CHINA BAMBOO INDUSTRY PLANS AT NATIONAL AND PROVINCIAL LEVELS

Translated by the International Bamboo and Rattan Organisation



International Bamboo and Rattan Organisation (INBAR)

INBAR, the International Bamboo and Rattan Organisation, is a multilateral development organisation of over 40 Member states for the promotion of bamboo and rattan. INBAR supports its members to include bamboo and rattan in their sustainable development action plans and green economy strategies. It promotes innovative ways of using bamboo and rattan to improve rural livelihoods, protect the environment, address climate change and issues of international bamboo and rattan trade and standards. INBAR connects a global network of partners from government, private and NGO sectors to promote a global agenda for sustainable development using bamboo and rattan.

About this report

This report combines the English translation of the China National Bamboo Plan 2011-2020 with abridged versions of bamboo industry development plans for Sichuan, Zhejiang and Yunnan. The report can be cited as: International Bamboo and Rattan Organisation (INBAR) (translators). 2018. China National Bamboo Planning. INBAR: Beijing, China.

Tel: +86-10-6470 6161; Fax: +86-10-6470 2166; Email: info@inbar.int www.inbar.int International Bamboo and Rattan Organisation (INBAR) PO Box 100102-86, Beijing 100102, P. R. China

Table of Contents

China's National Plan for Bamboo Industry	1
Preface	1
Chapter 1 Overview of China's National Bamboo Industry	3
Chapter 2 China's Bamboo Industry Situation and Prospects	13
Chapter 3 Guidelines for Developing the Bamboo Industry	21
Chapter 4 Key Construction Task	25
Chapter 5 Cost and Benefits Assessment	37
Chapter 6 Safeguarding Measures	39
Development Plan for the Bamboo Industry in Sichuan Province	41
1. Current status	41
2. Development goals and strategy	41
3. Key tasks	42
4. Environment protection	45
5. Supporting measures	46
Action Plan for Upgrading the Bamboo Industry in Zhejiang Province 2015-2017	49
1. Background information	49
2. General requirements	51
3. Key tasks	52
4. Priority projects	53
5. Supporting measures	55
Development Plan for the Bamboo Industry in Yunnan Province 2014-2020	57
1. Current status	57
2. Development goals and strategy	57
3. Key tasks	59
4. Supporting measures	62

China's National Plan for Bamboo Industry

Preface

Bamboo resources are of high ecological, industrial and cultural value. Worldwide, there are more than 1200 species in over 70 bamboo genera, many lying in the tropical and subtropical areas, and a few located in the temperate and boreal zones. Geologically, bamboo resources are distributed in three areas: the Asia-Pacific bamboo area, the American bamboo area and the African bamboo area. China is a leading country in bamboo resources, with numerous species, large bamboo distribution areas and high economic value. Relevant statistics indicate that there are over 500 bamboo plants species in 39 genera in China, mainly distributed in the south region of the 35°N latitude. With its bamboo resources, bamboo areas, bamboo timber standing volume and production ranking first in the world, China has been awarded the title of 'Bamboo Kingdom'. Currently, the 6.73 million-hectare (ha) bamboo forests lie in 16 provinces, autonomous regions or municipalities.

Bamboo products range from traditional bamboo products, such as materials for construction, housewares and crafts, to bamboo timber-based panels, bamboo paper pulp, bamboo fibre products, bamboo charcoal, bamboo vinegar, bamboo shoots and extracts from bamboo leaves. These provide thousands of products. In China, about 7.55 million farmers are directly involved in bamboo forest cultivation, product processing and production. In 2010, the national output of the bamboo industry was worth 117.3 billion CNY, producing 1400 million culms of bamboo timber, 1.66 million tons of bamboo shoots, 3.58 million tons of bamboo timber-based panels, 1.11 million cubic metres of bamboo flooring, 11.25 million pieces of bamboo furniture, 120,000 tons of bamboo fibre products, 2.17 million tons of bamboo paper pulp and 3.77 million tons of bamboo-based housewares.

