the forest cover from 24.9% to 39.1%, bring 7.71 million hectares of farmland under the protection of shelterbelt networks, and reduce the volume of soil and water erosion by 50%.

Since the commencement of the programme in 1991, 1.57 million hectares have been planted, of which 324,000 hectares were planted in 1994. By now, the total area of forested land along

China's coastline has reached 6.67 million hectares which constitute a framework shelterbelt stretching 15,000 kilometres and bring 6.17 million hectares of farmland under effective protection.

During the Ninth Five-Year Plan period, priority will be given to prevention and control of wind and water erosion in the water and soil erosion areas along the coastline by establishing an integrated protective forest system incorporating coastal framework shelterbelts and farmland shelterbelt networks. This system will effectively control water and soil erosion in coastal areas, enhance the capacity to fight against natural calamities, improve functions of ecosystems and the macro environment for investment so as to support the economic development and help raise people's living standards in the coastal areas. The programme scope shall cover 1.002 million hectares.

Between 2001-2010, it is planned to plant 1.067 million hectares and a green shelter along the coastline will take initial shape which will bring under control water and soil erosion along the coast, mitigate the adverse effect of natural calamities such as wind/sandstorm, drought and flood.

2.3.4 Plain Afforestation Programme

In China, there are ten major plains, e.g.: the Northeast Plain, the North China Plain and 918 plain, semi-plain and partial plain counties. The total land area, farmland and population of the plain areas account respectively for 15%, 45% and 50% of the country's total. They are major production bases for grain, cotton and edible oil, etc..

Promotion of plain afforestation and vigorous development of plain forestry is a major strategy to speed up the pace of territory greening and improvement of the ecosystems and environment in the plain areas. It has a far-reaching strategic importance for the advancement of economic development in China's agricultural areas, securing high and stable yield in agriculture and animal husbandry, increasing the potential of agricultural development, adjustment of the layout of domestic timber production, mitigating the conflict between forest protection and local timber and fuelwood demand, promoting adjustment of rural industrial structure, and increasing people's income.

By the end of 1994, the number of counties (cities, districts), prefecture (cities), and provinces (autonomous regions) over the country realizing the goal of plain greening reached 724, 118 and 9 respectively. During the Ninth Five-Year Plan period, efforts will be made to promote all the 918 plain, semi-plain and partial plain counties to reach the afforestation criteria set forth by the Ministry of Forestry with 276 counties meeting high level criteria. The total area of farmland under shelterbelt protection nation-wide will hit 43.99 million hectares and the forested land in the plain area reach 26.31 million hectares.

Between 2001 and 2010, 362 counties will reach high level afforestation criteria and efforts will be made to promote the high-efficiency forestry development in plain agricultural regions.

2.3.5 Taihang Mountains Afforestation Programme

During the Ninth Five-Year Plan period, priority will be given to the establishment of headwater conservation forest, water and soil conservation forest in the rocky and hilly areas of the Taihang Mountains, to the appropriate development of economic forests, rehabilitation of forest vegetation and enhancement of the capacity of water and soil conservation. Main activities include: water and soil conservation forests along the upper reaches of Haihe River and tributaries of the Yellow River, water and soil conservation forests in the eastern part of the Taihang Mountains featuring by development of "economic valleys", and the dry-fruit dominating economic forest bases in the western and south-eastern part of the Taihang Mountains. The total afforestation area will be 1.36 million hectares. The Programme was launched in 1994, and 358,000 hectares of afforestation was accomplished in the very same year.

Between 2001-2010, it is planned to afforest 1.623 million hectares and control initially water and soil erosion in the programme area and bring about substantial improvement in the regional environment.

2.3.6 National Programme to Combat Desertification

The Chinese government attaches great importance to combating desertification and has incorporated it into the national economic and social development plan with complete water/soil conservation and desertification combating research and management organizations established from the Central to local levels. Soon after the United Nations Conference on Environment and Development held in Brazil in 1992, in the spirit of *Agenda 21*, a framework document for the global sustainable development strategy, China took the lead in the international community in formulation of *China's Agenda 21* which incorporates as a major component desertification combating. In 1994, the Chinese government initialled the *United Nations Convention to Combat Desertification*. In order to enhance desertification combating endeavours in China, the China National Committee and its Senior Expert Advisory Group to Implement the UN Convention to Combat Desertification was set up and the former National Sand Control Coordinating Group was renamed as China National Coordinating group to Combat Desertification. In January 1995, the *China National Action Programme to Implement the UN Convention to Combat Desertification* was formulated.

China has gained successful experience in the last 40 years in combating desertification with quite remarkable achievements reached. For instance, dune stabilization and aerial sowing techniques in the arid, semi-arid and sub-humid arid areas, the desertification combating techniques along highways and railways, the supplementary techniques for shelterbelt development in oases, and the integrated control and rehabilitation techniques for secondary salinized soil have been widely extended. By now, about 1 million hectares of windbreak and sand fixation forests have been established and 1.73 million hectares of desert have been controlled and utilized which have brought under control 10% of the wind-eroded and desertified land, helped rehabilitate and protect 44 million hectares of pastureland. There has been an increase of 20% in grass yield and 11 million hectares of wind/sand prone farmland have come under protection of shelterbelt networks with a rise of 10-30% in grain yield. Fuelwood forests have also been greatly promoted and the problem of fuel shortage has been solved for some rural households.

At present, the area of wind-eroded and desertified land is on the increase: in northern China, the annual rate of expansion for wind-eroded and desertified land was about 150,000 hectares during the 1960s and 70s, and 210,000 hectares in the 1980s. In the last 10 years, around 24,000 square kilometres of land have been turned into desertified land due to wind erosion.

Since 1994, the government has organized a multi-disciplinary, multi-sectoral task force to carry out the first national survey on desertified and sandy land which encompasses 861 counties/ cities/districts in 29 provinces/autonomous regions/municipalities from the absolute arid areas to moist regions covering 49.39% of the country's total land area. Status maps on national desertification have been prepared. Furthermore, the government has set up China National Desertification Monitoring Centre and *formulated the Technical Plan on the Monitoring Principles of Desertification in China* and established monitoring plots in Ningxia. *The Plan for the National Programme to Combat Desertification between 1991 and 2000* has been implemented during the process of which 20 priority counties, 9 experimental zones and 22 experimental and demonstration bases have been set up in different types of desertification zones (dominated by north-west, north and north-east of China).

By 2000, advanced biological and engineering techniques will be adopted to harness the wind-eroded and desertified farmland and pastureland. Resources shall be wisely designed and utilized to establish an eco-economic development model integrating cultivation/livestock raising, processing, and sideline/trade. Some 16.05 million hectares of pastureland will be upgraded and 2 million hectares of high standard artificial grassland will be established; about 250,000 hectares of intercropping/rotational cropping among grain, fruits and grass, and 130,000 hectares of medicinal herbs and economic crops will be established; 60,000 hectares of water area be utilized; 230,000 hectares of timber plantation and economic forests be established; 230,000 hectares of deserts and low yield farmland be transformed; a number of entities and enterprises be established to provide employment opportunities for the local people in the programme area.

By 2010, a legalized resource management system and a high quality and sustainable sectoral development and industrial system will be established in the wind-eroded and desertified areas to conduct integrated development of the desertified land for supply of grain, cotton, edible oil, meat, eggs and milk, and for securing healthy progress in environmental and economic development. Efforts will be made to upgrade 34 million hectares of natural pastureland, establish 5 million hectares of high quality artificial pastureland, develop 1 million hectares for intercropping/rotational cropping among forest, fruits and grass, harness and rehabilitate half of the pastureland subject to degradation, desertification and salinization, develop 230,000 hectares to grow various medicinal herbs and economic plants, utilize a water area of 130,000 hectares and transform by means of afforestation 300,000 hectares of low yield farmland.

2.3.7 Shelterbelt Development Programme for Comprehensive Management of Huaihe River and Taihu Lake Basin Area

The programme aims at establishing a multi-forest type, multi-function and multi-benefit shelterbelt system primarily for flood control and it encompasses 208 counties/cities/districts in 7 provinces/municipality. The priority during the Ninth Five-Year Plan period will be establishment of water and soil conservation forests mainly for head water conservation and

water and soil conservation in the Dabie Mountain area, low mountains and hilly areas of Tongbai Mountain Range, low mountains and hilly areas of Funiu Mountain Range, hilly areas in Songshan and Huangshan mountains, hilly areas and tableland along the middle and lower reaches of Huaihe River, hilly and rocky mountains along the lower reaches of Huaihe River and low mountains and hilly areas in Tianmu and Yisu mountains; project for wavebreaking shelterbelts along Lixia River; and project for farmland shelterbelts in Taihu Plain and wavebreaks along Taihu dikes. The total area to be afforested is 728,000 hectares.

Between 2001 and 2010, 319,000 hectares are planned to be planted so as to reach the goal of bringing under initial control the water and soil erosion problem through integrated approaches of treatment and promote environmental development into a healthy circle.

2.3.8 Shelterbelt Development Programme in the Pearl River Valley

The Pearl River Shelterbelt Programme encompassing 177 counties/cities of Yunnan, Guizhou, Guangxi and Guangdong provinces/autonomous region aims primarily at increasing the area of forest resources, control of water and soil erosion, mitigating the effect of natural calamities and promoting a healthy biological chain. During the Ninth Five-Year Plan period, efforts will be made to harness water and soil erosion in the programme area so as to increase forest land and improve the local environment and further tap the potential of agriculture. Some 578,000 hectares shall be planted. The priority projects include the water and soil conservation and wavebreaking forest project along the northern bank of Hongshui River of the Nanpanjiang River; the head water conservation and water and soil conservation forest project in the northern section of Nanpanjiang River; the bank protection forest project along the southern bank of Nanpanjiang River through Hongshui River to Xunjiang River; and the bank protection and water and soil conservation forest along the Xijiang River.

Between 2001 and 2010, about 622,000 hectares will be planted to raise the forest cover in the programme area up to 56%, bring obvious improvement to the local environment and initiate achievement of the wish for dense forests and bumper harvests.

2.3.9 Integrated Shelterbelt Development Programme in Liaohe River Valley

This programme plans to give priority to erosion control and combating wind and sand damage in the light of the local natural and ecological conditions so as to eradicate fundamentally the adverse impacts of natural calamities. It covers 77 counties/cities/banners in Hebei, Inner Mongolia, Jilin and Liaoning provinces/autonomous region. During the Ninth Five-Year Plan period, priority will be given to shelterbelt development primarily for water and soil conservation, head water conservation, and windbreaking and sand fixation, and development of economic and fuelwood forests with moderate expansion of the timber plantations. The total planned area for afforestation is 717,000 hectares. Major projects include: project for establishing water and soil conservation forests along the upper and middle reaches of the Liaohe River; project for establishing head water conservation and water and soil conservation forests along the upper reaches of Xilamulun River; water and soil conservation forest project along the upper reaches of Jiaolai River; project for establishing water and soil conservation forests, windbreaks and sand fixing forests along the upper and middle reaches of the Liu-Rao river system; wavebreaking forests project along the flood prevention dikes of Liaohe River;

project for establishing water and soil conservation and head water conservation forests in low mountainous and hilly areas along the upper reaches of Dongliao River; water and soil conservation forests project in the wind and water eroded area of Dongliao River Plain; and headwater conservation forests and timber plantation project in the mountainous area in eastern Liaoning Province.

Between 2001 and 2010, 483,000 hectares will be planted which will bring under control such natural calamities as water and soil erosion, wind and sand damage, promote the steady development of agriculture and mitigate the imbalance between market demand and supply of the forest and subsidiary products.

2.3.10 Shelterbelt Development Programme along the Middle Reaches of the Yellow River

This programme encompasses 177 counties/cities/banners in Inner Mongolia, Shaanxi, Shanxi, Gansu, Ningxia and Henan provinces/autonomous regions and aims at controlling water and soil erosion in the Yellow River Valley, reducing sand and earth content in the Yellow River. It is to bring into maximum play the role of major water storage facilities in the programme area in flood and avalanche control, reduction of sediments as well as in water supply and power generation and safeguarding people's living conditions and high and stable yield in agriculture.

During the Ninth Five-Year Plan period, priority shall be given to establishment of headwater conservation forests along the upper reaches of all tributaries, bank and slope protection forests along the main course and its tributaries and on steep mountain slopes; farmland and pastureland shelterbelt networks and water and soil conservation forests on flat land, ridges, earth mounds and flat hilly areas; and timber oriented protection forests and economic forests along fertile and moist river banks. The planned area for afforestation is 1.05 million hectares.

Between 2001 and 2010, about 2.1 million hectares are to be planted to raise the forest cover up to 24.4%, which will bring about remarkable improvement of the environment, protect farmland, decrease the sand and mud flow into rivers and substantially reduce sediments in water conservancy facilities.

2.4 Forest Protection

2.4.1 Status-quo

The Chinese government attaches great importance to forest fire prevention and control, and requests governments at all levels to implement stringently the Regulations on Forest Fire Prevention and Control and relevant local rules and regulations, following the guideline of “prevention first and control”. The forest fire prevention target responsibility system is adopted to strengthen fire prevention infrastructure development and crew training, and reinforce fire prevention centring around fire origin management with remarkable achievement score

In recent years, there has been a promising trend of overall decline in the occurrence of forest fires. The control rate of forest fire in 1994 over the country was almost 1.2 times higher than that of 1993, and 1.1 times higher than the average level of the previous 6 years, making a new best historical record.

Prevention of forest pests and diseases has been strengthened with the rate of prevention and control being increased substantially. In the Seventh Five-Year Plan Period, a total of 14.93 million hectares of forest diseases and pests affected land have been brought under control, a rise of 8.9% compared to that in the Sixth Five-Year Plan period. The trend indicates that the controlled area is enlarged year by year. The rate of integrated prevention and control has increased to 40% from 36.7% in the Sixth Five-Year Plan period. The integrated prevention and control projects have achieved initial success. About 156 counties in 21 provinces/municipalities/autonomous regions have been organized to conduct the integrated control activities for various types diseases and pests on 3.7333 million hectares of land with promising results achieved.

Nevertheless, China still faces a major challenge and arduous tasks of forest protection. The present fire prevention infrastructure in China is inadequate to fulfil the task and falls short of the requirements for the establishment of “four networks and two specializations”, i.e.: fire risk prediction and forecast network, lookout network, communication network, firebreaks network, personnel specialization and specialization of fire suppression equipment. Fire prevention facilities for virgin forests are rather poor; the facilities for observation, communication, transportation and fire control for collectively owned forests in southern China are inadequate; there are no fire prevention facilities at all for forests in some remote mountainous areas; the comprehensive prevention and control system for forest fires remains fragile.

In China, the problem of forest pests and disease remains extremely serious with increasing types of pests and diseases, expanding affected areas, and shortening of intervals between attacks. According to general survey, there are 8,000 types of forest pests and diseases among which 2,900 are forest diseases with over 200 of them being capable of reaching epidemic scale and over 100 frequently causing disasters of damage. Since 1980, the annual affected forest area has exceeded 6.67 million hectares with the worst year being over 10 million hectares, the loss in annual wood growth amounts to 15 million cubic meters, equivalent to 4% of the annual consumption of forest resources nation-wide, and the financial loss about RMB 2 billion yuan. The area affected by forest pests and diseases in 1994 also reached 7 million hectares.

2.4.2 Trend of development for forest fire prevention and control

Among the intended achievements are: a) enhance the overall capacity for forest fire prevention and control, gradually reduce the number of forest fire occurrence and the scale of damage, bring the percentage of affected areas to below one per thousand and try to eliminate tremendous forest fires and severe human casualties all together. Realize eventually the “four networks and two specializations” in all class I, II and III fire danger zones by the end of this century; and (b) establish and improve the organizational and command system for forest fire prevention, formulate and improve rules and systematic measures for fire prevention for class I, II and III fire danger zones, focusing on the following five key projects:

- The Forest Fire Risk Prediction and Forecast Project. Establish a system for the monitoring and forecasting of forest fire dangers, using the national meteorological satellite services; establish a system for the evaluation of fire dangers and a supporting system for fire prevention decision making, utilizing computer database management and geographical information system software as the basis;

- The Forest Fire Monitoring and Lookout Project. Establish 10,000 lookout towers or posts nation-wide by the year 2000 to complete the formation of a command system for forest fire prevention and fire fighting;

- The Radio Communication Project for Forest Fire Management. Acquire or replace 18,000 radio transmitters, 80,000 walkie-talkies and 1,280 facsimile machines by the year 2000;

- The Aerial Surveillance Plane Airstrips Project. Complete or Improve the existing ground-guarantee facilities of seventeen airstrips for air surveillance planes;

- The Firebreaks Development Project.

2.4.3 Trend of development for prevention of forest diseases and pests

Control the disease and pest-affected areas and damage degree nation-wide by "one decrease (decrease of the frequency of occurrence) and three increases (increase of the coverage of prevention, quarantine and monitoring)'. By the end of this century, complete the preliminary establishment of a nation-wide system of prevention and quarantine stations, monitoring and forecasting network, quarantine inspection network, prevention and control network, and the development of "one station, three networks and two specializations". A prevention and control system will be established during the Ninth Five-Year Plan period for the major forest regions and the worst affected areas, achieving a 70% coverage of comprehensive prevention and control for these areas.

By the year 2000, complete the initial establishment of a system for prevention, control and supervision of forest pests and diseases in major afforestation areas of national shelterbelt programmes and the worst affected areas of forest pests and diseases which will include the following components:

- Project focusing on prevention and control of diseases and pests affecting poplars across the entire northern part of China;
- Project focusing on prevention and control of pine caterpillars affecting forest regions in the north-east and Inner Mongolia, forest farms in the north and north-west of China and in the collectively-owned forest regions in southern China;
- Project focusing on prevention and control of *Cryptothelea variegata* affecting shelterbelts in the farming areas of central China;
- Project focusing on prevention and control of seriously damaging forest pests and diseases;
- Project focusing on prevention and control of destructive forest rats.

2.5 Conservation of Biodiversity of Forests and Wetlands

2.5.1 Status-quo

China is one of the countries in the world which host the most diverse wild fauna and flora species including 32,800 higher plants and 104,500 animal species. As the majority areas in China were not affected by the Quaternary Clacier, about 10,000 ancient, relic and endemic species of 200 genera have been preserved; China is also one of the three major centres of origin for cultivated plants in the world, with a lot of wild related species of cultivated plants.

The natural wetlands in China include marsh, peatland, meadow, salty plateau lake, salinized marsh and coastal wetland, etc., which cover an area of 25 million hectares throughout the country, accounting for 2.6% of China's total land area.

The Chinese government attaches great importance to conservation and utilization of forest biodiversity, wild fauna, flora and wetlands, and has promulgated *the Forest Law*, *the Law of Wildlife Conservation*, and acceded to *the UN Convention on Biological Diversity*, *CITES* and the *Convention on Wetlands of International Importance Especially as Waterfowl Habitats*.

China has made considerable progress in conserving and utilizing forest biodiversity, wild fauna, flora and wetlands. It has set up over 500 nature reserves for conserving forest and wetland ecosystems and wild fauna and flora; compiled *Forests in China, Flora Sinica, Fauna Sinica* and *the Red Data Book of Botany in China*; and enhanced the studies on the conservation and breeding techniques of the rare and endangered species of wild fauna and flora. In a bid to rescue and breed rare and endangered plant species, China has set up over 400 *ex-situ* conservation and regeneration areas and germplasm resource banks, more than 120 botanical gardens and arboreta which bring under protection 18,000 species and 90% of State protected wild plant species have been preserved in the *ex-situ* conservation process and nearly 1,000 rare and precious plants been protected and bred. By now, artificial breeding of such endemic rare and endangered plant species as *Cathaya argyronhylla*, *Metasequoia glyptostroboides* and *Davidia involucrata* has been successful.

By 1995, there were 799 different type nature reserves in China covering 7.185 million hectares. For conservation of forest and wetland ecosystems and wild fauna and flora, 574 nature reserves covering 61.12 million hectares or 6.37% of the country's total land area has been established of which 71 are national nature reserves covering 10.12 million hectares; 12 reserves had been incorporated into the Man and Biosphere Nature Reserve Network of UNESCO. The forestry sector also manages 751 forest parks with a total area of 6.6 million hectares.

2.5.2 Trend of development for biodiversity conservation

The following is intended (a) complete the baseline inventory of China's forest biodiversity and wild fauna and flora by the year 2000; (b) improve the *in-situ* and *ex-situ* conservation networks for the rare and endangered wildlife species for an appropriate layout of the conservation network and a better means of conservation as well by the year 2000; and (c) attach great importance to the wise use of wild fauna and flora resources while strengthening the conservation of forest biodiversity and wild fauna and flora.

2.5.3 Trend of development for conservation of wetland resources

By the year 2000, *China Wetland Conservation Action Plan* will be hammered out and the baseline inventory of China's wetland resources be completed. By the year 2010, *China Wetland Conservation Action Plan* will be fully implemented which will hold back destruction of wetland resources and ensure the comprehensive conservation and wise use of China's wetland resources.

2.5.4 Trend of development for nature reserves

Eighty new nature reserves of forest ecosystem, wetland ecosystem and wild fauna and flora types will be set up from 1996 to 2000, of which 36 are national nature reserves. Thus, the total number of nature reserves and national nature reserves will reach respectively 600 and 100, with the total area reaching 60.59 million hectares. Another 100 nature reserves will be set up between 2000 and 2010, of which 50 are national nature reserves, bringing the total number of nature reserves and national nature reserves to 750 and 150 respectively, and the total area to 70.68 million hectares. The total number of nature reserves in China will reach 800 by 2050 of which 180 will be national nature reserves. The level of development for the national nature reserves and some provincial nature reserves will meet the criteria set forth by the Ministry of Forestry.