Although tremendous progress has been made in China's bamboo industry in recent years, some issues continue to impede its all-around development. These constraints are particularly acute in the following two aspects: (1) the imbalance of regional development with small-scale processing enterprises of weak comprehensive capacity, low bamboo resource multipurpose utilisation rates and low value-added products; and (2) consumers' limited recognition of modern bamboo products. Despite the time-honoured domestic utilisation history of bamboo, bamboo product markets are largely internationally dependent; the domestic market makes up only a tiny share due to a slow and inadequate domestic demand.

China's 12th Five-Year Plan (2011-2015) defines the bamboo industry as one of the ten pillars of the forestry industries. Developing the bamboo industry bears an important influence on China's implementation of farmer-preferable policies, encouraging farmers' employment, raising farmers' income and cultivating new economic growing points. China's large mountainous areas, which make up 69 per cent of the total territory, provide an agreeable home to many regionally unique bamboo species and to 56 per cent of the total population. Viewed from a national land and resource strategic utilisation perspective, developing the bamboo industry is one of the best practices for improving forest land fertility, increasing farmers' income, creating rural employment, stabilising society and improving the development situation in mountain areas in China. Additionally, bamboo is as important as other tree species for improving a nation's green growth and ecological environment; bamboo thus has a share in China's Key Forestry Ecological Engineering Programme. A scientific and rational

utilisation and exploration of China's bamboo forests serves as a perfect supplement to accelerating territory greening and forest resource increments.

The rapid development of the bamboo industry alleviates the intense supply and demand for timber, thus ensuring national timber security, speeding up the economic development of mountain areas, increasing farmers' incomes, enriching the ecological culture and promoting ecological civilisation. The bamboo industry also contributes heavily to the 'double increase' aim (made by the Hu Jintao administration at the UN Climate Summit in 2009) to increase the total forest area by 40 million ha and the total forest inventory by 1.3 billion cubic meters compared with 2005. Finally, the bamboo industry contributes to forest carbon-sink increments, climate change mitigation and adaptation, and the realisation of green growth. The State Forestry Administration, PRC, has thus compiled this document: 'China: National Planning for Bamboo Industry (2011-2020)'.

Planning Compiling Group, October 2012

Chapter 1 Overview of China's National Bamboo Industry

Part 1 Profile of Bamboo Resources

1. China's National Bamboo Resources

1.1 Bamboo Resources

China is rich in bamboo resources and has a time-honoured bamboo cultivation and utilisation history. The noted British scholar, Joseph Needham, once remarked in his book, 'Science and Civilisation in China', that the 'East Asian civilisation is none other than a bamboo civilisation' and 'China is the cradle of that bamboo civilisation'. With over 500 bamboo species in 39 genera, China ranks first worldwide in terms of area, volume, bamboo-based products production and export volume. China has long held the name of 'Bamboo Kingdom'.

Statistics show that by the end of 2010, the area of bamboo forests in China reached 6.7274 million ha in the 16 major bamboo provinces or regions, accounting for 0.70 per cent of the total national land area and 3.48 per cent of the total forest area. These forests can provide 28.63 billion standing culms. Among the entire bamboo forest, 373,800 ha (5.56 per cent of the total bamboo forest area) were bamboo forests for shoots, 940,600 ha (13.98 per cent) were for paper pulp, 2.44 million ha (36.32 per cent) were for timber, 1.26 million ha (18.67 per cent) were for public benefit and 50,500 ha (0.75 per cent) served as scenery. The national bamboo nursery's annual capacity is 120 million seedlings, with 43 bamboo-themed parks, 26 bamboo botanic gardens and 181 ha of bonsai bamboo forest (see Table 1-1 and Appendix 5).