Enhance management and conservation of nature reserves, raise the level of management and conservation. With this serving as a basis, efforts shall be made to use resources in a proper way and enhance the self sustaining ability of nature reserves.

A national nature reserve network, appropriate in size and distribution, complete in grades and types will take shape by 2010.

2.6 Demand, Supply and Trade of Forest Products

2.6.1 Production of Major Forest Products

2.6.1.1 Logs

For decades, the domestic supply of logs in China has consisted of three components, i.e.: logs under planning, logs outside planning, and fuelwood. The government has accurate statistics on logs (some fuelwood included) under the State planning which is officially published each year by the Ministry of Forestry. However, there are no official and accurate statistical data for logs outside State planning and fuelwood; indirect guess work and estimation have to be applied in most cases.

As per the statistics of the Ministry of Forestry, production of logs (some fuelwood included) in China between 1981 and 1994 is given in Table 13:

Table 13 - Timber Production in China Under Planning 1981-1994, Unit: 1,000 cubic meters

Year	Production		Year	Production	
	Industrial	Fuelwood		Industrial	Fuelwood
1981	45,430	3,990	1988	57,510	4,670
1982	46,510	3,990	1989	50,370	7,650
1983	47,790	4,530	1990	51,090	4,620
1984	57,290	6,560	1991	52,890	5,180
1985	58,330	4,900	1992	56,270	5,470
1986	59,620	5,400	1993	58,600	5,320
1987	59,540	4,540	1994	60,130	6,020

Source: Forestry Yearbook of China, 1994

Table 14 - Total and Breakdown of Forest Resource Consumption in China 1988-1994, Unit: 1,000 cubic meters

Breakdown	1988		1989		1990		1991		1992		1993		1994	
	consumption	%	consumption	%	consumption	%	consumption	%	consumption	%	consumption	%	consumption	%
Total	328,496	100	300,727	100	297,264	100	292,661	100	298,057	100	296,654	100	298,292	100
commercial use	124,895	38	118,723	39.5	115,919	39	119,075	40.7	127,920	42.9	128,637	43.3	131,743	44.2
local consumption	70,528	21.5	58,064	19.3	63,986	21.5	60,937	20.8	58,289	19.6	61,393	20.7	62,018	20.8
Wood for mushroom cultiva.	7,970	2.4	7,433	2.5	6,529	2.2	6,434	2.2	7,820	2.6	7,674	2.6	8,161	2.7
fuelwood	106,815	32.5	104,670	34.8	97,101	32.7	92,186	31.5	92,071	30.9	88,403	29.8	85,936	28.8
loss in disasters	8,016	2.5	6,806	2.3	4,843	1.6	7,626	2.6	7,564	2.5	6,351	2.1	6,675	2.2
others	8,909	2.7	5,031	1.7	8,886	3.0	6,403	2.2	4,393	1.5	4,196	1.4	3,759	1.3

Source: Department of Resources and Forestry Administration of the Ministry of Forestry, 1994.

Supply and consumption of timber outside State planning and fuelwood are usually estimated figures with reference to the State's actual consumption of forest resources. Due to the fact that the statistical data on national consumption of forest resources are from the findings of the regular national forest resources inventories, they reflect well the actual annual roundwood consumption in China. According to statistics from the fourth national forest resources inventory done from 1989 to 1993, the annual consumption volume of forest resources in China during that period was 346.24118 million cubic meters. If calculated using 65% as the average timber recovery rate for standing stocks, the national timber production would come out to be 225.0572 million cubic meters. This figure is much higher than the presently published production volume in statistics.

Though the timber production volume calculated based on forest resources inventory can be more accurate in reflecting the actual situation of China’s timber production, there are certain limitations. The work is done periodically (once every five years), thus only capable of providing an average figure for the years during the inventory, while incapable of providing the resource consumption volume and timber production volume of each year.

Another problem with this figure is that it only shows the total consumption volume of forest resources, without defining its structure.

To make up for this shortcoming, the Department of Resources and Forestry Administration of the Ministry of Forestry has organized the Academy of Forest Inventory and Planning to carry out a survey on the country’s forest resources consumption volume once a year. This work is based on statistics collected from field survey on fixed spots and a calculation at the national level. The yearly forest resources consumption figures obtained through such a method are not as accurate as statistics from forest resource inventories, yet they can provide every year’s figures in time, and they can also provide the structure for resource consumption, thus this method is also widely used. Generally speaking, this figure is more rational and closer to the actual situation than the timber production figure published every year. Table 14 shows the consumption volume and structure of forest resources between 1988 and 1994.

Table 14 indicates that the annual roundwood consumption in China was between 193 - 214 million cubic meters during the period 1988-1994 excluding fuelwood consumption and loss in natural disasters. Based on a timber recovery of 65%, the annual timber production could be 125.45 - 139.1 million cubic meters. In the past decade, the Chinese government has adopted a series of measures to reverse the adverse trend of consumption exceeding growth and the excessive use of fuelwood, including formulation and implementation of the quota logging system, vigorous development of integrated timber utilization, strengthening forest protection and extension of alternative energy sources and the energy saving stoves in rural areas. Table 14 presents a favourable trend: forest resource consumption in China was stable and gradually decreased between 1988 and 1994, consumption of the standing stock volume decreased by 30.204 million cubic meters or 9.2%. During the same period, the following changes took place in the composition of forest resources consumption:

(1) *Increase in the proportion of commercial roundwood*. Commercial roundwood made up 44.2% of the total consumption of the standing stock volume in 1994, an increase of 6.848 million cubic meters or 6.2% compared to 38% in 1988. Although the increase was not big, it indicated a trend of gradual increase in the forest resources to meet the needs of the forest products industry.

(2) *Gradual drop in fuelwood consumption*. Fuelwood consumption in 1994 dropped by 20.879 million cubic meters or 15.8% compared to that in 1988. However, the proportion of fuelwood consumption in the total resource consumption is still large (28.8%, and even over 70% in some provinces). This indicates that there is great potential in increasing supply of industrial roundwood just by taking various resource saving measures.

(3) *Gradual decrease in local farmers' consumption of roundwood*. Compared to that in 1988, the local farmers' consumption of roundwood decreased by 8.51 million cubic meters in 1994 and its percentage share in the total consumption of the standing stock volume also dropped from 21.5% down to 20.8%. This trend is favourable for expanding supply of commercial roundwood and for development of the forest products industry.

2.6.1.2 Sawntimber

As per the statistics of the Ministry of Forestry, China's sawntimber production was 12.9434 million cubic meters in 1994 which was slightly less than that in 1993 and lower than the peak production in 1995 (15.908 million cubic meters). Sawntimber production in China since 1981 is illustrated in Table 15.

Table 15 - Sawntimber Production in China Between 1981-1994, Unit: 1,000 cubic meters

Year	Production	Year	Production
1981	13,011	1988	14,684
1982	13,609	1989	13,933
1983	13,945	1990	12,849
1984	15,086	1991	11,415
1985	15,908	1992	11,187
1986	15,052	1993	14,013
1987	14,719	1994	12,943

Source: National Forestry Statistics, 1994.

In the last decade and over, sawntimber production in China has been stagnant and started to decline since 1985. The main reason was the gradual decline in the quality of forest resources, particularly decline in large diameter resources of such common species as *Pinus koraiensis, Cunninghamia lanceolata, Picea spp., Abies spp., Fraxinus mandshurica* and *Quercus mongolica*. This not only has direct impact on the quantity of sawntimber production but also lowers the quality of products. In addition, many timber demanding units purchase roundwood and process by themselves or contract out to individually owned or collective small scale factories to process into sawntimber products which are not included in the national statistics of sawntimber production. This is also a direct cause of the relatively small figure in the statistics of national sawntimber production.

2.6.1.3 Wood-based Panels

Plywood

Before the 1980s, development of China's plywood industry was very slow. The total production of plywood was merely 329,900 cubic meters in 1980. After China adopted the policy of reform and opening to the outside world together with increasingly more overseas investments, plywood production has increased steadily. By 1994, the national production of plywood had reached 2.606 million cubic meters. Plywood production in China between 1981 and 1994 is given in Table 16.

Table 16 - Plywood Production in China 1981-1994, Unit: 1,000 cubic meters

Year	Production	Year	Production
1981	351	1988	827
1982	394	1989	728
1983	455	1990	759
1984	490	1991	1,054
1985	539	1992	1,565
1986	611	1993	2,125
1987	776	1994	2,606

Source: National Forestry Statistics, 1994.

Plywood products made in China are mainly utility plywood products with very little special plywood products except a small quantity of bamboo plywood. Of the total plywood production in 1993 and 1994, the special plywood accounted for only 37,100 cubic meters and 28,900 cubic meters respectively; bamboo plywood production was 93,100 cubic meters and 51,200 cubic meters respectively.

Fibreboard (MDF included)

For a long period of time, fibreboard production in China was dominated by wet pressed hardboard and MDF production started production since the early 1980s. Since the early 1990s, production of wet pressed hardboard has been stagnant and shrinking due to small production scale, poor quality of products and environmental pollution. Instead, MDF production has witnessed rapid development. Softboard (non-compressed fibreboard) is produced only in few Chinese factories with an annual production of less than 10,000 cubic meters (Table 17). In addition, there is also some small scale production of non-wood fibreboard using agricultural residues and bagasse.

Table 17 - Fibreboard Production in China 1981-1994, Unit: 1,000 cubic meters

Year	Total	Wooden fibreboard				Non-wood fibreboard
		subtotal	hardboard	MDF	softboard	
1981	568.3					
1982	669.9					
1983	734.5					
1984	735.9					
1985	895.0					
1986	1,027.0					
1987	1,206.5					
1988	1,484.1					
1989	1,442.7					
1990	1,172.4	1,082.6	992.9	86.9	2.8	89.3
1991	1,174.3	1,056.9	914.2	136.6	9.0	117.4
1992	1,444.5	1,301.8	1,016.2	285.6		142.7
1993	1,809.7	1,648.7	1,330.3	312.9	5.5	161.0
1994	1,930.3	1,805.7	1,508.3	289.2	8.2	124.6

Note: Production before 1989 was mainly hardboard.
Source: National Forestry Statistics, 1994.

Particleboard

In the early 1980s, China started its adjustment of the industrial policy on wood-based panels and shifted priority in wood-based panel development from hardboard to the development of particleboard. Along with the subsequent increase in investment and in introduced equipment, particleboard production has been gradually increasing. By 1992, the national production had exceeded 1 million cubic meters. Raw material for particleboard production in are mainly residues of timber processing industries, poor quality and small diameter roundwood, the proportion of non-wood particleboard is very small. Furthermore, four OSB (oriented structural board) factories are to enter into operation soon in China, but the designed capacity for these factories are quite small with a total annual capacity of less than 60,000 cubic meters. Particleboard production in China between 1981 and 1994 is shown in Table 18.

Table 18 - Particleboard Production in China 1981-1994, Unit: 1,000 cubic meters

year	total	ordinary particle board	cement particle board	non-wood particle board	year	total	ordinary particle board	cement particle board	non-wood particle board
1981	76.7				1988	483.1			
1982	102.7				1989	442.0			
1983	127.4				1990	428.0	394.6	1.7	31.7
1984	164.8				1991	613.8	567.5		46.3
1985	182.1				1992	1,158.5	1,078.7		59.8
1986	210.3				1993	1,571.3	1,500.8		70.5
1987	377.8				1994	1,682.0	1,592.0	0.5	89.5

Note: Production before 1989 was mainly ordinary particleboard.
Source: Forestry Statistics of China, 1994.

2.6.1.4 Paper and paperboard

Along with the rapid advancement of the national economy and the sharp increase in demand for paper products, China's paper making industry has scored remarkable development in the last decade. In particular since the mid-1980s, production of paper and paperboard has been tripled. By 1994 the production reached 21.38 million tons nearly tripling the production of 1981. For details, see Table 19.

Table 19 - Paper and Paperboard Production in China 1981-1994, Unit: 1,000 tons

Year	Production	Year	Production
1981	5,400	1988	12,700
1982	5,890	1989	13,330
1983	6,610	1990	13,720
1984	7,560	1991	14,790
1985	9,110	1992	17,250
1986	9,990	1993	18,680
1987	11,410	1994	21,380

Source: China Paper Making Yearbook, 1994.

2.6.2 Consumption of Major Forest Products

2.6.2.1 Industrial Roundwood

Due to the substantial decline of the domestic harvestible forest resources, particularly depletion of large diameter roundwood and plywood logs, and the strict quota logging system of the State for control of excessive resource consumption, the Chinese government adopted, since the early 1980s, the policy of appropriate import of large diameter industrial roundwood. Table 20 presents the total commercial roundwood consumption under the State planning and the total consumption of industrial roundwood (outside plan supply included) between 1981 and 1994 including the imported roundwood.

Table 20 - Consumption of Industrial Roundwood in China 1988-1994[1] 1,000 cubic meters

Year	Industrial round-wood consumption under planning	Total industrial roundwood consumption	
1988	68,185	91,857[2]	132,205[3]
1989	56,780	83,580	119,743
1990	55,283	79,540	121,182
1991	56,987	81,496	121,190
1992	60,940	87,818	126,119
1993	62,067	87,081	128,508
1994	63,465	88,968	131,249

Source: Forestry Yearbook of China, 1994; Customs Statistics of China, 1994.

Note: 1. Industrial roundwood import included.
2. Estimation based only on consumption of commercial timber resources.
3. Including commercial timber, timber for farmers' own use and planting materials for propagation.

Calculations based on Table 20 indicate that the per capita consumption of industrial roundwood under State planning was only 0.05 cubic meters in 1994 and the per capita consumption of total industrial roundwood was 0.07-0.11 cubic meters (1994).

2.6.2.2 Sawntimber

Many users process sawntimber on their own with roundwood purchased. Therefore, although consumption of sawntimber as such is a lot, no accurate statistics can be expected. If only based on the recorded national production of sawntimber together with import but excluding export, statistical data on sawntimber consumption in China between 1988 and 1994 are given in Table 21.

Table 21 - Recorded Sawntimber Consumption in China 1988-1994, Unit: 1,000 cubic meters

Year	Sawntimber consumption
1988	15,073
1989	14,054
1990	13,015
1991	11,623
1992	11,238
1993	15,001
1994	13,508

Source: Forestry Statistics of China, 1994; Customs Statistics of China, 1994.

2.6.2.3 Wood-based Panels

Consumption of wood-based panels in China has been dominated by plywood for many years, even at present. For instance, of the total wood-based panel consumption in 1994, plywood consumption (import included) made up as high as 57%. The direct cause for a constantly large plywood demand is the continuously increasing demand for plywood by such sectors as furniture making, interior decoration and vehicle and ship manufacturing along with the rapid national economic development. On the other hand, increasing number of plywood plants established with overseas financing, vigorous development of small scale township/town plywood mills and big imports of cheap plywood from the south-east Asian countries provide sufficient supply for the plywood market in China. Today, the annual plywood consumption in China is around 4-5 million cubic meters. Plywood consumption in China between 1988 and 1994 is given in Table 22.

Table 22 - Plywood Consumption in China 1988-1994, Unit: 1,000 cubic meters

Year	Production	Import	Export	Consumption
1988	827	1,352	8	2,171
1989	728	1,073	9	1,792
1990	759	1,377	21	2,115
1991	1,054	1,463	22	2,495
1992	1,565	1,585	43	3,107
1993	2,125	1,513	45	3,593
1994	2,606	2,177	106	4,677

Source: Forestry Statistics of China, 1994; Customs Statistics of China, 1994.

As for other panel products such as fibreboard (MDF included) and particleboard, there is little import and export, the market demand is primarily met by domestic production.

2.6.2.4 Paper and paperboard

Despite of the rapid development in China's paper making industry in recent years, the domestic market demand can not yet be met not only in quantity, but more importantly, in quality the end users require. Due to the fact that 60% of the raw material for pulp making in China is crop straws, wood pulp (including imported wood pulp) making up only 14% and waste paper 25%, sufficient quantity of high quality paper and various special paper products cannot be produced. In this connection, large quantities of pulp and paper products have to be imported every year to meet the demand of the domestic market for high quality paper products. Consumption of paper and paperboard in China between 1988 and 1994 is given in Table 23.

Table 23 - Consumption of Paper and Paperboard in China 1988-1994

Year	Consumption of paper and paperboard (1,000 tons)
1988	13,429
1989	14,166
1990	14,629
1991	16,093
1992	19,377
1993	20,428
1994	24,270

Source: Paper Making Yearbook of China, 1994.

Note: The consumption of paper and paperboard in China further increased to 30.62 million tons by 1995, ranking the second in the world compared to the third of 1994. Yet the per capita consumption volume is still rather low, being 20.2 kg/person/year in 1994, ranking 63 in the world, and increased to 25.1 kg/person/year in 1995, ranking 57 in the world.

2.6.3 Import, Export and Trade of Major Forest Products

Before the mid-1970s, China basically followed the routine of a self-sufficient economy and, as in other economic sectors, value of forest products trade was very low. Ever since 1980s, along with implementation of the reform and open-door policy, economic development has entered a high growth period. Simultaneously, population growth and decline of domestic forest resources further worsened the existing imbalance between wood demand and supply. Shortage of timber and other forest products became a major restraining factor hindering development of the national economy. Within this context, in order to secure the normal operation of the national economy, meet the people's demand, prevent the existing forest resources from further depletion and protect the fragile ecosystem and environment, the Chinese government made a strategic decision, that is, although China is in a tight economic situation and falls extremely short of foreign exchange, a certain amount of foreign exchange has to be allocated for import of timber and other forest products in urgent need.

2.6.3.1 Import of Forest Products

The forest products China imports fall into 6 major categories, i.e.: logs, plywood, pulp (including waste paper), paper and paperboard, sawntimber and veneer. Between 1981 and 1992, logs dominated the forest products China imported with accumulative value of import for the 12 years reaching US$ 7.04 billion, accounting for 32% of China's total import value, followed by paper and paperboard: US$ 6.45 billion or 29%, followed by pulp and waste paper: US$ 4.99 billion or 19%, and finally plywood: US$ 3.972 billion or 18%. In recent years, along with log export bans adopted by increasing number of countries and the continuous price increase for logs (including temperate conifers and tropical hardwoods), the volume of log imports into China has dropped while its import of plywood, veneer, paper and paperboard keeps on increasing; import of pulp, waste paper and sawntimber remains steady with moderate increase (Table 24).

Table 24 - China's Import of Forest Products 1981-1994

Year	Roundwood 1,000 m^3	Sawntimber 1,000 m^3	Plywood 1,000 m^3	Veneer 1,000 m^3	Pulp/wastepaper 1,000 tons	Paper/paperboard 1,000 tons
1981	1,871	75	259	0.3	710	766
1982	4,652	132	5,140	8.4	584	459
1983	6,613	162	304	4.9	977	517
1984	7,956	600	573	1.2	824	608
1985	9,820	148	824	2.3	779	863
1986	7,818	165	621	0.9	737	1,095
1987	7,189	98	1,406	30.2	979	1,336
1988	10,675	392	1,352	24.6	788	852
1989	6,410	125	1,073	13.5	465	858
1990	4,193	252	1,377	5.8	765	952
1991	4,097	306	1,463	27.9	1,291	1,339
1992	4,670	974	1,585	241.4	1,343	2,443
1993	3,467	1,318	1,513	350.0	1,300	2,500
1994	3,335	955	2,177	239.0	1,410	3,180
Total	82,757	5,702	15,041	950.4	12,952	17,768
Equivalent annual growth rate (%)	4.5	21.5	17.8	Infinite	5.4	11.6

Source: Customs Statistics of China, 1994.

Before 1991, roundwood import consisted of mainly coniferous species but changes began to take place since 1992. For instance, the proportion of conifers reduced from 88.8% in 1988 sharply down to 35.7% in 1994. Meanwhile, the proportion of hardwood import has soared up rapidly from 11.2% to 64.3% (Table 25).

Table 25 - China's Import of Roundwood 1988-1994, Unit: 1,000 cubic meters

Items	1988	1989	1990	1991	1992	1993	1994	Equivalent Annual growth %
Total roundwood import	10,675	6,410	4,193	4,097	4,670	3,467	3,335	-21.5
Conifer import	9,484	5,650	3,474	2,491	2,225	1,519	1,191	-41.2
% of conifer import	88.8	88.1	82.8	60.8	47.6	43.8	35.7	-
Hardwood import	1,191	760	719	1,606	2,445	1,887	2,033	9.4
% of hardwood import	11.2	11.9	11.2	39.2	85.4	56.2	64.3	-

Source: Customs Statistics of China, 1994.

The coniferous roundwood China imports is mainly from the United States, dominated by Douglas Fir and Hemlock. For instance, the US proportion in China's' import of coniferous roundwood in 1988-1989 was 61.6%. However, due to the high prices for the US products, China's import of coniferous roundwood from Russia and New Zealand have increased in recent years and tend to keep expanding. China's imports of hardwood logs, plywood, veneer and even sawntimber are primarily tropical products. China's import of tropical forest products between 1988 and 1994 is illustrated in Table 26.

Table 26 - China's Import of Tropical Forest Products 1988 - 1994, Unit: 1,000 cubic meters

Product	1988	1989	1990	1991	1992	1993	1994	Equivalent Annual growth %
roundwood	940.4	337.1	690.6	1,394.6	1,775.9	1,887.3	2,032.9	13.7
plywood	1,199.6	827.1	1,301.6	1,416.7	1,423.6	1,371.0	2,177.2	10.4
veneer	17.7	12.5	5.4	27.1	206.8	287.0	193.3	49.0
sawntimber	210.7	44.8	153.8	88.0	459.6	703.0	714.6	22.5

Source: Customs Statistics of China, 1994.

China's import of tropical hardwood logs are mainly of *Parashorea* species and other species suitable for plywood production. And *Parashorea* species roundwood is mainly imported from Malaysia and other tropical hardwoods for veneer production are from western African countries such as Gabon, Cameroon, Equatorial Guinea etc. and Papua New Guinea. In addition, some products of valuable tropical species such as *Tectona grandis, Phoebe bournei, Bixa orellana,* etc. are imported from Myanmar, Laos, Cambodia, etc.

Thin plywood, mainly from Indonesia and Malaysia, dominates the plywood products China imports. For a long period of time, Indonesian plywood has dominated China's domestic market for imported plywood. However, changes are taking place in recent years: the Malaysian plywood is taking over the market of the Indonesian plywood due to its relatively low, thus competitive, prices. The tropical veneer and sawntimber products China imports are also from Malaysia and Indonesia.

2.6.3.2 Export of Forest Products

China is deficient in timber resources and hence has little export of forest products, especially the resource consuming products such as roundwood, sawntimber and plywood. In recent years, eucalupt plantations established in provinces such as Guangdong and Hainan are

entering into harvested age, large volume of woodchips are being exported to Japan (Table 27).

Table 27 - China's Export of Forest Products 1988-1994

Products	1988	1989	1990	1991	1992	1993	1994
roundwood (1,000 m^3)	314	475	91.2	135.0	237	155	91.0
sawntimber (1,000 m^3)	3	4	86.0	98.0	923	330	390.0
veneer (1,000 m^3)			2.0	4.0	72	16	17.0
plywood (1,000 m^3)	8	9	21.0	21.8	238	45	106.0
woodchip (1,000 tons)			292.0	535.0	505	759.1	1,897.7

Source: Customs Statistics of China, 1994.

Table 28 - China's Export of Forest Products in 1995

Product	Volume	Value (US$ 1,000)	% compared to last year	
			Quantity	Value
resin	0.04 tons	22.51	-12.3	-2.9
rosin	282,600 tons	166 00	-11.3	17.5
woodchip	1,897,700 tons	174 00	66.1	11.8
conifer timber	69,900 tons	722.23	1,238.1	755.0
non-conifer timber	1,837,800 tons	167 00	51.7	114.0
charcoal	26,100 tons	1,536.54	71.6	113.0
roundwood	97,100 m^3	4,715.26	7.0	9.2
sleeper	1,200 m^3	11.94	900.8	750.3
sawntimber	408,000 m^3	195 00	11.5	18.6
veneer	21,100 tons	2,801.25	70.7	83.3
particleboard	5,400 tons	279.84	110.3	106.8
fibreboard	43,800 tons	1,288.12	53.3	16.6
plywood	129,000 m^3	3,907.01	25.3	23.5
chemical/semichemical wood pulp	27,000 tons	1,747.26	-84.2	-75.6
waste paper	15,900 tons	170.16	9.4	73.3
paper and paperboard	530,000 tons		200.0	
furniture*		70 037.17		28.8

* Note: Chairs and benches, medical furniture, mattress and bedroom furniture are not included.
Source: Customs Statistics of China, 1995.

China's export of forest products has always been dominated by economic forest products such as walnut, chestnut, Chinese date and bamboo shoots, followed by rosin and other products. But along with the development of the forest products industry and continuous increase of overseas investment, export of value added products, e.g.: paper and furniture, is increasing day by day with a favourable trend of surpassing the old-timers

The serious imbalance of trade in forest products and enormous trade deficit are not only a heavy economic burden for China as a developing country but also grievously hinder the overall economic development. In order to reverse the adverse situation and replace the one-way deficiency-supply trade by a two-way complementary trade, the Chinese government has formulated policies to encourage expansion of forest product export. Key measures to implement such policies include:

(1) *Establishing export-oriented forest products production and processing bases.* Several export-oriented forest products bases will be established in China by the end of this century which include pulp making base, wood-based panel (plywood, particleboard and MDF) production base, rosin processing base, bamboo processing base, furniture production base and tannin extract making base.

(2) *Improving structure of forest product export.* Establishment of the above-mentioned forest product bases will initiate a transition from the current pattern of export which is dominated by export of raw material and primary products into a new one which will be dominated by export of semi/final products and processed products.

(3) *Raising funds from diverse sources*. In order to establish the above bases as soon as possible, the Government will raise funds from diverse sources, i.e.: cooperation between forestry and related industrial sectors, between the Central and local governments, between Chinese and overseas counterparts (including overseas investment and international loans).

(4) *Restructuring the management system.* In order to secure the smooth implementation of the policies and provide a healthy working environment, the management system will be restructured in a phased way. The proposed practice will be: the previous sectoral and local management will be replaced by line management with establishment of sectoral group corporations so as to expand production scale and raise economic benefits.

(5) *Adopting incentive and preferential policies*. In order to encourage and support the establishment of the forest products bases (especially for the value added products), the government will provide preferential policies for organizations, corporations and enterprises concerned with regard to taxation, use of foreign exchange, import of raw materials and introduction of technologies and equipment.

2.7 Forest Products Industry

2.7.1 *Status Quo* of the Industry[4]

2.7.1.1 Major Achievements after the Founding of the P.R. China

The forest products industry in old China was least developed with limited production of sawntimber, plywood and paper making only in a few big cities in north-east China and along the coast. After the founding of the people's Republic of China (in 1949), the forest products industry has experienced rapid development which is highlighted by:

(1) Establishment of a modern industrial system with a full range of products. As far as variety of product is concerned, in addition to sawntimber, plywood and ordinary paper products, production is also underway for fibreboard (MDF included), particleboard (OSB, cement-bonded particleboard and gypsum particleboard included), decorative materials for secondary processing and all kinds of special paper and paperboard products[5].

(2) Substantial improvement in quality and quantity of products: for instance, China's sawntimber production has increased from 3.437 million cubic meters in 1950 to 12.94 million cubic meters in 1994, plywood production from 16,900 cubic meters in 1951 to 2.606 million cubic meters in 1994, paper and paperboard production from 0.11 million tons in 1949 to 21.38 million tons in 1994, fibreboard and particleboard production from nil to 1.93 million and 1.682 million cubic meters in 1994 respectively. Furthermore, extensive substitution of synthetic resin for protein glue and application of adjustment and control automation in all wood-based panel and pulp and paper production lines have improved quality of related products to a great extent.

(3) Remarkable improvement of production techniques and equipment. Mechanization has been introduced for sawntimber production to set up modern continuous production lines which has reduced the heavy labour work in some major sections of large sawmills. Continuous operation and automation have been introduced in the production of fibreboard, plastic lamination board, paper and paperboard. At present, the above-mentioned production lines mainly composed of introduced sets of equipment have reached the level of the developed countries in the 1980s and quite a few have reached the standard of the developed countries in the 1990s.

---

[4] China carried out the third industrial inventory in 1996, which is completed by now. As far as the forestry industries are concerned, the statistics obtained from this inventory are closer to reality than published figures. Yet, due to some technical problems such as statistical methods, there are still some problems with it, and some errors have been detected already. Since statistics of year 1995 provided by this inventory are greatly different from previous statistics, and more confirmation and checking is necessary, so such figures are not cited in this article.

According to information from the national industrial inventory done in 1996, the production volume of China's major forestry products in 1995 is as follows: sawntimber - 41,837,800 m^3; wood-based panels - 16,846,000 m^3; (of which: plywood - 7,593,000 m^3; fiberboard - 1,791,000 m^3; including MDF - 537,000 m^3; particle board - 4,350,000 m^3; others - 2,738,000 m^3).

[5] Accompanying growth of forest industries has been machine manufacturing. The machinery and equipment manufacturing system has been established for the forest products industry which can produce not only different kinds of saws, planing machines, milling machines and sanding machines, but also complete production lines for making plywood, particleboard (OSB), fibreboard (MDF), and decorative materials for wood-based panels and pulp and paper making.

(4) Establishment of an independent and complete educational, research and designing system and formation of a competent technical force.

2.7.1.2 The Main Aspects of Under-Development Compared to the Industrialized Countries

Since the founding of the People's Republic of China, remarkable achievements have been made in China's forest products industry. However, compared to the developed countries and advanced international standards, China still has a long way to go in this regard, which is highlighted in the following aspects:

(1) *Low level of per capita consumption of major forest products.* The average annual consumption of sawntimber, wood-based panels, paper and paperboards per 1,000 people reaches 77 cubic meters, 24 cubic meters and 45 tons respectively in the world but only 11 cubic meters, 4 cubic meters and 20 tons respectively in China (exports included).

(2) *Inappropriate structure of timber consumption and product composition*. The annual fuelwood consumption still accounts for 28.8% of its total consumption of forest resources and that for industrial timber only 44.2% (not including local self-supply consumption and timber used for sideline production). Of the industrial wood consumption, wood consumption for wood-based panel production is about 14.4 million cubic meters making up merely 16.8% of the industrial wood consumption, and that for paper and paperboard production reaches 7.695 million cubic meters or 9% of the total industrial consumption.

(3) *Scattered processing facilities and small production scale.* There are about 2,000 sawmills in China each with an average annual capacity of 1,200 cubic meters; over 500 plywood mills (excluding a large number of rural enterprises and specialized rural households) with an annual capacity of 5,000 cubic meters per plant; more than 400 fibreboard (including MDF) plants with an annual capacity of 5,000 cubic meters per plant; over 200 particleboard plants with an annual capacity of less than 10,000 cubic meters; and almost 10,000 paper mills with an annual production capacity of around 3,200 tons.

(4) *Backward technologies and out-of-date equipment*. The production technology and equipment adopted in most of China's existing forest products enterprises, excluding those having introduced complete sets of equipment, were commonly used by the developed countries in the 1960s and 70s. The technical level of some small business ventures is even lower. Thus, low productivity leads to higher material and energy consumption.

(5) *Small proportion of secondary processed products and less variety of products*. In sawntimber production, products of ordinary sawmills are usually not sanded or are sold out immediately after the sanding process. Although some large and medium sawmills in urban areas have kiln dryers, low design capacity and ever increasingly scattered sawmilling industry result in limited quantity of sawntimber undergoing kiln drying - less than 30% of the total sawntimber production. Sawntimber drying is restricted to railway sleepers, and a large proportion of urban and rural construction timber and pit props are used without preservation.

Secondary processing of wood-based panels started in the early 1960s, however, low level of overall industrial development has resulted in very slow advancement. Major existing

problems in the secondary processing of wood-based panels include: (1) few varieties and poor quality of raw timber materials which have direct impacts on secondary processing; (2) unitary means of processing dominated by decorative treatment with very small proportion of functional treatment; (3) small proportion of secondary processed products with poor quality. Large amount of wood-based panels are put in use without any treatment or with merely simple treatment such as rough lacquering, and secondary processed wood-based panels account for about 20% of the total consumption. Poor quality is characterized mainly by few varieties of lamination materials, unnatural grain patterns and being prone to colour changes.

(6) *Low proportion of wood pulp in pulping materials*. At present, China's total pulp production has reached 17 million tons, however, wood pulp accounts for merely 10%. Even with imported wood pulp being calculated, the share of wood pulp for paper making accounts for only 14%, whereas in developed countries, over 90% of the paper making materials is wood pulp.

(7) *Environmental pollution problems remain to be solved*. At present there are still over 400 wet process hardboard factories in China and a large number of small straw pulp factories with an annual capacity under 5,000 tons. Small production scale, backward technologies and equipment have resulted in the pending issue of waste water discharge. In addition, much remains to be done in such fields as dust treatment in sawmilling and blockboard plants, poisonous gas prevention and control in furniture and wood-based panel plants, and noise control for single machines.

2.7.2 Trend of Development for the Forest Products Industry

2.7.2.1 Population Growth and Economic Development

In accordance with the *Proposal on the Outline of the Ninth Five-Year Plan (1996-2000) for National Economic and Social Development and the Long-range Target for the Year 2010* promulgated by the Central Committee of the CPC, the trend is for population in China to be less than 1.3 billion by 2000 and 1.4 billion by 2010.

Economic development in China is now entering a golden period featured by a stable and rapid growth. The goal of social and national economic development by 2010 put forth in the *Proposal* is to double the gross national product, improve people's living conditions and establish quite complete socialist market economic system; further promote standardization, legislation of the economic management system and its operational system, optimize resource distribution, and improve the overall and technical competence of the national economy so as to achieve sustainable social and economic development.

This means that by early next century, the overall scale of China's national economy will leap forward to the third place in the world's ranking. Although the per capita income is still at the level of the developing countries, China's ranking will be upgraded from the list of low income countries to medium-level income countries.

2.7.2.2 Demand for Major Forest Products

In accordance with the forest products market projection study conducted by experts sponsored by the Ministry of Forestry, wood demand in China will be increasing over the coming 15 years and beyond. By 2000, China's demand is projected to be 164.49 million cubic meters for commercial roundwood and 77.6 million cubic meters for fuelwood. By 2010, the demand will reach 180.11 million cubic meters and fuelwood 77.59 million cubic meters respectively[6]. In light of China's existing resources, the demand-supply gap excluding fuelwood) will be 45 million cubic meters.

Demand for wood-based panels will increase to 9-10 million cubic meters by 2000 and 13-14 million cubic meters by 2010, and that for paper and paperboard will be 39.27 million tons and 83.8 million tons respectively (Table 29).

Table 29 - Projection of Demand for Major Forest Products in China between 2000 and 2010

Year	Commercial roundwood (1,000 m^3)	Wood-based panels (1,000 m^3)	Paper & paperboard (1,000 tons)
2000	164,490	9,000 - 10,000	39,272.0
2010	180,110	13,000 - 14,000	83,801.0

Note: Commercial roundwood includes industrial roundwood, local self-supply roundwood and roundwood for sideline operations.

2.7.2.3 The Guiding Ideology and Goal of Development for the Forest Products Industry

(1) Guiding Ideology

- The objective of vigorous development of forest products industry is to meet, to the greatest extent, the needs for forest products to promote the development of the national economy and improve the living conditions of the people.

- In the light of the gradual decline in large diameter roundwood resource in the native forest and deficiency of industrial roundwood supply, the future development of the forest products industry will shift from the traditional preference of sawntimber and plywood to priority development of non-veneer wood-based panels and paper products.

- With regard to the materials required for production of non-veneer wood-based panels and the pulp and paper making industries, the former will shift its reliance mainly on logging and processing residues to the primary reliance on fast growing plantations and the small diameter and poor quality roundwood from native forests; and the latter should increase the percentage of wood fibre in pulping materials through priority development of fast growing plantations and utilization of poor quality roundwood from native forests.

- As far as product composition is concerned, development of wood-based panels should give priority to the development of particleboard (including OSB and cement-bonded particleboard) and MDF while restricting the development of wet process hardboard. The priority of development for paper products shall be offset newsprint and magazine paper, kraft box paper, cloth coated white paperboard, and paper for computer, fax, printing and

[6] Note lack of growth in fuelwood consumption over 10 years (editor).

copying, high quality paper products for office use, food packaging, medical service and daily use.

- Product quality index shall get in line with the international practice.

- Layout of production shall be properly designed. Production bases shall shift to wood supplying areas from the traditional preference of cities so as to form the production pattern that the forest areas produce products dominated by roundwood and wood pulp and large and medium-size cities produce mainly secondary processed products and paper products.

- Adjustment of scale of production to pursue the principle of integration of large, medium and small undertakings. In the light of the local level of economic development, efforts shall be made to establish large enterprises with an annual capacity of over 100,000 cubic meters (tons) in cities which are within or close to the forest area with easy access; in inland cities with certain abundance of resources, medium sized enterprises (30,000 - 50,000 cubic meters/tons) shall dominate; and in the remote areas with under developed economy and inconvenient access, priority shall be given to the establishment of small enterprises.

- Production equipment shall be predominantly Chinese made.

- Efforts shall be made to achieve balance of the total import/export trading volume of the forest products.

(2) Goal of development

The overall goal of China's development for the forest products industry to the year 2010 is to establish a sustainable forest products industry system with Chinese characteristics. The main attributes of such a system are:

- The raw material supply base (including wood and non-wood materials) is stable;

- The products can meet the demand of the domestic market on the quantity, quality, varieties (excluding plywood and special purpose paper) and specifications of products;

- Technologies and equipment are all domestic products.

- The domestic and overseas environmental criteria are met in manufacture, usage and recycling of products.

- Production and management systems which are in line with Chinese conditions are established.

- With regard to trade in forest products, the current one way trade with imports greatly exceeding exports is replaced by more balanced trade particularly through expansion of non-veneer wood-based panels, paper products and furniture production.

2.8 Development and Utilization of Non-wood Forest Products

China has rich non-wood forest products of considerable economic value which are indispensable to people's living and social development. Non-wood forest products include two major categories: economic forest products and forest chemicals. Economic forest products are divided into seven categories of fruits, edible woody oil, industrial raw materials, beverages, woody medicinal herbs, spices and bamboo products. Forest chemicals mainly include rosin, turpentine oil, active carbon, tannin, shellac and natural edible pigment.

Economic forests are an important component of China's forest resources and their products are important to national construction and people's living. The development of economic forests not only will boost the growth of national economy and improve dietary structure of the population but also have been proved important for poverty eradication in rural and mountainous areas. Over the past decade, economic forests have grown by over 670,000 hectares annually which accounts for 15% of annual afforestation area with an annual output value of more than RMB 40 billion yuan; the total area has reached 14 million hectares. The product quality has improved greatly and the number of recognized famous and quality goods are increasing. The export of such products reached the of 1 million ton mark in 1992 with earnings of US$ 1.2 billion.

Under the guidance of the policy of reform and opening to the outside world, great achievements have been made in China in the last decade in the production and utilization of non-wood forest products which still has great potential of further development. As far as future development priority is concerned, efforts shall be made, on the basis of summary and integrated studies, to reinforce and improve product quality, develop new series of products and open up new fields so as to further increase the ecological, economic and social benefits. By the year 2000, 45 economic tree species shall be developed and 530,000 hectares of new production sites for famous, special and quality products be set up in 459 counties.

2.8.1 Food and Edible Oil Produced by Woody Plants

There is a broad and promising future for the development, management and integrated utilization of woody food and edible oil in China. In 1990, the yield of major economic forest products such as chestnut, red date, walnut, oil-tea, almond, hawthorn and ginkgo broke the highest historical record. According to preliminary estimate, the output value for major economic forest products exceeded RMB 4 billion yuan in 1990, which made up 1/4 of China's national gross forestry output value. By now, the total area of economic forests has reached 16 million hectares in China and the annual production of major economic forest products has exceeded 20 million tons. The storage and processing capacity is 10% of the total production. A series of fine processed products have been developed with product export accounting for over 1 million tons earning about US$ 1.2 billion. Economic forest products have become the major export products for China's forestry sector and some products have become people's necessary daily needs and financial sources for revitalizing the economy in the forest areas in some provinces/autonomous regions.

Chestnut is China's major woody food and an essential product for export. The production of chestnut in 1994 was 220,000 tons, while China's annual volume of chestnut export is around 25,000 tons, mostly to Japan. Walnut is China's major forest product export. There are over 1

million hectares of walnut forests in China. The production of walnut in 1994 was 210,000 tons. China's annual volume of walnut export is 47,000 tons, mainly to Europe, Canada and countries and regions in the far-east. Chinese Date is also a main woody food in China with a total area of 240,000 hectares and an annual production of fresh date reaching 400,000 tons. China's annual volume of dry date export is 47,000 tons. Ginkgo is distributed across over 20 provinces/autonomous regions in China with an annual production of over 5,000 tons, mostly for export. *Camellia spp*. is endemic to China distributing in 15 provinces/autonomous regions with a total area of over 4 million hectares and an annual yield of some 500 tons of tea oil which makes up 8.6% of China's total production of edible vegetable oil. The production of *Camellia spp.* seeds reached 630,000 tons in 1994.

2.8.2 Woody Plant Oil, Lacquer and Wax

Many traditional special and by-products fall under this category, such as tung oil, Chinese tallow oil, insect wax, raw lacquer and other woody oil types. Wise development and full utilization of these resources have great significance for revitalizing China's forest economics, satisfying the State's needs and enhancing the country's capacity in export and foreign exchange earning. Chinese tallow tree covers over 200,000 hectares with an annual production of 85,000 tons. Both the area and production of tallow trees in China have dropped a bit in recent years. The production of tallow seeds was only around 40,000 tons in 1994. Every year, China exports small amounts of Chinese tallow products, mostly to European and American countries. Oil tung is one of the main tree species in China producing industrial oil which covers a total area of 1.8 million hectares. Its production in 1994 was 440,000 tons. China's tung oil export has an annual volume of 12,000 tons. Raw lacquer covers a total of 500,000 hectares with an annual production of 3,219 tons (1994). Raw lacquer is a traditional export product, e.g.: 300 tons/year during 1980-1986, mostly to Japan, Hong Kong, Macao and the United Kingdom. China's annual rosin production approaches 400,000 tons and turpentine 46,000 tons with the annual rosin export making up 40-50% of the world's total rosin trade. In southern China's forest areas, the annual resin production is now over 570,000 tons (1994) which has not only provided employment opportunities for 300,000 people but also increased the per capita income up to nearly RMB 2,000 yuan.