Province	Fujian	Jiangxi	Sichuan	Hunan	Zhejiang	Guangdong	Guangxi	Anhui
Area	1,041,475	986,448	860,019	847,196	831,900	651,400	340,900	340,000
Proportion	15.48%	14.66%	12.78%	12.59%	12.37%	9.68%	5.07%	5.05%
Province	Hubei	Yunnan	Shanxi	Chongqing	Guizhou	Jiangsu	Hainan	Henan
Area	239,105	193,447	117,294	111,825	106,482	31,085	16,491	12,347
Proportion	3.55%	2.88%	1.74%	1.66%	1.58%	0.46%	0.25%	0.18%

Table 1-1 China's Main Bamboo Provinces' (autonomous regions) Bamboo Areas Unit ha

1.2 Bamboo Resource Distribution and Characteristics

China has abundant bamboo resources, with species that vary from the sympodial cluster species in tropical areas to the monopodial species in subtropical areas and the amphipodial species, which can survive in the cold, high elevation and high-altitude areas. These bamboo species are mainly located in the south, to latitudes of 35°N. Natural bamboo forests can be found in 27 provinces or autonomous regions, except for Xinjiang, Inner Mongolia and Heilongjiang. They are extensively distributed in 13 provinces or autonomous regions, including Fujian, Zhejiang, Jiangxi, Hunan, Guangdong, Anhui and Hubei, and mountain areas in the west part of China, including Sichuan, Guangxi, Guizhou, Chongqing, Yunnan and Shan'xi. The unique local climate, soil texture and landforms in the provinces create clear regional differences in the bamboo distribution that depend on the characteristic biological variations. The following are the four main distribution areas:

1. Yellow River - Yangtze River Bamboo Region

This region is geologically located between latitudes 35°N and 40°N, with an average annual temperature ranging from 12°C to 17°C and an average rainfall of 600-1200 mm. Main bamboo species include *Phyllostachys, Pleioblastus, Sinarundinaria Nakai, Arundinaria, Sasa Makino et Shibata* and *Bashania*.

2. Yangtze River - Nanling Bamboo Region

This region is geologically located from 25°N to 30°N, with an average annual temperature ranging from 15°C to 20°C and an average rainfall of 1200-2000 mm. It is the largest bamboo region in China. Main bamboo species include *Phyllostachys, Pleioblastus Nakai, Brachystachyum Keng, Indosasa McClure, Neosinocalamus Keng f.* and *Chimonobambusa quadrangularis (Fenzi) Makino.*

3. South China Bamboo Region

This region is geologically located from latitudes 10°N to 20°N, with an average annual temperature ranging from 20°C to 22°C and an average rainfall of 1200-2000 mm. This region is rich in bamboo species. Main species include *Bambusa, Dendrocalamus, Acidosasa C.D. Chu et C.S. Chao, Dinochloa, Gigantochloa, Bambusa cerosissima McClure, Pseudosasa, Pseudostachyum, Leptocanna Chia et H.L. Fung and Melocanna.*

4. Southwest China Mountain Bamboo Region

This region is geologically located in the mountain area in the west part of China, with an elevation of 1000-3000 m, average annual temperatures ranging from 8°C to 12°C and a rainfall of 800-1000 mm. This region is home to the indigenous bamboo stands. Main species include *Chimonobambusa quadrangularis (Fenzi) Makino, Sinarundinaria Nakai, Qiongzhuea Hsueh et Yi, Yushania Keng f.* and *Neosinocalamus Keng f.*

1.3 World Bamboo Resources

a. World Bamboo Resource Distribution

Recognised as the world's second largest forest, Bamboo takes an important position in global forest resources. Worldwide, there are over 1200 species in over 70 genera, mainly distributed in tropical or subtropical areas in Asia, Africa and South America, with a few scattered in temperate and cold areas. While forest area worldwide has decreased dramatically, bamboo forest area is increasing by three per cent year-on-year. Currently, the world bamboo forest area is 22 million ha, approximately one per cent of the total forest area worldwide, and the annual bamboo timber production is approximately 15 to 20 million tons. World bamboo areas can be classified into the Asia-Pacific bamboo zone, the American bamboo zone and the African bamboo zone.

b. World Bamboo Industry Development

1) Asia Bamboo Industry Development

The Asia-Pacific bamboo zone is the world's largest bamboo area, with over 900 species in more than 50 genera. The 14 million ha bamboo area accounts for 64 per cent of the world's total bamboo area; cluster bamboos dominate about three-fifths of the land and monopodial bamboos cover the other two-fifths. The main bamboo-producing countries include Bangladesh, Cambodia, China, India, Indonesia, Japan, Malaysia, Myanmar, the Philippines, the Republic of Korea, Sri Lanka, Thailand and Vietnam.