2.8.3 Flowers and Plants

The guiding ideology for development of flowers and plants is that the demonstration bases for flower and decorative plants shall be planned as a whole system and the development of such production bases be accelerated. It is planned that, between 1996 and 2000, the cultivation area for flowers and plants will be expanded from the current 11,300 hectares up to 26,300 hectares; 27 demonstration bases will be established managing 191.9 hectares; research activities with regard to flowers and plants shall be improved to raise the level of cultivation. The production capacity of bamboo will reach 33,300 hectares, and the number of demonstration bases will be extended to 52 managing a total area of 266.7 hectares.

2.8.4 The Bamboo Industry

In China, there are about 370 bamboo species in 39 genera covering an area of 3.8 million hectares of which *Phyllostachys pubescans* covers 2.6 million hectares. In 1994, the national bamboo production was 490 million culms. The number of bamboo species, bamboo forest area, and the total national bamboo production accounts for 1/3 of the world's total respectively. China is famed as "the Kingdom of Bamboo".

The emerging bamboo industry composing of the whole process from bamboo cultivation to processing and utilization has taken shape in China. Bamboo utilization has broken through the traditional fields and been extensively used in sectors such as construction, light industry, food processing, packaging and transportation. Bamboo products exceed 1,000 varieties under seven categories including bamboo wood-based panels, bamboo paper making, bamboo summer sleeping mat, bamboo chopsticks, bamboo articles for daily use, bamboo arts and craft, bamboo shoots and bamboo food.

Bamboo forest resources are a unique advantage of China's forestry sector. Development of a bamboo industry based on these resources will not only promote the development of national economy, increasing foreign exchange earning and help people in the bamboo forest areas eradicate poverty and strive for prosperity, but also have great significance for creating a sound ecosystem and environment. Between 1996 and 2000, bamboo cultivation will follow the principle of oriented cultivation with priority to be given to the cultivation of multiple-purpose bamboo forests for construction, fibre and bamboo shoots; a total of 1.933 million hectares of new bamboo forests will be either planted or improved so that the bamboo production will reach 10.207 million tons.

2.8.5 Aromatic Forest Plants

Production of essential oil and extract from the residues of final cutting, thinning and other fragrant materials is also a major aspect of the development and utilization of non-wood forest products in China's forest areas. *Litsea cubeba* is a major fragrant oil species growing mostly in southern China, over 10,000 hectares in Hunan Province alone. The further processing of the fruits of *Litsea cubeba* generates great economic benefits. The introduction of *Eucalyptus* species to China dates back to 100 years ago and the current area of *Eucalyptus* plantations has reached 670,000 hectares in 16 provinces/autonomous regions. China's annual production of *Eucalyptus* leaf oil is around 3,000 tons with 1/3 for export mostly to countries such as France and Germany.

2.8.6 Forest Soft Drinks

There are rich resources for soft drink production in China's forest areas, such as birch sap, seabuckthorn, kiwi fruits, bureji gooseberry, blackberry, amur grape, wild rose, cowberry, siberian nitraria and pine pollen, etc. Recent development has scored remarkable achievements.

China is rich in the resources of Betula which covers over 10 million hectares with 34 species mostly in north, north-east and south-west China. The *Betula* sap, apart from domestic sales, are also exported to South Korea and Hong Kong and welcome by the consumers. Seabuckthorn is a wild shrub covering over 1 million hectares in China mostly in the Three-north Region. In recent years, such foreign countries as the USA, Japan and Switzerland have started joint ventures in

developing seabuckthorn products. *Actinidia chinensis* is a major wild fruit in China distributed in 24 provinces/autonomous regions including Henan, Hunan, Sichuan and Jiangxi with an annual production of 300,000 tons.

2.8.7 Traditional Chinese Medicinal Herbs in the Forest Areas

Forest is a major source for the production of the Chinese traditional medicinal herbs. The major products include: Ginseng, American Ginseng, pilose antler, Tall Gastrodia, Bezoar, Cocos Poria, Eucommia, Roots of Common Baphicacanthus, Ural Licorice, Flower of Lily Magnolia, Chinese Thorowax, Officinal Magnolia, Chinese Wolfberry, Redbark Cinchona, Chinese Magnoliavine, Manyprickle Acanthopanax, Paraspectacular Barberry, Ganoderma, Gardenia and Bear Gallbladder.

Chinese Ginseng is a key product in the production of traditional Chinese medicinal herbs in northern China's forest areas. American Ginseng was introduced to China since 1975 with the current annual production exceeding 50 tons. Japanese Cornel Dogwood is both an economic tree species but also a well-known medicinal herb, distributed in such provinces as Zhejiang, Anhui, Henan, Shandong, Shanxi, Shaanxi and Sichuan. Deer raising for pilose antlers is a economically valuable undertaking in China's forest areas and product supply cannot meet the market demand.

Forest chemicals industry is an important component of forestry, many forest chemical products such as rosin, activated carbon etc. are important raw materials for light industry and food industry. Since 1949, the development of China's forest chemicals industry has achieved great progress, with an output value reaching RMB 3 billion yuan in 1992, earning a foreign exchange of US $ 180 million. The quality and degree of processing of products have been greatly improved.

Despite of the significant progress, the production of economic forests still falls short of increasing demands for its quantity, quality and variety. The problems of low output both as a whole and on a per capita basis (e.g. fruits per capita being not even one third of the world's average), poor quality, lack of varieties (especially famous and quality products) still exist at present.

Major problems facing forest chemicals industry at present are: lack of raw-material supplying centres, lack of re-processed products, low level of process and backward production techniques, etc..

As far as trend of development is concerned, according to goals raised in *the National Guideline for the Reform and Development of China's Food Structure for the 1990s*, the per capita consumption of fruits will reach 23 kg. and edible vegetable oil 8 kg. by the year 2000. To realize this, 500 production bases for famous, special and quality commodities will be established by 2000. The area of economic forests nation-wide will reach 21.47 million hectares (with an annual increase of 667,000 hectares), the output 35 million tons (annual increase of 1.8 million tons), the per capita fruit and nut consumption 26.8 kg. (currently 18 kg.). The overall output value for economic forest products is RMB 59 billion yuan.

During the Ninth Five-Year Plan period, the famous, special and quality products will be developed under the principle of high yield, high quality and high efficiency to strengthen the capacity of product processing, storage, transport, fresh keeping and foreign exchange earning, increase varieties, output and quality while efforts be also made to develop the wild forest fruit resources. In the Yangtze River valley and southern China's provinces/autonomous regions/ municipalities endeavour will be made to develop economic forests dominated by species producing woody oil, industrial raw materials, woody medicinal herbs, tropical and subtropical fruits, and spices. Economic forests dominated by woody food and dry and fresh fruits species will be established in provinces/autonomous regions/municipalities along the middle and lower reaches of the Yellow River. During the Ninth Five-Year Plan period, priority shall be given to the development of 10 major economic forest development zones, 100 pilot plots and 500 production bases for famous, special and quality products falling under 5 categories of woody food and edible oil, industrial raw materials, fresh and dry fruits, spices and woody medicinal herbs. It is planned to accomplish 754,000 hectares of base development. Between 2001 and 2010, another 500 base counties are planned to be established so as to set up economic forests production bases which have multiple species, multiple varieties, high quality and highly beneficial production series with advanced world standard.

2.9 Woody Energy and Fuelwood

Forest energy is a traditional source of energy for the Chinese people which has relatively low cost and is of immediate benefit. It is a daily use energy indispensable in the large expanse of rural China, the hilly and mountainous areas in particular. The current annual total fuelwood consumption in rural China is about 250 million tons accounting for 24.2% of the total annual energy consumption in rural China or about 34% of the total annual consumption of energy for living in rural China.

China is a country badly short of fuelwood resources. Vigorous development of fast growing, high heat value and multi-purpose fuelwood species and increasing the area of fuelwood forests are among the major measures to be adopted for solving the difficulty of rural energy and realization of returning crop straw back to the field. Major problem in the development of fuelwood forests is that fuelwood supply falls short of demand and the gap is large with serious consequences.

China is a country with limited forests, the per capita share of the forest area is less than 0.13 hectares and the fuelwood forest accounts for nearly 37.2%. The existing fuelwood forests can supply 24 million tons of fuelwood comparing to the total actual fuelwood consumption of 252 million tons in rural China. About 228 million tons of fuelwood are collected by cutting timber forest, protection forest and "four-side" plantings and excessive logging of the forest as a whole. The national annual actual fuelwood consumption accounting for 100 million cubic meters or 30% of the national annual consumption of forests becomes a major factor leading to the large consumption of forest resources. Survey and studies of Lanzhou Institute of Desert under the Chinese Academy of Sciences also show that overcutting for fuelwood has become a leading factor for desertification in China.

In the last 15 years, a total of 4.9727 million hectares of fuelwood forests have been planted in China which constitute a group of fuelwood production bases and have played a significant role in mitigating the shortage of rural energy. In order to keep in line with the overall

development of the rural economy, the Ministry of Forestry worked out a forest energy project which plans to carry out planting and afforestation activities in wood-deficient areas to increase the area of forest energy bases by 12 million hectares, and establish a properly distributed and wisely structured forest energy system. Fuelwood forest development and expansion of the fuelwood resource is a major means of mitigating fuelwood supply deficiency, shortage of rural energy and overcoming the difficulty of rural fuels.

At present in China, except in few provinces/autonomous regions, fuelwood forest has a too-low percentage. In this connection, during the Ninth Five-Year Plan period, fuelwood forests shall be duly developed in all areas which are suitable for establishment of fuelwood forests. Top priority shall be given to the fuelwood development in fuelwood-deficit hilly and low mountainous areas, coastal areas in southern China and the semi-arid areas in the Three-north Region. During the Ninth Five-Year Plan period, some 3 million hectares of fuelwood forests shall be developed throughout the country, with priority to be given to development of the trial counties for fuelwood development which will increase the total area of fuelwood forests by 2.1 million hectares. Between 2001-2010, another 10 million hectares of fuelwood forests shall be established so as to satisfy basically the demand of fuelwood for energy consumption by the urban and rural residents.

2.10 Services provided by forests

China boasts of vast forest areas, with many beautiful landscapes formed by forests and peculiar land form as well as topography, and a great deal of historical and cultural relics distributed over the land, fostering a great potential for development.

Since 1982, forestry departments at different levels have incorporated the utilization of forest landscape resources and the establishment of forest parks into the overall planning for forestry development. By year 1994, about 700 forest parks had been established over the whole country, 19 international hunting grounds and 1 forest recreation area were also established. A complete service system incorporating food, accommodation, travelling, sightseeing, shopping and entertainment has been initially formed in these forest parks, which have received a total of about 0.2 billion visits of Chinese and foreign tourists, earning 1 billion yuan from forest tourism. In 1994 alone, the number of people visiting forest parks exceeded 40 million visits. China International Forest Travel Service, the first of its kind in China specialized in forest tourism, was established in 1994. By the end of 1995, over 700 forest parks of various types had been set up over the whole country. About 60 million visits of Chinese and foreign tourists were received in 1995 alone, earning over 0.5 billion yuan.

The proper establishment of forest parks, and development of forest tourism can induce direct economic benefits, increase employment opportunities in forest areas, mitigate the economic difficulty of forest areas, and promote the development of forestry. They can also facilitate the conservation of forest resources, increase forest ecological benefits, enhance people's environmental conservation and "greening" awareness.

The Chinese government is planning further development of new forest landscape resources, development of key forest parks with high standards, going on developing national forest tourist zones and new forest tourist routes, developing forest parks and forest tourism into major industries of forestry. The Chinese government is planning to speed up the development

process of forest tourism, urban forestry and landscape forestry during the Ninth Five-Year Plan period (1996-2000). It is also planning to establish 400 new forest parks, 80 of which are of national level. The emphasis will be laid on strengthening of infrastructure construction, establishing forest tourist hotels and restaurants of proper scale, initially forming China's forest tourism system; developing tourism with special features and expansion of influence to attract Chinese and foreign tourists.

With the development of forest tourism, the development of relevant trade and service industries will be promoted, providing a big market for tourist commodities with forest characteristics and local special products. It is expected that by the year 2000, the total number of forest parks all over China will reach 1000, covering a management area of 9 million ha.; people going for forest tours will reach 0.1 billion visits, bringing an income of 9.5 billion yuan, and $0.5 billion of foreign exchange from tourism. By the year 2010, it is expected that the total number of forest parks all over China will reach 2000, with a management area of 19 million ha., of which 100 national forest parks will reach the international advanced level. It is hoped that 0.2 billion visits of tourists will be received every year, of which 2.0 million visits are foreign tourists, realizing the goal of an income of over RMB 30 billion yuan from forest tourism.

2.11 Forestry Science, Technology and Education

Strengthening of research in basic forestry science and applied technology, vigorous development of forestry education, implementation of professional training and training of special personnel in the whole forestry sector is an important condition and guarantee for the Chinese government to promote the strategy of developing forestry through science and technology and sustainable forestry development strategy.

The Ministry of Forestry has organized and implemented the strategy of developing forestry through science and technology, issued *the Forestry Vitalization Programme Through Science and Technology*, implemented the running mechanism of production, planning and finance jointly promoting the transformation of research achievements. The system of combining scientific research with development is progressing; the content of science and technology in forest products is gradually increasing.

As of now, a scientific and technological information network and three scientific and technological systems of scientific research, extension and technical supervision have been initially formed nation-wide. Altogether 248 forestry scientific research agencies above prefecture level have been established over the whole country, 81 research sections have been set up in forestry colleges and universities. There are 200,000 technical staff in forestry enterprises and institutions; 2,157 forestry technical extension agencies above the county level have been set up, with 28,711 professional technical extension staff, initially forming a nation-wide forestry technical extension network. Furthermore, 185 technical supervision agencies of various types have been set up while 13 provinces and autonomous regions have set up forestry scientific and technological information centres.

The infrastructure development of forestry science and technology has been strengthened: 29 key laboratories have been set up, covering all subjects of the secondary level forestry science and 60% of the tertiary level forestry science. The State Education Commission has set up 1 key

laboratory in the forestry sector. The State Planning Commission and the State Science and Technology Commission have established 2 national engineering centres in the forestry sector. The Ministry of Forestry has set up 11 stations for long term research on forest ecosystems, and has strengthened development of quality control, increased investment, upgraded instruments and facilities.

Forestry scientific research has achieved major progress and important achievements. During the Eighth Five-Year Plan period, the Ministry of Forestry was responsible for 93 special topic researches of 8 subjects and 2 projects which are namely: Study on the Oriented Cultivation Techniques of Industrial Timber Forests with Short Rotation Cycles, Study on the Ecological Forestry Engineering Technical System. The total investment was 80.5 million yuan, with 738 scientific research, teaching and production agencies and 3,421 instances of technical staff participating in the studies, setting up 639 experimental and demonstration bases, 5,240 ha. of experimental and demonstration forests, obtaining 159 research achievements, of which 129 have already been applied in production and development, creating an economic benefit of 1.289 billion yuan. Over the 5 years, the Ministry of Forestry set up 187 items for research, investing about 20 million yuan; 1,235 achievements in science and technology were obtained in the country's forestry sector, of which 88 have won national awards for scientific and technological progress and national invention awards, 615 have won awards for scientific and technological progress of the ministry.

The extension of forestry research achievements has been very effective: 100 advanced achievements are selected every year to be organized for implementation by the Ministry of Forestry and local levels by different groups. During the Eighth Five-Year Plan period, 203 research achievements of various types were organized to be developed and promoted, 34 experimental demonstration zones for the development of forestry science and technology were set up. A direct economic benefit of 400 million yuan has been obtained from demonstration zones of extension, 1 billion yuan has been earned from technical extension, over US$20 million of foreign exchange has been obtained from products entering the international market. Apart from these, the Ministry of Forestry has formulated and started the Mountain Vitalization Programme, to improve the forestry technical development demonstration system.

The training capability of forestry education has been enhanced. There are 35,000 forestry college and university students at school in China in 1995, and over 51,000 students in secondary specialized forestry schools, forming a training network in China's forestry sector.

The on-job training system has been gradually established and improved. *The Post Norms for Forestry Officials* and the forestry section of *the Criteria for Workers' Technical Grades of the People's Republic of China* were formulated, including 486 official post certificate systems. At the same time, major efforts should be made to strengthen training of practical techniques and basic skills for forest farmers. The on-job training will be gradually standardized and made systematic.

2.12 Forestry Institutions and Forestry Policies

2.12.1 Forestry Institutions

China's forestry institutions are set up at five levels, namely: the Ministry of Forestry in the central government; forestry (agricultural and forestry) departments of provinces/ autonomous regions/municipalities; forestry bureaux of prefectures/cities; forestry bureaux of counties/banners/cities; and forestry stations of townships/towns.

2.12.2 Forestry Policies

The Forest Law of the People's Republic of China was formally promulgated on September 20, 1984. By year 1994, China had formulated and promulgated 4 forestry laws, regulations and legal documents, 4 forestry administrative regulations, over 60 sectoral regulations and over 200 local forestry by-laws and governmental regulations.

(1) The Forest Law of the People's Republic of China

On September 20, 1984, the Seventh Meeting of the Sixth Standing Committee of the National People's Congress (NPC) held discussions, approved and formally promulgated the Forest Law of the People's Republic of China. With the approval of the State Council, the Ministry of Forestry promulgated the Regulations for Implementing the Forest Law of the People's Republic of China on May 10, 1986.

The Forest Law of the People's Republic of China has altogether 42 Articles in 7 Chapters including General Provisions, Forest Management, Forest Protection, Tree Planting and Afforestation, Forest Felling, Legal Responsibilities and Supplementary Articles, setting up a code of conduct for forestry administrative management agencies at different levels and forest owners, managers and utilizers.

The Forest Law of the People's Republic of China especially stipulates that the following protective measures should be implemented for forest resources:

- implement logging quotas on forests, encourage planting and afforestation, mountain closure, expand the area covered by forests;
- provide economic support or long-term loans for collective and individual afforestation and forest tending, in line with relevant regulations of the state and local people's governments;
- collect forest tending fee which is to be used especially for afforestation and forest tending;
- a certain amount of money will be collected from coal and paper making sectors according to the yield of their products to be especially used in the establishment of timber forests producing pit props and raw materials for paper making;
- establish a forestry fund system.

(2) Law of Water and Soil Conservation of the People's Republic of China

On June 29, 1991, the 20th Meeting of the 7th Standing Committee of the NPC approved and formally promulgated the Law of Water and Soil Conservation of PRC. With the approval of the

State Council, the Ministry of Forestry issued the regulations for implementing this law in August, 1993.

The Law of Water and Soil Conservation of the PRC has altogether 42 Articles in 6 Chapters, which are General Provisions, Prevention, Treatment, Supervision, Legal Responsibilities and Supplementary Articles. As the highest level law of China's laws and regulations on soil and water conservation, it clearly stipulates the responsibility for China's soil and water conservation undertaking is with water resources administrative line agencies above the county level; cultivation on steep slopes is forbidden; tree felling should be appropriate with simultaneous formulation of soil and water conservation measures for the felling area; the Environmental Impact Assessment (EIA) report of economic construction projects should have a soil and water conservation plan approved by water resources administrative line agencies; encourage collective agricultural economic organizations and farmers in the areas suffering from soil and water erosion to carry out treatment of the land, implement supporting policies in the aspects of fund, energy, food and taxation, etc.; barren mountains, ditches, hills and shore land can be contracted by collective agricultural economic organizations (individual farmers or joint households) for treatment of areas suffering from soil and water erosion, with the state protecting the legal rights and benefits of people concerned.

(3) Regulations on the Protection of Terrestrial Wildlife

On February 12, 1992, the State Council approved this Regulation and instructed the Ministry of Forestry to promulgate and implement it. The "terrestrial wildlife" referred to in the Regulation includes legally protected precious, endangered, and beneficial terrestrial wildlife with important economic and scientific research value; "wildlife products" refers to any part or derivative of terrestrial wildlife. This Regulation includes 46 Articles of 7 Chapters: General Provisions, Wildlife Conservation, Management of Wildlife Hunting, Management of Wildlife Taming and Breeding, Management of Wildlife Utilization, Awards and Punishment and Supplementary Articles.

The Regulation stipulates that hunting and killing of key national protected wild animals are forbidden; a system of applying for special hunting permits and a taming and breeding permit system for key protected wild animals will be implemented; selling and buying of key national protected wild animals or their products on markets are forbidden.

(4) Provisional Regulations on Forest Management

This Regulations is a government decree formally promulgated by the Ministry of Forestry, and started to be implemented on August 13th, 1993. This Regulations includes 34 Articles of 6 Chapters which are General Rules, Management of Forest Land Ownership, Forest Protection and Utilization, Management of Occupying and Requiring Forest Land, Awards and Punishment, Supplementary Articles. The Regulations clearly stipulate that the major tasks of responsible forestry agencies and local forest land management and supervision agencies are implementing and executing relevant national and local laws, regulations and policies concerning forest land management:

- responsible for inventory and statistics on forest land, monitor consumption and growth of forests;

- responsible for formulation, supervision and implementation of plans for forest land conservation and utilization;

- responsible for registration and change of forest land ownership and for managing forest land records;

- review and approve matters relevant to the requiring of forest land, supervise and manage the collection and utilization of compensation fee for forest trees and forest land, settlement and subsidy fee and fee for rehabilitation of forest vegetation;

- supervise and inspect the situation of forest land conservation, management and utilization, help solve relevant problems;

- responsible for investigating administrative cases of illegal occupation and damage of forest land, illegal utilization of forest land, forbid illegal activities of damaging forest land.

This decree also clearly forbids grazing, fuelwood collection, hunting and productive management activities other than forestry in afforested land and young forest land which have not formed forests, and mountain closure areas. Cultivation on forest land on steep slopes greater than 25 degrees for growing agricultural crops is forbidden and already cultivated land should be returned for forestry use within a limited period.

(5) Urban Greening Regulations

This Regulation was signed and issued to be implemented by Premier of the State Council on June 22, 1992. The Regulation includes 34 Articles of 5 Chapters which are General Rules, Planning and Construction, Conservation and Management, Punishment and Supplementary Articles.

The Regulation clearly stipulates that planning for urban greening should be incorporated into the overall urban planning; area of land for urban greening in proportion to the population and area of the city should be wisely arranged; planning indexes for per capita urban public green land and coverage of green land should be formulated. The Regulation also stipulates detailed punishment methods for actions of damaging urban trees, flowers and grass, arbitrary occupation of urban green land, units or individuals carrying out commercial activities on urban public green land without authorization.

(6) Regulations of the PRC on Nature Reserves

The State Council formally promulgated and implemented *Regulations of the PRC on Nature Reserves* on October 9, 1994. The Regulation includes 44 Articles of 5 Chapters which are General Rules, Development of Nature Reserves, Management of Nature Reserves, Legal Responsibilities and Supplementary Articles.

This Regulation clarifies that nature reserves refer to areas under special protection and management which are set aside from land, terrestrial water body or ocean according to law, with the location of protected objects such as representative natural eco-systems, natural concentration and distribution areas of precious and endangered wild fauna and flora species and natural relics with special significance etc..

The Regulation divides a nature reserve into core zone, buffer zone and experimental zone; activities such as felling, grazing, hunting, fishing, herb collection, cultivation, burning grass on waste land, mining, stone collection and sand digging etc. are forbidden. It is also forbidden for anyone to enter the core zone of the nature reserves. The Regulation also stipulates detailed punishment methods for agencies and individuals violating the above regulations.

(7) Regulations on Forest Park Management

On January 22, 1994, the Minister for Forestry signed and issued Regulations on Forest Park Management. The Regulations clarify that forest parks refer to places of a certain scale with beautiful forest landscape, concentrated natural landscapes and cultural landscapes, which can be used for tourism, rest or scientific, cultural and educational activities. The Regulations divides forest parks into three levels: national forest parks, provincial level forest parks, city and county level forest parks. This Regulations also stipulates that agencies and individuals harming forest and wild fauna and flora resources in forest parks will be penalised according to relevant laws and regulations.

(8) Detailed Rules for the Implementation of Plant Quarantine Regulations (Forestry Part)

The Minister for Forestry signed and issued this Regulation on July 26, 1994. The Rules stipulate: the system of Forest Plants Quarantine Staff Certificate and the system for the signing and issuance of Plant Quarantine Certificates will be implemented.

The Rules points out that forest plants and their products which should be quarantined include: forest tree seeds, seedlings and other propagation materials: arbour, shrub, bamboo, flower and other forest plants; timber, bamboo, medicinal herbs, fruits, bonsai and other forest products.

3. PROSPECTS

The Third Plenary Session of the Eleventh Central Committee of the Communist Party of China (hereinafter referred to as "CPC") convened at the end of l978 opened a new stage of development for the socialist undertaking in China. Ideological emancipation and seeking truth from facts made people start thinking about such questions as how to promote development, consolidation and advancement of socialism and how to search for the effective means to realize public ownership. During the past l8 years of reform and opening up which have experienced such phases as dominance of the planned economy supplemented by market adjustment - the planned commodity economy - integration of the planned economy and the market economy establishment of the socialist market economic system, China has undertaken an extensive and profound social reform under the guidance of Deng Xiaoping's theory on development of the socialist market economic system with Chinese characteristics. The intention has been to change the production relations and components of the superstructure not adapted to the development of productive forces and achieve in a phased way the dual fundamental changes of the economic system and the mode of economic growth. As a major component of China's reform practice, the forestry sector in China, having experienced pains of reform and strategic choices, has sought development from reform and opened up a road of forestry development with Chinese characteristics through the implementation of a series of important policies.

3.1 Forestry Reform Practice and Long-Term Planning

During the past l8 years of reform and opening to the outside world which have experienced such phases as dominance of the planned economy supplemented by market adjustment - the planned commodity economy - integration of the planned economy and the market economy and eventually establishment of the socialist market economic system, China has undertaken an extensive profound social reform under the guidance of Deng Xiaoping's theory on development of the socialist market economic system with Chinese characteristics, so as to change the production relations and components of the superstructure not adapted to the development of productive forces and materialize in a phased way the dual fundamental changes of the economic system and the mode of economic growth. As a major component of China's reform practice, the forestry sector in China, having experienced pains of reform and strategic choices, has sought for development from reform and opened up a road of forestry development with Chinese characteristics through the implementation of a series of important policies.

3.1.1 Reform Practice in China's Forestry Sector

3.1.1.1 Outline of the Essential Points in State Reform and Forestry Reform in the First Phase

Between the Third Plenary Session of the Eleventh CPC Central Committee and the Fourteenth CPC National Congress, reform in China experienced 3 phases: Between l979 and l984, the focus was on rural reform which subsequently demolished the People's Commune system which combined together governmental administration and community management. Application of diversified forms of joint household contract responsibility system and substantial increase in the purchasing prices for farm produce stimulated farmer enthusiasm for commodity production, resulted in substantial increase in farm produce and rise of township enterprises with historical changes taking place in rural economic system. A road of poverty alleviation and modernization was found for rural China. The urban reform started with enterprise reform on a trial basis, special economic zones were established and l4 coastal cities opened up. Throughout this period, rural forestry in China was dominated by public ownership with coexistence of multiple economic sectors and breakthrough was made in the establishment of pluralistic, multi-level and multi-type forestry management entities.

3.1.1.2 "3D" Reform to shape new management entities and investment mechanism in forestry management

Farmers are the main forces for production in forest regions. Sustainable forestry development in China requires the relevant policies to find the junction points of forestry development and public benefits, and establish benefit guarantees and encouragement mechanisms.

In March l981, the CPC Central Committee and the State Council promulgated *the Decision on Several Issues Related to Forest Protection and Forestry Development* which, in light of the long-lasting ambiguous ownership of mountains and forests and unsecured benefits of local labourer, underlined that the prime policy for rural forestry reform was to determine the ownership of mountains and forests, designate mountain slopes for household uses and define forestry responsibility system("3D" in short).

By 1984,1781 counties had completed the forestry "3D" process with ownership certificates issued governing a total of l.45 billion mu (15 mu =1 ha.) of mountain forests, of which 470 million mu were designated as privately managed mountains for about 57 million rural households. In consideration that forestry production has to be scale operations, the policy that "the tree belongs to he who planted it, and the jointly planted trees belong to the collective" was implemented and joint initiatives were launched in rural forestry management such as contract afforestation by special households, cooperative afforestation, joint afforestation, vigorous development of rural cooperative share-holdings forest farm and running of "green ventures". The cooperative Share-holding system turned out to be the most viable and fresh practice emerging from the reform process. Rural forest farms developed with new structure of benefit sharing. Between the mid-1980s and the present, the cooperative share-holding economy emerging from the forestry reform process has shaped new rural forestry management entities and become an effective mode to realize public forest ownership. New ways of forestry development have been explored by trans-regional, multi-disciplinary and cross-ownership contribution of funds sites, labour, personnel, technologies and equipment, and optimal

combination of production factors by means of share-holding cooperation, e.g.: converted share-holding and mutual share-holding.

Before the reform, input in forestry came mainly from the State and collective sources. The State forest relied purely on State investment and all profits were submitted; the collectively owned forests adopted the policy that work was done in forest farm while distribution was manipulated by production brigade. Along with the deepening of reform, the input distribution mechanism became inoperable. Such systems as compulsory labour input, accumulation labour input and diversified funding have strengthened the interior accumulation and capacity building of the forestry sector. The preliminary established mechanism of gross fund input features "labour" contribution by farmers, diversified funding sources and State subsidiaries. The principle of "distribution according to work" prevailed, with “other” production factors (land, funds, techniques, etc.) being considered in distribution. Use of forestry funds in the forestry sector has change from free " subsidy" into combinations of paid and free inputs. Discount loans for afforestation and share-holding afforestation have placed forestry funds on an upward trajectory which is snowballing, with value being added.

3.1.1.3 Reform of the Targeted Afforestation Responsibility System

Forestry is run by the whole society and the public is mobilized to carry out afforestation activities. Extensive implementation of the targeted afforestation responsibility system during their terms in office for leading officials is a successful policy with Chinese characteristics developed in China's forestry reform. On December 13, 1981, the Fourth Session of the Fifth National People's Congress adopted the *Resolution on the National Compulsory Tree-planting Campaign*. Subsequently, the State Council promulgated *Regulations for the Implementation of the National Compulsory Tree-planting Campaign* which stipulated by legislation the obligations a citizen must fulfil. The Directive on In-depth and Down-to-earth Implementation of the Territory Greening Campaign promulgated by the CPC Central Committee and the State Council in 1984 states: " the responsibilities of tree-planting and grass growing for a greener motherland shall be shouldered by the party committees and governments at all levels and by the top leaders of all organizations. ... This shall be a routine practice and a major component in assessment of the leading officials". A CPC Central Committee decision in 1987 reiterates:" the targeted responsibility system for forest protection and development shall be adopted for leading officials during their terms n office", and " decline and growth of forest resources shall be a major component in assessing the political achievements of the leading officials at the county level".

Subsequently, in the light of the spirit of the above mentioned policies, the planned targets for afforestation were set and responsibility contracts signed at all levels which required the leading officials themselves to run afforestation plots. Inspection and appraisal were carried out in light of appraisal indicators and with measures of award and penalty. The terms of office may change but not the indicators, and the number of staff may be reduced but not the afforestation task. By 1995, the annual rate of plantation establishment and mountain closure in China had reached about 5.3 million hectares and 3.67 million hectares respectively and the accumulated established forest area through compulsory tree-planting activities was about 33.33 million hectares with both its scale and pace of development ranking the first in the world. By now, 12 provinces/autonomous regions have reached their target of preliminary elimination of their barren mountains.

3.1.1.4 Outline of the Essential Points in State and Forestry Reforms in the Second Phase

In October 1984, the Third Plenary Session of the Twelfth CPC Central Committee adopted the *Decision on Restructuring Economic System*. At the end of 1991, priority of reform shifted from rural to urban areas which is marked by transformation of business management mechanism and change from profit submission to tax collection for State enterprises so as to make them relatively independent economic entities and a dominant force in the market. Policies have been made to promote market development, price reform and restructuring the macro-management system; substantial reduction of mandatory State planning; abolishment of the State monopoly for purchase of major farm produce and by products such as grain and cotton and increase market regulation of production materials. Efforts were made to further promote the open-door policy with the establishment of Hainan Special Economic Zone and opening up of Zhujiang River, Yangtze River and the Minnan Delta. During this period, the circulation system of wood and wood products was in a transition from the planned economy to the market economy, the international environment for forestry development became increasingly better and the forestry legal system was continuously improved.

3.1.1.5 Reform of Timber Circulation System

Reform was made on timber circulation system so as to improve the multi-channel, multi-form market networks. Between the early 1950s and 1978, circulation of wood and major wood products was governed by the planned economic management system featured by State monopoly for purchase, sale and distribution. A CPC Central Committee decision in 1985 stated that State monopoly for timber should be abolished in south China's collective forest regions and timber price be open which pushed open the closed gate of the timber market. However, the incomplete policy and deviations in policy implementation resulted in illegal and indiscriminate logging in some places.

In this connection, the CPC Central Committee and the State Council jointly promulgated on June 30, 1987 the *Directive on Strengthening Forest Resources Management in South China's Collective Forest Regions and Strictly Cracking down on Illegal and Indiscriminate Logging* which stated that, in major timber producing counties, the forestry department shall be the only designated authority for timber purchase from mountainous areas. Basic stipulations were also made on strict implementation of the logging quota, protection by legal means of the ownership of state mountains and forests, improvement of the forestry production responsibility system, rectification of timber circulation channels and licensed logging, transportation and sales under the supervision of the forestry sector.

Meanwhile, the State forest regions in north China raised prices for wood products four times respectively in 1981, 1986, 1988, and 1990 and gradually expanded the ratio of their own sales. Non-wood forest products gradually entered the market trade. The proportion of State monopoly of timber declined from 80% of the total commercial timber down to 10% in 1993. By now, the forestry sector has established over 2,500 marketing units and purchase networks under the jurisdiction of prefecture and county forestry agencies, nearly 1,600 sales agents in forest regions; over 4,000 State forest-farms are both producers and sales agents themselves practising integrated business management. A number of timber trade fairs have been established in succession, helping the formation of the multi-element, multi-channel and multi-form timber circulation system dominating by the forestry sector and wood processing enterprises.

3.1.1.6 Reform of State Forestry Enterprises

The State forest regions are the major bases for wood production in China. Since the founding of the People's Republic of China in 1949, the State-owned forestry enterprises have provided the State with enormous volume of commercial timber and primitive accumulation. However, continuous social and population growth, historically pending issues in the administrative system, management mechanism and economic structure, and prolonged excessive logging of forest resources interacted to bring the State owned forestry enterprises gradually into the resource and economic crises in the early period of the reform process. It is within this context that the Ministry of Forestry proposed in 1979 that the excessive logging should be checked and efforts should be made to develop new forest regions, speeding up afforestation and tending, and giving priority to comprehensive utilization and diversified operations. Subsequently a new pattern of silvicultural production, forest products industry and diversified operations took shape.

Between 1985 and 1987, a leader responsibility system was promoted to practice the contracted responsibility system for the quota submission of profits by the enterprises to the government's financial department and trials on forestry shareholding system were also practised. In the late 1980s, the State adopted a series of supporting policies such as reduction in timber production by adopting the quota logging system, gradual decrease in the quota of timber demand in the State's plan, adjustment of timber prices, increase in the proportion of afforestation fund and the discount loans needed for diversified operations in the forest industry, exemption of levies and taxes on some forest products and increase of investment into forestry. These policies helped mitigate, to some extent, the crises facing forestry enterprises. Due to sluggish adjustment of economic structures, slow reform of the economic management system and management mechanism, the pending problems were not solved fundamentally. In 1991, in accordance with the national guideline of "giving priority to the large enterprises and letting go the small ones" and revitalize the large and medium-size State owned enterprises, the government incorporated the four large State owned forestry enterprises in north-east China and Inner Mongolia (including 84 forestry bureaux) into the first list of the 50 trial enterprise groups in order to deepen the reform on State Forestry enterprises and establish modern forestry enterprise system and new economic operational mechanism suitable for the socialist market economic system.

3.1.1.7 Reform of the Forestry Legal System

Under the conditions of the socialist market economic system, it is a must to improve the legal system so as to safeguard forestry development. Administrative and legal means are required to supplement the economic mean in use. In order to further strengthen forest resource management and separate administration from commercial activities, the Chinese Ministry of Forestry, since 1989, has dispatched forest resource supervisory organizations to major forestry provinces/autonomous regions to supervise consumption and growth of State forest resources, forestry policy implementation and resource management, and the forestry administrations in these provinces/autonomous regions have sent forest resource supervisory organizations to forestry bureaux so that an up-down forest resource supervisory and management system has taken shape.

In 1991, the Chinese forestry sector experienced the transition from applying logging quota system to commercial roundwood only into the new practice of overall control of forest resource consumption. China has made unremitting efforts to enact and improve forestry laws and

regulations with regard to property right management, value appraisal, examination and approval and contract notarization so as to standardize the transfer, lease and mortgage of and share purchase with the property rights of forest resources to guarantee value adding through the circulation and conversion of the forest resource assets.

The development of the socialist market economic system is a process to continuously develop and improve behavioural norms and the legal system. It has become the conscious action of the forestry sector to unify forestry reform, opening to the outside world, sustainable development and forestry legal system development, and to integrate reform decisions with legislative guarantee. The *Forest Law of the People's Republic of China* promulgated officially by the National People's Congress in September 1984 is the first basic forest law of its kind ever since the founding of the people's republic of China in 1949. In November 1988, the Law of Wildlife Conservation of the People's Republic of China was promulgated. During the Eighth Five-Year Plan period, along with the deepening of reform, the legislative development underpinned by the *Forest Law of the People's Republic of China* and the *Law of Wildlife Conservation of the People's Republic of China* entered into a period of improvement ad supplementation.

By September 1994, China had promulgated 4 forestry laws/legal documents, 9 forestry administrative regulations, over 60 sectors rules and more than 200 local forestry by-laws and local governmental regulations which formed the basic framework of forestry legislation. It turns out to be true that forests are now managed with legal means and there are laws to abide by and regulations to follow. The second five-year publicity programme on forestry legislation has been successfully completed and the law enforcement supervisory system been established.

3.1.1.8 Reform of the International Forestry Cooperation System

Along with the increasing trend of internationalization of economic and technological development in the world, China's forestry sector has adopted the open-door policy and carried out extensive inter-governmental, inter-sector and non-governmental economic and technology cooperation as well as personnel training. Priority Fields and priority development projects for international forestry cooperation have been defined in a bid to attract foreign investment and expand foreign trade in forestry. A multi-channel, multi-level and multi-form, bilateral and multilateral cooperation framework has taken shape.

3.1.1.9 Development of Forestry Reform Experimental Zones

As a major component of the rural reform, the Chinese ministry of Forestry has approved, since 1987, the establishment of 10 forestry reform experimental zones of different types encompassing 96 counties/cities of 9 prefectures in 10 provinces/autonomous regions and one forest industrial bureau covering some 260,000 square kilometres. The pilot forestry reform experimental bases are allowed to break some of the current policies and systems so that reform in the experimental zones may experience breakthroughs and practice in advance. The experimental zones have set up independent organizations and formulated standard procedures for them in six phases: the initial investigation and study plan, the design plan, evaluation and approval, personnel training, plan implementation and monitoring, summary and appraisal zones. In consideration of the pending issues in the forestry economic practice, a group of projects have been selected closely related to medium and long term decision making to conduct reform experiments in such fields as forestry management system, forms of economic organization for grass-roots cooperation, business models, development of the circulation market

of forest products, development of forest land system, forest resource asset management, management system development and establishment of modern forestry enterprise system. These experiments have provided quite systematic and practical evidence for the formulation of forestry policies.

3.1.2 The Long-Term Targets and Strategy of China's Forestry Reform

3.1.2.1 Outline of the Essential Points in State Reform and Forestry Reform in the Third Phase

Since 1992, China's reform of the economic system entered into the third and key period. The *Decision on Several Issues Concerning Establishment of the Socialist Market Economic System* was adopted by the Third Plenary Session of the Fourteenth CPC Central committee in 1993. In the light of this guideline, reform in China shifted its focus from breaking the traditional system to the establishment of a new one; from policy adjustment to policy innovations; from specific reforms to comprehensive and integrated reform; from emphasizing key breakthroughs to the combination of overall advancement with key breakthroughs. The supplementary reform of taxation, finance, prices and foreign exchange undertaken in 1994 pushed implementation of the open-door policy and development of the socialist modernization into a new period. During this period, China's forestry entered into the comprehensive and supplementary reform period.

In August 1995, the State Commission for Restructuring the Economic System and the Ministry of Forestry jointly promulgated *the General Outline for Restructuring Forestry Economic System* which explicitly proposed to establish a forestry economic system both in line with the socialist economy and reflecting the characteristics and needs of forestry, change the mode of forestry economic growth, develop the forestry productive capacity, establish in a phased way a fairly completed forestry ecosystem and relatively advanced forestry industrial system in China, and achieve the targets stipulated in the Outline of the Ninth Forestry Plan and the Plan to the Year 2010.

3.1.2.2 The Priorities for China's Forestry Reform and Policy Implementation During the Ninth Five-Year Plan Period

3.1.2.2.1 Implementation of the Differentiated Forestry Management Strategy

First of all, the protection forest which plays a major role in territory security, biodiversity conservation, agro-ecosystem conservation and environmental protection in both urban and rural areas, shall be categorized as **forest for public benefit** with relevant economic policies to follow, On one hand, the forest for public benefit shall be taken as a public welfare undertaking of the State with inputs solely from the government through financial arrangements at all levels in light of their jurisdiction. On the other hand, in accordance with the principle that he who benefits shall pay, input shall be materialized with compensation of the beneficiaries. The compensation mechanism for forest's ecological benefits should be established to create in a phased way a favourable input and output circulation for the forest for public benefit. The **commercial forest** shall be market oriented in optimizing resource allocation structure and efforts be made to change the mode of economic growth, increase the quality of forest growth, and in the light of the development needs in forest products industry, achieve the base production and commercialization for oriented cultivation of forest resources. It is intended to practice high input, high output, high technical content, intensive and grouped management. The

two major forestry systems shall be developed in line with the law of nature and the laws of economy to realize the successful matching of the forestry economic system and the market economic system. Differentiated forest management is a basis for the realization of fundamental changes in economic structure and the mode of economic growth, and a fundamental measure for raising the quality of economic growth, and a fundamental measure for raising the quality of economic growth in forestry. It may lead to great changes in a series of forestry management strategies with regard to forestry management system, mode of management, investment channel, industrial policies, and administrative laws and regulations.

3.1.2.2.2 Forestry Asset Management

Under the market economic conditions, the forest resource must be taken as a dynamic asset which could keep and add value through legal and commercial exchange. There will be establishment of forest resource administration and management mechanism. the forest asset supervision and operation mechanism, and continuous improvement of legal stipulations shall be a critical step in deepening reform during the Ninth Five-Year Plan period.