After China, India is the second largest bamboo-producing country in Asia in terms of bamboo species and bamboo area, with 136 species in 19 genera covering an area of four million ha. However, in India, bamboo is regarded as the 'poor people's timber' because bamboo utilisation can be compared with wood in terms of largescale consumption. India currently produces the most bamboo paper in Asia. Almost half of the 100 paper factories in India use bamboo timber pulp as a raw papermaking material, and the proportion of bamboo in raw papermaking materials is as high as 45 to 60 per cent. These materials are used in paper products ranging from craft paper, wrapping paper and newsprint paper to high-grade papers, such as lining paper, bond paper and stationery paper.

Even though Myanmar's territory is only 600,000 square km, it has a bamboo forest area of 2,170,000 ha, containing 90 bamboo species. To make full use of its rich bamboo resources, Myanmar's government has successively established several bamboo timber paper plants. Valued per capita, Myanmar has the largest bamboo consumption.

Japan has a bamboo forest area of 14,130,000 ha, with 230 species in 13 genera. While Bamboo can be found in almost all areas in Japan, except for Hokkaido, Kyushu has the lion's share with 60 per cent of Japan's total bamboo forest area. In Japan, 97 per cent of the bamboo forests are privately owned under intensive management and operation, with an annual bamboo timber production of 200,000-300,000 tons. The bamboo timber processing products in Japan are mainly crafts, daily necessities, clothes hangers, decorations and fences. This sector employs 100,000 people, often in small-sized factories or household workshops. The 1960s and 1970s were Japan's primetime for the bamboo industry. When the production costs climbed in the 1980s, the bamboo industry began to decline. The bamboo shoot processing technology was transferred to China in the middle of the 1980s, making China the main bamboo shoot processing base.

The bamboo distribution in other Asian countries is as follows: Bangladesh has 33,000 ha; Cambodia has 287,000 ha; Indonesia has 60,000 ha; Malaysia has 20,000 ha; the Philippines has 130 ha; the Republic of Korea has 8000 ha; Sri Lanka has 2000 ha; Thailand has 67,000 ha; and Vietnam has 130,000 ha.

2) Bamboo Industry Development in America

The bamboo area in the American zone closely resembles that of the Asia-Pacific zone. This zone stretches from North America to South America, ranging from 47°S in the southern part of Argentina to 40°N in the eastern part of the United States (US). The total bamboo area is 1,600,000 ha and contains over 270 species in 18 genera. All genera are cluster types, except for *Arundinaria*, a monopodial bamboo. With the exception of several large species, the bamboo species in the American zone are mainly short, with low economic value and are concentrated in areas between the Tropic of Cancer and Tropic of Capricorn in Latin America, such as Mexico, Guatemala, Honduras, Colombia, Venezuela and the Amazon region in Brazil. The species are numerous and the areas large.

Apart from *Arundinaria* and two of its derived subspecies, no other indigenous bamboo species are observed in the US. Exotic bamboo species were introduced at the end of the 19th century. At the beginning of the 20th century, the US Department of Agriculture (USDA) launched a research project on bamboo paper pulp and created extensive bamboo species collections. The US Bamboo Association was established at the end of the 1970s, when considerable bamboo education, promotion and introductory work was conducted. Since then, bamboo processing and trade have been active; about 40-50 enterprises are engaged in the production, operation and distribution of bamboo products. The US has seen a robust growth of bamboo gardening. Currently, the US has about 150 bamboo orchards or nurseries dealing with bamboo seeds and seedling sales, six moderately large production trade companies, 12 specialised bamboo nurseries and about 10 companies with a

licence to import exotic bamboo species. A comparatively full and comprehensive service scheme for bamboo production, supply and sales has been set up, and the US currently has the world's largest import market for bamboo products.