3.1.2.2.3 Adjustment of Forestry Industrial Structure, Improvement of Forestry Industrial Policies and Adoption of the Strategy of Selecting the Best and Supporting the Strong

Adjustment of forestry industrial structure, improvement of forestry industrial policies and adoption of the strategy to select the best and support the strong. The pioneer and highly efficient fields which provide strong support to overall capacity building of forestry shall be taken as the priorities for development in the forest products industry. The promising enterprises shall be encouraged to annex small and weak ones or control or purchase shares of other enterprises to promote the appropriate flow and transfer of the State forestry assets into high-benefit fields. Manipulation of the stock and wise use of the increased benefits shall help realize restructuring forest assets and forestry enterprises.

3.1.2.2.4 Reform towards a Modern Forestry Enterprise System

Acceleration of the change in the management mechanism of large and medium State forestry enterprises to set up a framework of modern forestry enterprise system by the end of this century shall be a priority of reform; it will be a difficult task to fulfil. At present, efforts are being made to set up 4 large forest industrial groups in the State forest regions in north-east China and Inner Mongolia. The main components of forestry property right shall be defined to promote asset management and administration of the forest resources. Endeavours shall be made to solve the practical problems related to enterprise administration and management mechanisms assets and liabilities, and reform on three systems. This is critical to the realization of "the two fundamental changes" in forestry during the Ninth Five-Year plan period.

3.1.2.2.5 Implementation of the Integrated Forestry Development Strategy in the Mountainous and Sandy Areas

Efforts shall be made to integrate forestry industrial development with settlement of the rural, agricultural and farmer's problems, reduction of the frequency of such natural calamities as drought, flood, wind and sand, environmental improvement in the poverty-stick areas, and the local initiatives of poverty eradication for a better life. By now, over 50 pilot mountain development counties have been set up.

3.1.2.2.6 Others

Efforts shall also be made to establish and develop timber and forest products markets, improve the socialized service system, deepen reform on forestry scientific, technological and educational systems. In light of the special features of forestry, the guideline for reform on the scientific and technological system: "assuring the service of key research staff and decentralizing related institutions" will be implemented. A group of key laboratories will be designated, large numbers of academic and technical pioneers trained to assure the continuous service of key research staff. The research, development and extension institutions providing direct service for forestry production and development will be decentralized and revitalized in a bid to establish socialized service system for forestry science and technology.

Educational structure shall be optimized to give vitality to running educational institutions. Endeavour shall also be made to seek for diversified means of jointly running educational institutions, to make systematic reform on subject structure, curriculum set-up, contents and means of teaching. The key universities and key majors shall be enhanced. Priority shall be given to vigorous development of vocational education, adult education and applied techniques training for forest farmers and to the integration of teaching, research and production.

China will further its opening to the outside world, take active part in activities related to Agenda 21 and implement the Forestry Action Plan for China's Agenda 21 which has been formulated. Priority shall be given to the establishment and improvement of the forestry legal system which composes of interlinked administrative laws and regulations and local by-laws and regulations covering such fields as forestry sectoral management, and protection, cultivation and wise use of forest resources and wild fauna and flora resources.

3.2 Sustainable Development Strategy for China's Forestry

Sustainable development has become a general consensus of the human society. Facing the 21st century, the development of China's forestry has to conquer problems and difficulties that emerge on the road to development, grasp opportunities and realize the sustainable development of China's forestry. The strategy for sustainable forestry development is a development of the strategy for China's sustainable development as formulated in *China's Agenda 21* and one of the cores of realizing the overall strategic goals of China's sustainable development. The purpose of the sustainable forestry development strategy is to implement the principle of sustainable development in the whole process of China's forestry industry practice, realizing sustainable forestry development. Thus, the sustainable development of China's forestry has to realize the sustainable utilization of forest resources and the harmony between cultivation of forest resources and environmental protection, while enhancing its capability of coping with rapid economic growth. The strategic goal for China's sustainable forestry development is to establish a relatively complete forestry ecological system and a relatively developed forestry industrial system, satisfying the need of China's economic and social development for timber and forest products.

The sustainable forestry development strategy will rely on development of education, science and technology, with an emphasis on establishing a technical system for sustainable forestry development. The implementation of the sustainable forestry development strategy needs to

have extensive social participation, public participation, stable and reliable economic input, thus the establishment of a social guarantee system and an economic guarantee system for sustainable forestry development is an important component of the sustainable forestry development strategy.

3.2.1 Sustainable Development Strategy for Forest Resources

China's sustainable forestry development is based on the sustainable development of forest resources. The present forest resources situation and eco-environment calls for emphasis of forestry development and environmental development to be active cultivation of forest resources. By the end of this century, a relatively complete forestry ecological system and relatively developed forestry industrial system will be initially established. It can be divided into 5 aspects in details:

- speed up forest tending and development of timber forest bases. China has scarce forest area, with low quality and productivity of forest stands. Only conscientious strengthening of tending and management of middle-aged and young forests can further increase the quantity and quality of forest resources; speeding up the development of fast growing and high yielding forest bases is an important strategic measure to increase timber stock volume, relieve the pressure on public welfare forest resources, mitigate the imbalance between supply and demand of timber;

- speed up the development of shelterbelt programmes. These shelterbelt programmes include the "Three-North" (Northeast, North China, Northwest) Shelterbelt Development Programme, the Shelterbelt Development Programme along the Middle and Upper Reaches of Yangtze River, the Coastal Shelterbelt Development Programme, Taihang Mountain Greening Programme and Plain Afforestation Programme. Taking the development of shelterbelts as a key component of overall forestry development, on the basis of conserving existing protection forests, a variety of afforestation methods will be adopted to increase the proportion of protection forests. The goal to be realized by the end of this century is that the area of protection forests will take up 30% of the total forest area;

- accomplish the tasks of combating desertification and afforestation. On the basis of actually conserving existing vegetation, 47.41 million ha. of desertified land will be treated by stages;

- develop economic forests and fuelwood forests where appropriate; and

- develop forest product industries, especially the development of wood-based panels industry, sawing industry, forest chemicals industry, wood pulp and paper making industry, wood chips industry and bamboo industry.

3.2.2 Strategy for Comprehensive and Sustainable Mountainous Development

China is a mountainous country with scarce forest resources. The poverty problem of China is mainly with poverty stricken mountainous areas. The mountainous areas have rich forest plant resources, so the implementation of comprehensive development with a focus on forestry is

decided by the characteristics of resources in the mountainous areas, and is an inevitable choice for economic development and poverty alleviation of mountainous areas.

Development of mountainous areas should be based on mountain resources, combining exploitation with sustainable development, economic benefits with improvement of the quality of eco-environment, woody forest resources with non-wood forest resources, development with poverty alleviation and with making mountain farmers richer, doing rational planning and classified implementation. The main issue is the development of "high yield, high quality, high efficiency sustainable forestry", with economic forests as a breakthrough, establishing a group of famous, special and quality economic forest bases, vigorously developing forests, fruits, bamboo, medicine, grass, flowers where appropriate, promoting integrated management such as the combination of forests with grain, animal husbandry, raising, medicine, mines, tourism, and the development of pollution free "green food". Poverty stricken counties will give priority to and lay emphasis on the development of planting, raising and processing industries which require little investment, produce quick results and high benefits, and directly help to solve people's problems of poverty and not having enough food or clothing.

3.2.3 The Sustainable Development Strategy to Combat Desertification

Desertification is a major ecological problem facing China. The Chinese government attaches great importance to combating desertification and has decided to put more efforts into the anti-desertification drive, including integrating combating desertification in the national economic and social development plan, establishing relatively complete soil and water conservation and combating desertification research and management agencies in the central government and locally.

The State Council held two National Anti-Desertification Working Meetings respectively in 1991 and 1993, approved *the Outline of Planning for the National Programme to Combat Desertification between 1991 and 2000* and *the Remarks on Policy Measures to Combat Desertificaton*. On October 14, 1994, the Chinese government signed *the UN Convention to Combat Desertification*. In order to do a better job in China's efforts to combat desertification and to correspond to the Convention, the China National Committee and Its Senior Advisory Group to Implement *the UN Convention to Combat Desertification* were set up by the State Council, the National Greening Committee and the Ministry of Forestry.

The National Programme to Combat Desertification started in China's 27 provinces (autonomous regions) comprehensively in 1992. The plan is to accomplish the combating of desertification and ecological construction tasks of treating 47.41 million ha. of land with 60 years of efforts. This programme lays emphasis on the treatment of desertified land, carries out integrated treatment focusing on the utilization of sandy area resources and the expansion of China's farmland area, to gradually reduce the area of desertified and wind eroded land, and establish an anti-desertification engineering system with the organic combination of prevention, treatment and utilization.

3.3 The Overall Objectives of China's Forestry Development

Taking the goal of sustainable national economic and social development as the point of departure, corresponding to the present situation of forestry development, problems and contradictions facing the country, and requirements for forestry development, the overall objectives of China's forestry development and reform are fixed as:

3.3.1 Objectives for the Development of Two Major Forestry Systems

By year 2000: lay a foundation for the initial establishment of a relatively complete forestry ecological system and a relatively developed forestry industrial system with forest cover reaching 15.5%, the forestry industrial growth rate 12% and the total output value of forestry industries reaching 304 billion yuan. The ten major forestry ecological programmes will form the basic framework of the ecological system, initially controlling the situation of overall eco-environmental deterioration, and start to enter the stage of smooth development, guaranteeing the stable and high yield of agriculture and animal husbandry, and the forestry role in conserving water contributes to the goal of increasing grain yield by 50 billion kg; the forestry industrial structure is greatly improved, the pace of shifting of economic growth mode from focusing on extensive management to focusing on intensive management is greatly accelerated, the comprehensive economic strength of forestry and the self development capacity is greatly strengthened; the comprehensive mountainous forestry development achieves periodical results, ensuring the realization of the goals of the National 87 Poverty Alleviation Programme, speeding up the process of poverty alleviation and making rural areas better off.

By year 2010: initially establish a relatively complete forestry ecological system and a relatively developed forestry industrial system. The forest cover should reach 17.5%, the growth rate of forestry industries 13% and the total output value of forestry industries 1,000 billion yuan. The forestry ecological programme forms a certain scale, starting to exert comprehensive functions of obviously improving the eco-environment, which can basically meet the needs of national economic development and people's lives, forestry makes a major contribution to the economic development of mountainous areas, promoting the coordinated development of regional economy; the forestry industrial structure becomes more and more optimized, the coordinated development of the primary, secondary and tertiary industries has achieved notable benefits; the forestry comprehensive strength almost reaches the level of countries with medium forestry development level.

3.3.2 Objectives of Forestry Economic Structural Reform

By year 2000: initially set up a basic framework of forestry economic system which is in line with the requirements of a socialist market economy, reflects the characteristics of forestry, the situation with China and with China's forestry. Rationalize forestry production relations through strengthening the force of forestry reform, creating conditions for the establishment of the two major forestry systems.

By year 2010: establish a relatively complete forestry economic system. Further realize the standardization and legalization of the forestry economic management system and running mechanism, further optimize distribution of resources, realize sustainable forestry development.

3.3.3 Major Indexes of Forestry Development

(1) Forestry Ecological System Development Indexes (1996-2000). The utilization rate of forest land increases from the present 51% to about 60%; the forest cover increases from the present 13.92% to 15.5%; the standing stock volume (including Taiwan Province) increases from the present 11.7 billion cubic meters to 12.66 billion cubic meters; the area of treated desertified land reaches 3.43 million ha., 2.2% of the total area; treated area suffering from soil and water erosion reaches 21.37 million ha., 12% of the total area; all plain farmland have shelterbelt networks; the area of all types of nature reserves (including wetland type) increases from the present 51.26 million ha. to 60.59 million ha., taking up 6.31% of the country's territory.

(2) Forestry Industrial System Development Indexes (1996-2000). The total output value of forestry industries increases from the present 180 billion yuan to 304 billion yuan; the growth rate of forestry industries reaches 12% (15% with mountainous areas); the contribution rate of scientific and technological progress to forestry economic growth doubles, reaching 40%; the contribution rate of forestry to the increase of mountainous farmers' income reaches about 50%; resettle 15 million rural surplus labourers through comprehensive mountainous forestry development; the comprehensive utilization rate of timber increases from the present 40% to 60%; the unit stock volume increases from the present 89 cubic meters per ha. to 96 cubic meters; the growth rate of forest trees increases from the present 3.89% to 4.3%; the stock volume of timber increases from the present 6.74 billion cubic meters to 6.94 billion; the total output of timber (including commercial timber, timber for farmers' own use, and for propagation) increases from the present 126.88 million cubic meters to 138.78 million; the output of wood based panels increases from the present 6.5 million cubic meters to 10 million; the total production of paper and paperboard reached 30 million hectares, of which the total output of pulp and paper in the forestry sector increases by 1 million tons.

(3) Medium and Long Term Forestry Development Indexes (Year 2010). Forest cover reaches 17.5%; the standing stock volume (including Taiwan Province) reaches 13.96 billion cubic meters; area of nature reserves of various types (including wetland type) reaches 70.68 million ha., taking up 7.36% of the country's territory; the total output of timber reaches 159 million cubic meters; the comprehensive utilization rate of timber reaches 80%; the total output value of forestry industries reaches 1,000 billion yuan; the supply and demand of timber

and major forest products initially strikes a balance; the contribution rate of scientific and technological progress to forestry economic growth reaches 60%.

3.4 Policy Measures for Forestry Development

3.4.1 Investment Policies

Forestry is a public welfare undertaking of the whole society, being one of the major industries of national economic and social development. Practices over the years reveal that the development of forestry has to rely on the whole society. With the intensifying of reforms in the investment and planning systems, the division of responsibilities and rights between the central and local governments has become clearer. Local governments should incorporate the development contents of forestry and especially ecological public welfare forestry into their plans of national economic and social development, providing support from corresponding financial and state budgets and various investment channels, to ensure necessary investment strength.

With regard to the development of forest bases with various special functions and the utilization of forest resources, it is suggested that channels for forestry to absorb social funds and input of social force should be broadened. It is also necessary to actively and fully utilize these two types of resources in the future development, opening up two markets, paying attention to the absorption of funds and technology from foreign governments, international financial organizations, foreign enterprises and companies, speeding up the development of forestry industries.

The Chinese government will adopt different investment channels according to different types:

- Type 1, development of the ecological system: including compulsory tree planting by all people; development of shelterbelt programmes; development of ecological type state forest farms and nurseries; the programme for combating desertification; development of nature reserves, conservation and utilization of wild fauna and flora, etc.. This type of development is mainly for maintaining and improving eco-environment, the major benefits being reflected in ecological benefits and social benefits, the channel for central government investment should still focus on appropriation within the state financial budget, supplemented by comprehensive agricultural development funds and food for work fund.

- Type 2, development of plantations: tending of middle-aged and young forest stands; development of fuelwood forests; development of economic forests; cultivation of bamboo forests, etc.. This type of development can basically produce some economic benefits, with still some differences among themselves, thus it is suggested that aerial sowing and mountain closure can be adopted as a subsidiary investment, while maintaining the channel of appropriation within the state financial budget; timber forest bases, tending of middle-aged and young forest stands, fuelwood forests and cultivation of bamboo forests will all use infrastructure funds in the budget; industrial raw material forests with short rotation periods and economic forests are industries with the best economic benefits in the forest establishment business, so this part of investment mainly depends on the expansion of the scale of comprehensive agricultural development investment and loans from non-

commercial banks. A certain amount of infrastructure funds in the budget will be provided for a few poverty stricken areas with revolutionary traditions and minority nationalities.

- Type 3, development of felling and transportation of timber: including development of forest areas (including transportation and energy construction); renovation and expansion of old bureaux (later stage forest farm construction etc.). This type of development is state basic industries with great social significance, yet with limited direct economic benefits, thus it needs to have the political investment from the state.

- Type 4, development of forest product industries: including the development of various types of forest product industries; technical renovation and expansion of forest machinery plants; construction of the forest products market; development of forests in overseas countries etc.. This type of development is an industry with relatively high economic benefits in the forestry sector, the major part of investment can be obtained from using loans from non-commercial banks.

- Type 5, social development of state owned forestry: including the social development of forest industrial enterprises of key state forest areas, state forest farms and nurseries etc.. This type of development belongs to problems inherited from history, yet is an important matter concerning the survival and development of state owned forestry. During the Ninth Five-Year Plan period, this part of investment should come from appropriation of state budget and financial expenditure. Governments of provinces and autonomous regions of the location should provide support in policy and funds actively.

- Type 6, diversified management of forest industries: being an important measure for state forest industrial enterprises to cast off “two crises”, wisely utilize forest resources, create new employment opportunities, and develop towards a favourable cycle. The investment channel used in the Eighth Five-Year Plan period (forest industry discount loan) should be maintained, and the scale should be increased to an appropriate extent.

- Type 7, development of forestry infrastructure: including the development of forestry scientific research (including technical extension stations); development of forestry education; development of forestry law enforcement system; development of forest pest and disease control; development of forest tree seedlings; development of forestry working stations; development of a monitoring system for forest resources, forest environment, wild fauna and flora, desertification; development of a forestry information system etc.. This type of development is a basic condition for forestry development and provides basic guarantee of success. Thus, the investment is suggested to be solved by appropriation from state financial budget.

- Type 8, other types of development in the forestry sector: including the development of forestry flowers; the development of forest parks and forest tourism; forestry diversified management etc.. Apart from forestry diversified management which goes on applying for discounted loans from agricultural banks, all can apply for certain subsidies through infrastructure funds in the state budget.

3.4.2 Policies on Science and Technology

The focuses of forestry science and technology development during the Ninth Five-Year Plan period are: promote a series of techniques of 10 big groups; focus on six major techniques which need to be solved urgently. These techniques are: the development of forestry production (such as the establishment of shelterbelts), integrated treatment of desertification, forest conservation, resource cultivation, high yield of economic forests and processing of forest products; actually solve 200 important scientific and technological difficulties; introduce 200 advanced techniques from foreign countries; pay attention to basic research and research on advanced and new techniques.

Strengthen development of infrastructure for scientific research. During the Ninth Five-Year Plan period, efforts will be made to set up 2-3 national level key laboratories and 5 national or line engineering technology centres apart from actively developing ministerial level key laboratories; stabilize and establish over 20 stations for positioning research of forest (wetland, desert) ecosystems according to climatic zones over the whole country; set up 20 fixed research bases for key forestry research institutes to carry out long term silviculture experiments, striving for the enhancement and modernization level of scientific research instruments and means; emphasize the dissemination and utilization of scientific and technological information, strengthen the development and management of science and technology books, information, important publications and data base, promoting networking of science and technology information.

Consolidate and improve the forestry scientific research system, science and technology extension system, experiment and demonstration system and technical supervision system. Apart from strengthening the efforts of ministries and provinces jointly setting up forestry technical extension stations, local governments should also collect funds using various forms and channels to be used in the development of extension stations, to form a forestry technical extension network with four levels of forestry technical extension agencies (ministry, province, prefecture, county) as the main body by the year 2000; improve the development of forestry experiment and demonstration system on the basis of consolidating present experimental demonstration zones, to establish 7 prefecture level technical development experimental demonstration zones and 60 demonstration counties of developing forestry through science and technology by the year 2000; organize the implementation of Mountain Vitalization Programme, to speed up the transformation of scientific and technological achievements and the process of helping mountainous areas, farmers and counties to get better off.

By the year 2000, the contribution rate of scientific and technological progress to forestry economic growth will double relative to the present level of about 20%; model areas and experimental demonstration zones exceed 50%; the transformation rate of scientific and technological achievements increase from the present 34% to 50%; the technical level of major fields reach the level of advanced countries at the end of the 1980's. By the year 2010, the contribution of scientific and technological progress to forestry economic growth and overall scope and achievements both scientific and technological should increase further by a large extent relative to the situation in year 2000.

3.4.3 Policies on Forest Products Industry

Forest products industry are the leading industries of forestry; the major aims will include readjusting forestry industrial structure, promoting high efficiency of industry, increasing the economic benefits of forestry industries, especially the alleviation of "two crises" (i.e. economic and resource) with state forest areas and the fostering of new economic growth points; at the same time, fast growing and high yielding forest resources can be fully utilized, promoting the development of afforestation and high yielding forests towards fixed-orientation with bases, commercialization and industrialization, solving the contradictions between forest resources cultivation and utilization.

Industry of pulp and paper making. The goals of the planning for China's pulp and paper making industry by year 2000 are: the production of paper and paperboard to reach 30 million tons, of which 25 million tons are domestically produced (3.32 million tons being wood pulp)[7], the proportion of wood pulp increase from 14% to 18%, the per capita consumption level increase from the present 23.4 kg to 26 kg. In order to realize these goals of development, the following policies will be implemented:

(1) *Lay emphasis on the development of key enterprises*. During the Ninth Five-Year Plan Period, key enterprises are required to gradually realize the goal of big scale operation and modernization. The goals for the development of key enterprises are: by year 2000, the number of pulp and paper making enterprises with an annual production capacity beyond 200,000 tons reach 8, that of enterprises with an annual production capacity between 100,000 - 200,000 reach 20. The forestry sector will concentrate on the development of 6 large scale paper mill projects, with a newly added production capacity of 960,000 tons. Efforts should also be made to carry out re-establishment and reform of small scale enterprises.

(2) *Adjust the structure of raw materials*. Due to the fact that the major reason obstructing the development of paper making industry towards big scale operation and the development of products towards higher grades is the small proportion of wood as raw materials, an integration of forests and the paper making industry will be emphasized during the Ninth Five-Year Plan Period. Apart from better utilization of three types of left over materials in forest areas (poor quality wood, small diameter wood, and the recovery of waste paper), emphasis should also be laid on the vigorous development of forest resources for paper making, trying to realize the goal of establishing bases for the supply of raw materials for paper making.