While Brazil has several small-scale paper plants to produce paper, gardening and indoor-outdoor decoration are the main purposes of bamboo in this region.

3) Bamboo Industry Development in Africa

Africa has a limited range of bamboo, stretching from 22° S in the southern part of Mozambique to 16°N in the eastern part of Sudan. The bamboo centre in Africa is a belt stretching from the west coast of Africa in the southern part of Senegal to the east coast in Madagascar, with vegetation ranging from tropical rainforests and deciduous evergreen mixed forests. The total area is 1.5 million ha, containing 50 species in 14 genera.

4) Bamboo Industry Development in Europe

Bamboo does not grow naturally in Europe; however, local people's personal preferences and high awareness of environmental conservation have made it possible to introduce exotic bamboo species. Italy, Germany, France, Holland and the United Kingdom (UK) have introduced many bamboo species from Asia, Africa and Latin America. The European Bamboo Association was established in 2000, and several bamboo gardens for scenery or for scientific research have been built. In 2002, a 'Bamboo in Europe' project was funded by a European commission; the project's aim was to plant some bamboo species in the northern part of Germany and to collect and evaluate bamboo species and genotypes.

Part 2 Bamboo Industry in China

China is a major producer of bamboo in the world, ranking first in terms of bamboo resource germplasm, bamboo forest area, bamboo timber stocking volume and production. China is also the world's largest exporter of bamboo products, taking the leading position in bamboo processing technology research and bamboo product innovation. After years of development, China's bamboo forest area and bamboo standing volume have grown rapidly, allowing for a gradual expansion in the scale of its bamboo industry. A number of leading and emerging bamboo enterprises have developed thousands of products including bamboo construction materials, bamboo-made items for daily use, bamboo-based panels, bamboo charcoal, bamboo furniture, bamboo fibre and bamboo drinks. Bamboo application has been extended to construction, paper-making, new material, furniture, packaging, transportation, medicine, food, textiles and tourism. Statistics reveal that the total output of the national bamboo industry has reached 117.3 billion CNY. Employing 7.75 million people, the bamboo industry serves as an emerging industry in China's forestry industry and a new economic growth point for alleviating poverty.

1. Bamboo Resource Cultivation in China

1.1 Bamboo Forest Area Rapid Expanding

China has attached great importance to bamboo resource cultivation. At the beginning of the 1950s, the total national bamboo forest area was 2 million ha, which increased to 3.2 million ha, 3.79 million ha, and 5.38 million ha in 1981, 1993 and 2008, respectively. A dramatic increase was observed by the end of 2010, with the total bamboo area reaching 6.73 million ha in the 16 dominating bamboo provinces.

1.2 Bamboo Forest Management Largely Improved

Bamboo resource management could bring better economic benefits. The collective forest ownership reform provides an impetus to improve bamboo forest management. By combining the practice of transforming the low-yielding forest with intensifying the cultivation techniques, China's bamboo resource quality has been improved by a large margin. The proportion of intensively-managed Moso bamboo forest area rose from 6 per cent in the 1980s to its current level of 30 per cent; concurrently, the bamboo culms in each ha rose from 1350 to 2070, and the average diameter increased from 6 cm to over 8 cm.

1.3 Bamboo Species Structure Optimised

The rich variety of bamboo species in China does not necessarily mean a complete economic utilisation. In recent years, stimulated by market demand and economic gains, main bamboo producing regions in China attempted to introduce fine species with high economic value while fully exploiting the values of the local dominant bamboo species. Considering the current market situation, China's bamboo resource utilisation is not limited to large-sized bamboo species but also covers species with good market promise and high economic values such as *Dendrocalamus giganteus*, *Phyllostachys praecox f.* and *Dendrocalamus affinis*. A balance has therefore been struck between developing bamboo forests intended for use as timber, or shoots, or both. The proportion of other bamboo species has risen from 21.97 per cent in the 1980s to 35 per cent at present. However, the area of Moso bamboo has decreased by nearly 9 per cent. The optimised bamboo species structure has greatly channelled the bamboo industry's development possibilities.