(3) *Optimize the structure of products*. The purpose of such an effort is to improve the quality and grade of products, increase the variety of products, and appropriately develop short-line products, such as offset printing newsprint, offset printing magazine paper, kraft paperboard, high grade coated paper, information paper, packaging paper, paper for hospital use and medium and high grade paper for domestic use, etc..

(4) *Renovate and improve techniques and facility levels*. In order to adapt to the diversified characteristics of raw materials for paper making, efforts will be made to vigorously research

[7] But see Table 30.

and develop techniques on utilization of cypress, birch and eucalyptus etc. for the production of chemical heat ground mechanical pulp and mechanical pulp to cope with the techniques of newsprint, cultural printing paper and paperboard. Efforts will also be made to vigorously research and promote the use of chemicals for paper making, develop de-inking techniques for wastepaper processing, and techniques and facilities for waste water treatment.

The planned production volume of paper and paperboard in China for year 2000 is 30 million tons, with a total consumption of 25.11 million tons of pulp, of which 23.91 million tons is domestically produced, 1.2 million tons of wood pulp imported. Of all the domestically produced pulp, the proportion of wood pulp will increase from 10% to 13.2%. By then, the proportion of different types of pulp will be as shown in Table 30:

Table 30 - Prediction of the Consumption of Pulp Raw Materials by Year 2000

type of pulp	consumption of pulp (1,000 tons)	proportion %
wood pulp	4,520	18
of which: produced domestically	3,320	13.2
imported	1,200	4.8
reed pulp	1,260	5
bagasse pulp	920	3.7
bamboo pulp	470	1.9
straw pulp	8,400	33.4
waste gunny and cotton pulp	1,000	4
waste paper pulp	8,040	32
others	500	2
total	25,110	100

According to the national plans for the development of pulp and paper making industry, the production capacity of paper and paperboard by year 2010 will reach 40 million tons, which will consume 36.8 million tons of pulp. According to the requirement that 22% should be wood pulp, the domestically produced wood pulp by then will be 8.1 million tons, while imported pulp will be 1.5 million tons.

Wood-based panel industry. Readjust the product composition and regional distribution of wood based panel industry. The development focus for wood based panel industry is on MDF, structural particle board, bamboo plywood and other new varieties of an appropriate scale. It is expected that 520,000 cubic meters of production capacity will be newly created. Particle board and hard fibreboard industries will improve techniques through enlargement of the raw materials provision scope, to expand the scale, treat pollution, improve product quality and functions (such as combustion separation, damp proofing, anti-borer), intensify the level of processing and appropriately develop mould pressing products.

The development of plywood industry should expand the scope of tree species under possible conditions of raw material supply, highlight the advantages of this board type, and lay emphasis on the development of sliced veneer.

Fully utilize bamboo resources, promote the production of products such as bamboo plywood, bamboo composite board and bamboo chipboard, increase the production capacity of bamboo

based panels by 300,000 cubic meters through technical renovation; increase the production capacity by 200,000 cubic meters through newly developed projects.

Forest chemical industry. At present, the output and export volume of China's rosin industry both rank high internationally, yet many problems still exist with this industry such as scattered distribution, small scale, backward techniques, low processing levels and incompatibility with raw material bases, etc.. Thus, the following efforts should be made: (1) vigorously carry out reforms of enterprises producing rosin and turpentine, enhance the grade of products and intensify processing; (2) readjust the enterprise layout through the implementation of industrial policies to realize proper scale management. In principle, no new plants will be built during the Ninth Five-Year Plan period; (3) promote some sino-foreign cooperative projects combining forests with deep processing of products. By the year 2000, the output of rosin would remain at around 420,000 tons, with over 250,000 tons of rosin and further-processed products exported. Properly develop the production of activated carbon in response to the demand of market; stabilize the yield of products such as shellac and extracts. The main focus will be the improvement of product quality, further processing, development of products range, establishment of raw material sources, and creating new ways of development; develop industrial rosin industry with specific emphasis.

Restructure and reactivate the sawmilling industry. Readjust layout, reduce the proportion of urban sawing; promote technical renovation focusing on timber recovery and quality of sawntimber, as well as further processing (such as finger joint timber and laminated veneer lumber). Actively promote processing of sawntimber in forest areas, kiln drying and wood preservation locally. The rate of kiln drying of sawntimber should increase from the present 20% to 50%. Apart from sleepers which need to be preserved, pit props and other types of timber that need preservation should adopt preservation measures.

3.4.4 Structural Reform Policies

Forestry is a basic industry and social welfare undertaking as well as a special trade in the national economy with three major ecological, economic and social benefits, combining the primary, secondary and tertiary industries. With the establishment of China's socialist market economy, a forestry economic system should also be established in the forestry sector which not only is in line with the socialist market economy, but also reflects the characteristics and requirements of forestry, thus fully exerting the irreplaceable functions of forestry in social development, national economic development and ecological development, promoting the sustainable and highly effective development of China's forestry. Section 3.1.1 gave fuller details on reforms.

The 1990s are a crucial stage for the realization of the second step strategic goals of China's modernization, and for forestry reform and development. On the whole, it is intended to set up the basic framework of the forestry economic system under conditions of socialist market economy. Specifically, the objectives and tasks of forestry reforms by the end of this century are to:

- establish a silviculture system which adopts classified management and scientific management;

- establish a assets management system with an emphasis on the supervision, management and running of forest resources and capital;

- establish a forestry industrial system with forest resources cultivation as a basis but with forest products industry as a focus and the coordinated development of primary, secondary and tertiary industries;

- establish an integrated, open, competitive and orderly forestry market system under the macro control of the state;

- establish a forestry macro control system with forestry funds as a guarantee, including economic means such as taxation, credit and loan, investment, price and industrial policies etc.,

- and other legal and administrative means.

3.4.5 Policies on International Exchange and Cooperation

China needs to further open up to the outside world, strengthen international exchange and cooperation in response to the establishment of the socialist market economy system and the development of international economic situation. Promote the advancement of forestry science and technology through international cooperation, functioning as a bridge for the development of forestry and foreign trade. Comprehensively promote international cooperation and exchange in the field of science and technology through the adoption of various forms such as bilateral, multilateral, governmental, non-governmental contacts and international meetings, expanding the scope of cooperation, strengthening exchange of students and scholars, joint development, research and production etc..

China has successively signed or joined some bilateral agreements and important international conventions in the field of environment such as *United Nations Framework Convention on Climate Change, the UN Convention on Biological Diversity, the UN Convention to Combat Desertification, the Convention on Wetlands of International Importance Especially as Waterfowl Habitat (the Ramsar Convention), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES), the Convention on World Natural and Cultural Heritage,* and *the International Tropical Timber Organization*. China has the responsibility of fulfilling its international obligations. China has formulated priority development fields and projects for international forestry cooperation and also actively participates in relevant international or regional activities.

While going on emphasizing high level exchanges and cooperation, major efforts should also be placed on non-governmental contacts, improving multi channel, multi layer and multi form cooperation patterns; strengthen exchange and cooperation in the field of science and technology, promote the commercialization, industrialization and internationalization of scientific and technological exchange achievements with cooperation in science and technology as a leading factor, taking into account the advantages, scientific, technological and economic characteristics of forestry with different countries; actively developing and promoting the cooperation among science, industry and trade; strengthen survey and research, exchange

according to need, emphasizing actual results. Further strengthen the absorption and digestion of introduced technology, conscientiously manage foreign funded projects.

APPENDIX I - CHINA: BASIC DATA ON SOCIETY AND ECONOMY

Table A1 - Statistics of National Economy and Social Development in 1994 Main Indexes of National Economy

Item	Unit	1978	1985	1990	1993	1994
1.Population	1,000 people	962,590	1,058,510	1,143,330	1,185,170	1,198,500
2.Employed people	1,000 people	401,520	498,730	567,400	602,200	614,520
# Staff person	1,000 people	94,990	123,580	140,590	148,490	148,330
3.Gross domestic production	Billion Yuan	358.8	852.7	1,768.1	3,417.2	4,379.9
Primary industry	Billion Yuan	101.8	254.2	501.7	665	823.1
Secondary industry	Billion Yuan	174.5	386.7	771.7	1,624.5	2,125.9
Industry	Billion Yuan	160.7	344.9	685.8	1414	1,835.9
Building industry	Billion Yuan	13.8	41.8	85.9	210.5	290
Third industry	Billion Yuan	82.5	211.9	984.7	1,127.7	1,430.9
of which transportation, post & telecommunication	Billion Yuan	17.3	40.7	111.8	219.6	268.6
Commerce	Billion Yuan	26.6	57.7	83.7	309.1	404.9
4.Total investment of fixed assets	Billion Yuan		254.32	444.93	1,245.79	1,592.63
5.Fiscal revenue	Billion Yuan	112.11	186.64	3312.6	511.48	518.18
Fiscal expenditure	Billion Yuan	111.1	184.48	345.2	531.98	581.98
6.Merchandize turnover	Billion ton /KM	982.9	1,836.5	2,620.7	3,051	3,327.4
7.Handling capacity of the main coastal ports	1,000 ton	198,340	311,540	483,210	678,350	765,710
8.Total value of post and telecommunication	Billion Yuan	1.17	2.96	8.17	46.27	68.82
9.Total value of retail sales of consumer goods	Billion Yuan	126.49	380.14	725.03	1,223.7	1,605.25
10.Total value of imports & exports	Billion US dollar	20.64	69.6	115.44	195.7	236.73
Total value of exports	Billion US dollar	9.75	27.35	62.09	91.74	121.04
Total value of imports	Billion US dollar	10.89	42.25	53.35	103.96	115.69
11.Output of main products						
Grain	1,000 ton	304,770	379,110	446,240	456,490	445,100
Cotton	1,000 ton	2,167	4,147	4,508	3,739	4,341
Oil crops	1,000 ton	5,218	15,784	16,132	18,039	19,896
Sugar crops	1,000 ton	23,818	60,468	72,145	76,242	73,452
Pork , beef & mutton	1,000 ton	8,563	17,607	25,135	32,255	369.7
Aquatic products	1,000 ton	4,660	7,050	12,370	18,230	21,430
Cloth	Billion meter	11.03	14.67	18.88	20.3	18.48
Machine-made paper & paperboard	1,000 ton	4,390	9,110	13,720	19,140	17,330
Raw coal	Billion ton	0.618	0.72	1.08	1.151	1.212
Electric energy production	Billion	256.6	410.7	621.2	839.5	909
	thousand-watt hour					
Crude oil	1,000 ton	104,050	124,900	138,310	145,240	147,640
Steel	1,000 ton	31,780	46,790	66,350	89,560	91,530
End products of steel	1,000 ton	22,080	36,930	51,530	77,160	80,040
Cement	1,000 ton	65,240	145,950	209,710	367,880	400,040

Note:

1. The figures on import and export trade for the years after 1985 were from the statistics made by the customs house
2. The values of various indexes in different years were all calculated by the actual price at that year except the values for post and telecommunication whose prices in 1978 was calculated at 1970's constant price, 1985 and 1990 at 1980's constant price, 1993 and 1994 at 1990's constant price.

Table A2 - Changes of Main Indexes for National Industrial Production

Product	Unit	1994	1993	Changes from 1993 to 1994(%)
Total wood production	1,000 cubic m.	66,151.4	63,922.3	3.5
Total wood -based panel production	1,000 cubic m.	6,647.2	5,797.9	14.6
Plywood	1,000 cubic m.	2,606.2	2,124.5	22.7
Fibre board	1,000 cubic m.	1,930.3	1,809.7	6.7
Particle board	1,000 cubic m.	1,682	1,571.3	7
Total bamboo-wood production	1,000 piece	504,295	433,561.6	16.3
Total saw timber production	1,000 cubic m.	12,943.4	14,012.6	-7.6
Total rosin production	Ton	437,269	503,681	-13.2
Total turpentine production	Ton	52,910	61,627	-14.1
Total tannin extract production	Ton	18,177	26,176	-30.6
Total shellac production	Ton	1,001	931	7.5
Wood production from forestry enterprises	1,000 cubic m.	38,657.7	35,695	8.3
Log	1,000 cubic m.	36,839.2	33,887	8.7
Fuel-wood	1,000 cubic m.	1,818.5	1,808	0.6
Wood-based panel production	1,000 cubic m.	2,260.1	2,324.3	-2.8
from forestry enterprises				
Plywood	1,000 cubic m.	701.5	738.8	-5
Fibre board	1,000 cubic m.	749	795.5	-5.8
Particle board	1,000 cubic m.	750.7	747.8	3.9
Bamboo wood production from forestry enterprises	1,000 piece	15,139.8	10,831.3	39.8
Sawntimber production from forestry enterprises	1,000 cubic m.	2,460.2	2,639.9	-6.8
Rosin production from forestry enterprises	Ton	224,451	221,713	1.2
Turpentine production from forestry enterprises	Ton	34,397	21,822	57.6
Tannin extract production from forestry enterprises	Ton	10,550	13,627	-22.6
Shellac production from forestry enterprises	Ton	949	695	36.5

Table A3 - Status of International Economic Cooperation

Year	Number of contracted countries or regions	Number of contract	External Aid (million US dollar)	Disbursement (million US dollar)
Total	**184**	**62,748**	**40,393**	**25,572**
1976	1	2	1	
1977	1	1		
1978	1	4	1	
1979	8	36	51	170
1980	16	172	185	
1981	36	363	504	
1982	38	314	509	348
1983	40	460	924	452
1984	52	740	1,737	623
1985	71	923	1,265	835
1986	83	944	1,359	973
1987	95	1,449	1,889	1,260
1988	103	2,126	2,172	1,430
1989	124	3,100	2,212	1,686
1990	122	5,175	2,604	1,867
1991	147	8,438	3,609	2,363
1992	159	9,405	6,585	3,049
1993	158	11,605	6,800	4,538
1994	171	17,491	7,988	5,978

Note: The repetition countries or regions were excluded when the statistics was made for each year.

Table A4 - Overall Use of Foreign Investment for Economic Development

Year	Total		Foreign loan		Foreign investment and others	
	Project number	Amount of investment million US dollar	Project number	Amount of investment million US dollar	Project number	Amount of investment million US dollar
Signed agreement for use of foreign investment						
1979-1982	949	20,548	27	13,549	922	6,999
1983	522	3,403	52	1,513	470	1,917
1984	1,894	4,791	38	1,916	1,856	2,875
1985	3,145	9,867	72	3,534	3,073	6,333
1986	1,551	11,737	53	8,407	1,498	3,330
1987	2,289	12,136	56	7,817	2,233	4,319
1988	6,063	16,004	118	9,813	5,945	6,191
1989	5,909	11,479	130	5,185	5,779	6,294
1990	7,371	12,086	98	5,099	7,273	6,987
1991	13,086	19,583	108	7,161	12,978	12,422
1992	48,858	69,439	94	10,703	48,764	58,736
1993	83,423	122,681	158	11,251	83,265	111,430
1994						83,088
Practical use of foreign investment						
1979-1982		12,457		10,690		1,767
1983		1,981		1,065		916
1984		2,705		1,286		1,719
1985		4,647		2,688		1,959
1986		7,258		5,014		2,244
1987		8,452		5,805		2,647
1988		10,226		6,487		3,739
1989		10,059		6,286		3,773
1990		10,289		6,534		3,755
1991		11,554		6,888		4,666
1992		19,202		7,911		11,291
1993		36,773		10,750		26,023
1994						33,946

Table A5 - Value of Overall National Imports and Exports

Year	In RMB (Billion yuan)			In US (Billion dollar)		
	Total value of import and export	Export	Import	Total value of import and export	Export	Import
1978	35.5	16.76	18.74	20.64	9.75	10.89
1980	57	27.12	29.88	38.14	18.12	20.02
1981	73.53	36.76	36.77	44.03	22.01	22.02
1982	77.13	41.38	35.75	41.61	22.32	19.29
1983	86.01	43.83	42.18	43.62	22.23	21.39
1984	120.1	58.05	62.05	53.55	26.14	27.41
1985	206.67	80.89	125.78	69.6	27.35	42.25
1986	258.04	108.21	149.83	73.85	30.94	42.91
1978	308.42	147	161.42	82.65	39.44	43.21
1988	382.18	176.67	205.51	102.79	47.52	55.27
1978	415.59	195.6	219.99	111.68	52.54	59.14
1990	556.01	298.58	257.43	115.44	62.09	53.35
1991	722.58	382.71	339.87	135.63	71.84	63.79
1992	911.96	467.63	444.33	165.53	84.94	80.59
1193	1,127.1	528.53	598.57	195.7	91.74	103.96
1994	2,039.15	1,042.46	996.69	236.73	121.04	115.69

Note: The figures for 1978 were from the statistics made by the foreign trade unit and the figures for 1980 and there after were from the statistics made by the customs house.

APPENDIX II - CHINA: BASIC DATA OF FORESTRY ECONOMICS

Table A6 - Changes of Main Indexes for State-owned Forestry Units

Item	Unit	1994	1993	Change from 1993 to 1994
1.Number of enterprises & institutions	individual	47,255	45,993	2.74
1-1 Forestry	individual	38,562	37,757	2.13
1-2 Industry	individual	2,012	1,650	21.94
2.Number of staff members	person	2,569,355	2,575,664	-0.24
2-1 Forestry	person	843,668	850,204	-0.77
State-owned tree farm	person	556,224	554,550	0.3
2-2 Industry	person	1,305,643	1,300,792	0.37
Enterprises of wood logging & transportation	person	1,082,383	1,072,154	0.95
Enterprises of wood processing	person	143,777	137,534	4.54
Enterprises of forest chemical industry	person	28,679	27,957	2.58
Year-end number of staff member				
Permanent staff	person	1,710,842	1,718,737	-0.46
Contractual staff	person	560,472	506,378	10.68
3.Total amount of wage of the total staff	1000 Yuan	861,399.5	682,861	26.15
3-1 Forestry	1000 Yuan	296,490.5	208,798.1	42
State-owned tree farm	1000 Yuan	192,139.5	133,794.3	43.61
3-2 Industry	1000 Yuan	395,046.4	346,427.3	14.03
Enterprises of wood logging & transportation	1000 Yuan	324,924.2	283,243.3	14.72
Enterprises of wood processing	1000 Yuan	44,105.1	37,037.5	19.08
Enterprises of forest chemical industry	1000 Yuan	8,697.9	8,055.1	7.98
4.Average amount of wage of the total staff	Yuan	3,427.3	2,712	26.38
4-1 Forestry	Yuan	3,590.3	2,685	33.72
State-owned tree farm	Yuan	3,535.4	2,468	43.25
4-2 Industry	Yuan	3,117.6	2,905	7.32
Enterprises of wood logging & transportation	Yuan	3,110.1	2,737	13.63
Enterprises of wood processing	Yuan	3,087	2,746	12.42
Enterprises of forest chemical industry	Yuan	3,031.7	2,919	3.86
5.Labour productivity of total value of industrial enterprises (calculating by total value of output)	Yuan/person/year	12,906	12,692	1.69
Enterprises of wood logging & transportation	Yuan/person/year	9,534	9,353	1.94
Enterprises of wood processing	Yuan/person/year	24,272	24,630	-1.45
Enterprises of forest chemical industry	Yuan/person/year	34,621	36,992	-6.41
6.Labour productivity of total value of industrial enterprises (calculating by the increment)	Yuan/person/year	7,771	7,949	-3.93
Enterprises of wood logging & transportation	Yuan/person/year	7,305	7,477	-2.3
Enterprises of wood processing	Yuan/person/year	7,990	9,187	-13.03
Enterprises of forest chemical industry	Yuan/person/year	11,980	14,210	-15.69
7.Labour productivity of total material of industrial enterprises				
Log	m^3/person/year	102	103	-0.97
Sawnwood	m^3/person/year	47	58	-18.97
Plywood	m^3/person/year	14	17	-17.65
Woody fibreboard	m^3/person/year	37	40	-7.5
Particle board	m^3/person/year	65	76	-14.47

Table A7 - Changes of the Main Indexes of Forestry Production in the Whole Country

Item	Unit	1994	1993	Change from 1993 to 1994
1. Total planting area	1,000 ha	5,992.66	5,903.4	1.51
of which air seeding	1,000 ha	802.42	859	-6.59
2. Forest establishment by afforestation project	1,000 ha	2,282.17	2,259.3	1.01
High-yielding forest afforestation	1,000 ha	462.72	504.7	-8.32
3. Reforestation for cutover site	1,000 ha	722.72	739.2	-2.23
4. Tending on juvenile forest	1,000 ha	9,738.38	10,020.6	-2.82
5. Tending on closed forest	1,000 ha	5,287.6	4,878.2	8.39
6. Improvement of low productive forest	1,000 ha	842.82	780.8	7.94
7. Scattered planting (on four sides)	1,000 tree	3,469,750	3,414,650	1.61
8. Nursing tree seedling	1,000 ha	240.82	261.6	-7.94
9. Tree seed collection	Ton	45,288	51,811.7	-12.59
10.Mountain closure for forest regeneration	1,000 ha	30,999.37	30,871.8	0.41
11.Production of main forest products	Ton			
a. Raw Lacquer	Ton	3,219	3,376	-4.65
b. Tung oil tree seed	Ton	434,539	421,027	3.21
c. Teaoil tree seed	Ton	630,737	487,942	29.26
d. Tallow tree seed	Ton	36,864	40,621	-9.25
e. Gallnut	Ton	9,094	8,818	3.13
f. Palm tree blade	Ton	50,339	45,895	9.68
g. Resin	Ton	569,270	580,780	-1.98
h. Bamboo shoot (in dry weight)	Ton	133,035	127,135	4.64
i. Walnut	Ton	209,997	192,159	9.28
j. Chestnut	Ton	218,793	162,403	34.72
k.Shellac	Ton	3,733	2,455	52.06

APPENDIX III - CHINA: BASIC DATA ON FOREST RESOURCES

Table A8 - Land Area for Forestry by Province Unit: 1000 ha

Province	Total land for forestry	Forest ed land								Open forest	Shrub	New planting	Nursery	Non-forest land				
		Total forested land	Subtotal	Forest stand s				Economic forest	Bamboo forest					Total	Bare land suitable for forest	Cutover site	Burnt forest	Desert land suitable for forest
				Timber forest	Protection forest	Fuel-wood forest	Special forest											
Total*	256,774.0	128,527.8	108,638.2	84,928.6	16,072.9	4,288.6	3,348.1	16,098.8	3,790.8	18,025.7	29,706.3	7,138.3	114.9	73,261.0	63,025.3	2,756.8	912.8	6,566.1
Beijing	919.5	267.1	145.5	41.4	80.3	7.4	16.4	121.6	0.0	35.2	209.4	22.9	4.5	380.1	363.3	2.0	0.4	14.7
Tianjing	141.0	85.8	45.7	1.6	40.9	0.0	3.2	40.1	0.0	1.2	4.8	9.6	2.4	37.2	19.2	0.4	0.8	16.8
Hebei	5,660.4	2,480.6	1,525.0	968.6	342.7	201.0	12.7	955.6	0.0	292.0	230.0	123.0	7.3	2,527.5	2,413.6	48.5	0.0	65.4
Shannxi	6,543.9	1,270.0	1,096.8	828.2	245.4	10.4	12.8	172.4	0.8	450.6	797.1	106.6	19.2	3,900.4	3825.1	28.8	2.4	44.1
Inner mongolia	32,140.6	14,065.7	13,199.6	11,781.2	500.2	222.9	695.3	866.1	0.0	1,100.7	2,124.2	421.2	12.5	14,416.3	10,436.7	270.1	106.8	3,602.7
Liaoning	5,462.0	3,918.6	2,712.7	1,741.2	509.3	406.3	55.9	1,205.9	0.0	266.3	71.5	165.8	6.2	1,033.6	925.9	38.4	0.0	69.3
Jilin	8,191.7	6,346.9	6,304.6	5,255.2	749.9	23.6	275.9	42.3	0.0	432.9	35.9	200.4	4.3	1,171.3	936.4	226.7	2.1	6.1
Heilongjiang	21,959.3	16,162.0	16,108.6	15,065.3	403.0	77.7	562.6	53.4	0.0	1,210.5	153.4	739.8	10.4	3,683.2	2,435.6	781.2	431.2	35.2
Shanghai	15.6	14.7	3.1	0.0	2.6	0.0	0.5	9.3	2.3	0.0	0.1	0.0	0.8	0.0	0.0	0.0	0.0	0.0
Jiangsu	632.6	412.2	229.4	140.6	70.6	10.6	7.6	160.8	22.0	19.2	6.4	18.4	4.2	172.2	156.6	11.0	0.2	4.4
Zhejiang	6,156.9	4,375.9	2,960.0	2,824.7	74.9	31.4	29.0	906.1	509.8	492.9	285.3	106.3	0.0	896.5	836.1	36.2	24.2	0.0
Anhui	4,383.5	2,256.1	1,642.2	1,465.9	119.5	42.6	14.2	410.5	203.4	302.8	145.8	121.8	5.9	1,551.1	1,442.2	28.4	9.5	71.0
Fujian	8,934.0	6,148.4	4,676.3	4,058.1	310.3	245.3	62.6	791.4	680.7	555.6	216.6	695.2	0.0	1,318.2	1,128.2	113.0	67.4	9.6
Jiangxi	10,483.4	6,727.7	5,045.7	4,148.8	255.8	610.7	30.4	1,130.4	551.6	1,165.5	105.6	561.2	0.0	1,923.4	1,811.4	64.0	28.8	19.2
Shandong	2,593.6	1,628.8	641.6	160.0	440.0	38.4	3.2	987.2	0.0	192.0	16.0	113.6	6.4	636.8	571.2	28.8	4.8	32.0
Henan	3,801.2	1,752.7	1310.5	834.5	313.1	132.3	30.6	429.3	12.9	278.3	184.0	75.8	8.0	1,502.4	1,413.8	24.1	3.2	61.3
Hubei	7551.3	3,952.2	3,330.3	2,517.1	335.4	428.9	48.9	500.9	121.0	437.0	930.1	146.0	1.0	2,085.0	1,988.8	63.2	8.0	25.0
Hunan	11,666.1	6,949.0	4,175.8	3,695.5	195.3	249.8	35.2	2,267.2	506.0	823.0	807.1	464.3	0.0	2,622.7	2,446.6	124.9	38.4	12.8
Guangdong	10,347.0	6,543.1	5,319.9	4,792.2	220.7	283.0	24.0	868.2	355.0	508.5	906.3	1,405.6	0.0	983.5	834.7	91.2	48.0	9.6
Guangxi	13,195.7	6,021.7	4,792.4	3,788.7	859.6	129.7	14.4	989.2	240.1	547.4	677.1	513.8	0.0	5,435.7	5,037.2	360.1	38.4	0.0
Hainan	1,725.9	1,066.3	605.7	415.0	139.1	8.4	43.2	449.8	10.8	62.4	121.0	16.8	0.0	459.4	393.4	24.0	8.4	33.6
Sichuan	26,722.0	11,531.8	10,346.4	6,709.0	3,464.1	12.9	160.4	839.8	345.6	2,740.1	7,909.4	234.1	6.5	4,300.1	4,099.0	129.6	39.4	32.1
Guizhou	7,398.8	2,602.8	2,195.1	1,,629.1	271.8	219.0	75.2	348.5	59.2	844.1	625.0	145.5	0.0	3,181.4	3,120.6	35.2	19.2	6.4
Yunnan	24,359.7	9,404.2	8,602.8	5,719.2	1,799.2	451.0	633.4	676.6	124.8	3,161.9	4,064.0	283.1	0.0	7,446.5	7,264.2	163.1	19.2	0.0
Tibetan	8,402.0	3,963.7	3,962.7	2,624.3	1,309.4	7.2	21.8	1.0	0.0	249.3	3,982.9	2.7	0.3	203.1	153.4	0.0	3.2	46.5
Shanxi	12,125.0	4,973.5	4,337.0	2,683.4	1,132.2	431.8	89.6	591.7	44.8	367.8	1,020.1	140.7	3.2	5,619.7	4,669.7	28.8	3.2	918.0
Gansu	7,270.3	1,948.6	1,744.2	802.0	715.2	3.6	223.4	204.4	0.0	400.6	1,718.7	171.7	8.0	3,022.7	1,954.1	14.6	2.4	1,051.6
Qinghai	2,875.4	250.1	246.5	33.2	210.9	0.0	2.4	3.6	0.0	115.8	1,600.0	48.0	0.8	860.7	762.8	2.8	2.0	93.1
Ningxia	1,027.3	102.0	83.2	12.0	38.8	0.0	32.4	18.8	0.0	46.4	122.2	35.6	1.6	719.5	457.6	6.4	0.0	255.5
Xinjiang	4,088.3	1,305.6	1,248.9	192.6	922.7	2.7	130.9	56.7	0.0	925.7	636.3	48.8	1.4	1,170.5	1127.9	11.3	1.2	30.1
Three provinces in northeast and Inner mongolia	62,291.6	36,574.6	35,612.8	32,101.7	1,653.1	324.2	1,533.8	961.8	0.0	2,744.1	2,313.5	1,361.4	27.2	19,270.8	13,808.7	1,278.0	540.1	3,644.0
Sichuan and Yunnan	51,081.7	20,936.0	18,949.2	12,428.2	5,263.3	463.9	793.8	1,516.4	470.4	5,902.0	11,973.4	517.2	6.5	11,746.6	11,363.2	292.7	58.6	32.1
Collective forests in ten southern provinces	81,842.6	46,643.2	34,743.4	29,335.1	2,782.4	2,248.8	377.1	8,662.2	3,237.6	5,739.2	4,819.9	4,176.5	6.9	20,456.9	19,039.2	940.2	290.3	187.2

Note: Data provided by the department of forest resource and forest policy, Ministry of forestry. Table 9 reports 133,703,500 but this includes Taiwan Province and the area of Tibet control line.

Table A9 - Forest Resources Unit: 1000 ha, 1000 m^3

Statistic range	Total area	Area of land for forest	Forest growing stock	Forest land area											Area of economic forest	Area of bamboo forest	Forest coverage	Percentage of land for forestry in total land area	Percentage of forest land in the total land for forest	Per capita	
				Total		Wood land area and stock														Area of forest land	Forest growing stock
				Area	Stock	Sum of wood land			Coniferous forest			Broad-leaved forest									
						Area	Stock	m^3/ha	Area	Stock	m^3/ha	Area	Stock	m^3/ha							
National	960,271.6	262,888.5	11,785,239.3	133,703.5	10,136,753.2	113,700.0	10,136,753.2	8.9	57,096.3	5,700,609.1	10.0	56,603.7	4,436,144.1	7.8	16,098.8	3,904.7	13.92	27.4	50.9	0.114	8.622
Beijing	1,782.1	919.5	9,110.3	267.1	4,462.6	145.5	4,462.6	3.1	43.4	843.7	1.9	102.1	3,618.9	3.5	121.6	0.0	14.99	51.6	29	0.024	0.405
Tianjing	1,149.3	141.0	2,480.5	85.8	1,586.6	45.7	1,586.6	3.5	4.1	44.5	1.1	41.6	1,542.1	3.7	40.1	0.0	7.47	12.3	60.9	0.009	0.172
Hebei	18,587.9	5,660.4	76,428.7	2,480.6	52,442.3	1,525.0	52,442.3	3.4	386.1	11,813.6	3.1	1,138.9	40,628.7	3.6	955.6	0.0	13.35	30.5	43.8	0.04	0.836
Shanxi	15,662.3	6,543.9	72,268.7	1,270.0	44,818.8	1,096.8	44,818.8	4.1	455.1	21,392.5	4.7	641.7	23,426.3	3.7	172.4	0.8	8.11	41.8	19.4	0.043	1.504
Inner mongolia	115,840.2	32,140.6	1,123,892.8	14,065.7	896,759.3	13,199.6	896,759.3	6.8	4,780.6	440,881.2	9.2	8,419.0	455,878.1	5.4	866.1	0.0	12.14	27.7	43.8	0.637	40.63
Liaoning	14,573.9	5,462.0	152,274.7	3,918.6	135,180.4	2,712.7	135,180.4	5.0	822.7	36,794.8	4.5	1,890.0	98,385.6	5.2	1,205.9	0.0	26.89	37.5	71.7	0.098	3.366
Jilin	18,886.9	8,191.7	780,978.7	6,346.9	758,341.8	6,304.6	759,341.8	12.0	1,474.4	198,226.9	13.4	4,830.2	560,114.9	11.6	42.3	0.0	33.6	43.4	77.5	0.251	29.95
Heilongjiang	45,460.8	21,959.3	1,571,601.7	16,162.0	1,347,588.7	16,108.6	1,347,588.7	8.4	5,860.6	599,601.0	10.2	10,248.0	747,987.7	7.3	53.4	0.0	35.55	48.3	73.6	0.448	37.35
Shanghai	595.6	15.6	1,173.3	14.7	106.2	3.1	106.2	3.4	2.9	88.6	3.1	0.2	17.6	8.8	9.3	2.3	2.47	2.6	94.2	0.001	0.008
Jiangsu	10,260.0	632.6	34,505.0	412.2	8,124.9	229.4	8,124.9	3.5	138.6	4,024.3	2.9	90.8	4,100.6	4.5	160.8	22.0	4.02	6.2	65.2	0.006	0.118
Zhejiang	10,180.0	6,156.9	112,456.5	4,375.9	94,613.9	2,960.0	94,613.9	3.2	2,576.2	72,531.9	2.8	383.8	22,082.0	5.8	906.1	509.8	42.99	60.5	71.1	0.103	2.234
Anhui	13,816.5	4,383.5	90,159.4	2,256.1	62,509.8	1,642.2	62,509.8	3.8	932.1	29,478.5	3.2	710.1	33,031.3	4.7	410.5	203.4	16.33	31.7	51.5	0.039	1.071
Fujian	12,150.0	8,934.0	394,652.0	6,148.4	321,688.9	4,676.3	321,688.9	6.9	3,214.6	175,739.5	5.5	1,461.7	145,949.4	10.0	791.4	680.7	50.6	73.5	68.8	0.197	10.32
Jiangxi	16,672.3	10,483.4	245,909.9	6,727.7	180,893.3	5,045.7	180,893.3	3.6	3,681.5	92,457.7	2.5	1,364.2	88,435.6	6.5	1,130.4	551.6	40.35	62.9	64.2	0.172	4.623
Shandong	15,222.1	2,593.6	61,864.9	1,628.8	15,002.8	641.6	15,002.8	2.3	276.8	3,595.2	1.3	364.8	11,407.6	3.1	987.2	0.0	10.7	17	62.8	0.019	0.174
Henan	16,700.0	3,801.2	117,486.4	1,752.7	48,189.1	1,310.5	48,189.1	3.7	315.1	9,330.9	3.0	995.4	38,858.2	3.9	429.3	12.9	10.5	22.8	46.1	0.02	0.544
Hubei	18,586.2	7,551.3	138,613.1	3,952.2	119,569.6	3,330.3	119,569.6	3.6	1,884.9	58,232.3	3.1	1,445.4	61,337.3	4.2	500.9	121.0	21.26	40.6	52.3	0.071	2.143
Hunan	21,183.5	11,666.1	194,467.4	6,949.0	151,478.3	4,175.8	151,478.3	3.6	3,385.3	101,935.3	3.0	790.5	49,543.0	6.3	2,267.2	506.0	32.8	55.1	59.6	0.111	2.417
Guangdong	17,790.1	10,347.0	192,880.9	6,543.1	162,481.7	5,319.9	162,481.7	3.1	3,631.1	87,261.8	2.4	1,688.8	75,219.9	4.5	868.2	355.0	36.78	58.2	63.2	0.1	2.49
Guangxi	23,760.0	13,195.7	255,240.0	6,021.7	213,592.3	4,792.4	213,592.3	4.5	2,425.4	92,466.2	3.8	2,367.0	121,126.1	5.1	989.2	240.1	25.34	55.5	45.6	0.137	4.877
Hinan	3,410.4	1,725.9	64,464.1	1,066.3	56,955.6	605.7	56,955.6	9.4	19.2	462.9	2.4	586.5	56,492.7	9.6	449.8	10.8	31.27	50.6	61.8	0.155	8.303
Sichuan	56,607.9	26,722.0	1,456,437.8	11,531.8	1,305,310.9	10,346.4	1,305,310.9	12.6	7,254.9	1,042,959.5	14.4	3,091.5	262,351.4	8.5	839.8	345.6	20.37	47.2	43.2	0.105	11.87
Guizhou	17,647.1	7,398.8	137,779.4	2,602.8	93,911.8	2,195.1	93,911.8	4.3	1,302.6	44,213.1	3.4	892.5	49,,698.7	5.6	348.5	59.2	14.75	41.9	35.2	0.077	2.794
Yunnan	38,264.4	24,359.7	1,366,406.1	9,404.2	1,105,281.8	8,602.8	1,105,281.8	12.8	4,225.9	474,219.3	11.2	4,376.9	631,062.5	14.4	676.6	124.8	24.58	63.7	38.6	0.245	28.84
Tibetan	122,843.6	12,547.0	2,084,801.5	7,169.9	2,053,798.5	7,168.9	2,053,798.5	28.6	5,378.7	1,687,495.3	31.4	1,790.2	366,303.2	20.5	1.0	0.0	5.84	10.2	57.1	3.145	900.8
Shanxi	20,597.7	12,125.0	320,563.4	4,973.5	279,182.5	4,337.0	279,182.5	6.4	718.9	37,551.8	5.2	3,618.1	241,630.7	6.7	591.7	44.8	24.15	58.9	41	0.146	8.199
Gansu	44,973.4	7,270.3	192,426.3	1,948.6	165,003.0	1,744.2	165,003.0	9.5	517.1	84,640.6	16.4	1,227.1	80,362.4	6.5	204.4	0.0	4.33	16.2	26.8	0.084	7.131
Qinghai	72,151.4	2,875.4	36,872.9	250.1	29,599.7	246.5	29,599.7	12.0	174.1	25,123.5	14.4	72.4	4,476.2	6.2	3.6	0.0	0.35	4	8.7	0.054	6.421
Ningxia	6,640.0	1,027.3	7,780.9	102.0	5,806.4	83.2	5,806.4	7.0	10.8	897.1	8.3	72.4	4,909.3	6.8	18.8	0.0	1.54	15.5	9.9	0.021	1.192
Xinjiang	164,700.0	4,088.3	262,416.0	1,305.6	195,625.7	1,248.9	195,625.7	15.7	774.3	164,020.6	21.2	474.6	31,605.1	6.7	56.7	0.0	0.79	2.5	31.9	0.083	12.37
Taiwan	3,576.0	1,969.5	226,846.0	1,969.5	226,846.0	1,855.6	226,846.0	12.2	428.3	102,285.0	23.9	1,427.3	124,561.0	8.7	0.0	113.9	55.08	55.1	100	0.197	22.68

APPENDIX IV - GLOSSARY

1. **Land for forestry use**: Land specially used for forestry production, including forested land, shrub land, open forest land and land without any trees such as land suitable for afforestation and non-forested land.

2. **Forested land:** Land with the growth of various categories of forests (native forest or plantation), bamboo forest and economic forests for special purposes (arbour or shrub). Forested land is an important component of forest resources.

3. **Open forest land:** One type of land for forestry use. Land with the growth of young forest stands between the age groups of I and II, with a density between 0.1 and 0.3. If the forest stand belongs to the III age group, the requirement for density should be between 0.1-0.2.

4. **Land suitable for afforestation**: One type of land for forestry use. All slash land after felling, burning, open land in forests and all barren mountains and land which are not suitable for planting agricultural corps, but suitable for the growth of trees.

5. **Standing stock:** living and standing trees in forest stands. The standing stock counted in forest surveys and statistics also include trees on open forest lands and separate single trees.

6. **Forests producing food and edible oil:** One type of economic forests. Forests with the main purpose of collecting fruit or seeds which can be used for food or for the extraction of edible oil.

7. **Sawntimber:** Timber after initial mechanical processing, with width less than three times of thickness.

8. **Forest fire occurrence rate:** The number of forest fire occurrence over 100,000 hectares of forests.

9. **Forest fire damage rate:** The proportion of area affected by forest fire to the total forest area shown in x/1000.

10. **Forest fire control rate:** Fire affected forest area each time. (ha/time)

11. **Checked out rate of forest fire**: The percentage of the number of forest fire with the cause investigated and dealt with to the total number of forest fire.

12. **Over-mature forests**: Forest stands one age group older than harvesting age.

13. **Mature forests:** Forest stands which have reached harvesting age or within one age group beyond harvesting age.

14. **Lumber:** Logs after sawing, such as sawntimber.

15. **Low productivity forests:** Forest stands with low growth volume or obvious low unit production. One type of low value forest stand.

16. **Forest stand resources:** Forest resources excluding economic forests and bamboo forest resources.

17. **Forest category:** Forest classification unit by benefits. The Forest Law of People's Republic of China divides forests into five categories: protection forests, timber forests, economic forests, fuelwood forests and special purpose forests.

18. **Special purpose forests:** Forests with special purposes of scientific research or environmental protection.

19. **Economic forests:** Forests with the purpose of producing fruits, edible oil, industrial raw materials or medicine.

20. **Silviculture:** One chain in forestry production. Cultivate plantations on barren mountains and land suitable for afforestation, and manage existing forests are both within the range of silviculture.

21. **Area of forest stands:** Area of forested land excluding economic forests and bamboo forests.

APPENDIX V - EXCHANGE RATES (1980-1997)

year	foreign currency	selling price of RMB
1980	$100	RMB 150
1985	$100	RMB 320
1989	$100	RMB 373
1993	$100	RMB 570
1995	$100	RMB 844
1997	$100	RMB 830

List of Working Papers released

APFSOS/WP/01	Regional Study - The South Pacific
APFSOS/WP/02	Pacific Rim Demand and Supply Situation, Trends and Prospects: Implications for Forest Products Trade in the Asia-Pacific Region
APFSOS/WP/03	The Implications of the GATT Uruguay Round and other Trade Arrangements for the Asia-Pacific Forest Products Trade
APFSOS/WP/04	Status, Trends and Future Scenarios for Forest Conservation including Protected Areas in the Asia-Pacific Region
APFSOS/WP/05	In-Depth Country Study - New Zealand
APFSOS/WP/06	In-Depth Country Study - Republic of Korea
APFSOS/WP/07	Country Report - Malaysia
APFSOS/WP/08	Country Report - Union of Myanmar
APFSOS/WP/09	Challenges and Opportunities: Policy options for the forestry sector in the Asia-Pacific Region
APFSOS/WP/10	Sources of Non-wood Fibre for Paper, Board and Panels Production: Status, Trends and Prospects for India
APFSOS/WP/11	Country Report - Pakistan
APFSOS/WP/12	Trends and Outlook for Forest Products Consumption, Production and Trade in the Asia-Pacific Region
APFSOS/WP/13	Country Report - Australia
APFSOS/WP/14	Country Report - China