2. Bamboo Shoot Processing Industry in China

Of China's 500 bamboo species in 39 genera, more than 200 species can produce edible bamboo shoots, 30 of which are of fine quality and good taste, such as Moso bamboo, *Cyperus alternifolius L., Phyllostachys praecox, dendrocalamus affinis, Sinocalamus oldhami* and *Acidosasa edulis*. Bamboo shoots can either be enjoyed fresh or made into several ready-to-eat products such as water-boiled bamboo shoots, seasoned bamboo shoots and dried bamboo shoots. China's annual bamboo shoot production exceeds one million tons, and Japan and the Republic of Korea are the main export destinations. Roughly estimated, bamboo shoot processing volume in 2010 was 1.66 million tons (see Table 1-2). Fujian Province produced the most (41.7 per cent), followed by Yunnan, Zhejiang, Anhui, Sichuan and Chongqing.

Province	Fujian	Yunnan	Zhejiang	Anhui	Sichuan	Chongqing	Guizhou
Production	692,157	262,132	149,200	140,378	138,090	100,000	63,488
Proportion	41.70%	15.79%	8.99%	8.46%	8.32%	6.02%	3.82%
Province	Hunan	Guangdong	Guangxi	Jiangxi	Hubei		
Production	44,000	28,849	23,991	8659	8350		
Proportion	2.65%	1.74%	1.45%	0.52%	0.50%		

Table 1-2 2010 Bamboo Shoot Production in Main Processing Areas

Unit: ton

3. Bamboo-Based Panel Industry in China

China's bamboo-based panel industry has taken advantage of China's rich bamboo resources and advanced wood-based panel technology. Twenty years of development have established a mature

bamboo-based panel industry system. Over 1000 enterprises are engaged in bamboo-based panel production in China from Zhejiang Province, Hunan Province, Sichuan Province, Jiangxi Province, Anhui Province and Fujiang Province, which are abundant in bamboo resources. The bamboo-based panel products exceed 10 types, including bamboo-mat plywood, bamboo-timber plywood, bamboo laminated board, woven-mat and curtain ply bamboo, bamboo fibreboard and bamboo particle board. According to available statistics, bamboo-based panel production in 2010 hit 3.5786 million tons (see Table 1-3). Production in Sichuan, Hunan, Fujian and Anhui Provinces has exceeded 500,000 tons each, with Sichuan accounting for the highest (23.47 per cent) of the nation's total production.

Province Sichuan Hunan Fujian Anhui Zhejiang Jiangxi Chongqing Production 840,000 700,000 664,780 516,815 481,200 157,500 132,000 19.56% 23.47% 18.58% 14.44% 13.45% 4.40% 3.69% Proportion Province Guangdong Yunnan Guangxi Hubei Guizhou 31,900 17,917 10,550 400 Production 25,500 Proportion 0.89% 0.71% 0.50% 0.29% 0.01%

Table 1-3 Bamboo-Based Panel Production in 2010

4. Bamboo Flooring Development in China

Bamboo flooring, which originates from China, was launched in the 1980s and has been well received by customers nationally and internationally for its hardness, strength, resilience, softness to the touch, straight and fine grain patterns, structure, reliable stability and deformation resistance. China leads the world in flooring production technology and quality with over 100 flooring production enterprises; however, only 100 of these enterprises are of a moderate scale and six per cent of the production is exported overseas to over 40 countries or regions, thus creating a key world bamboo flooring export base. According to statistics, China's bamboo flooring output in 2010 was 1.1138 million cubic meters (see Table 1-4), with Fujian, Hubei, Sichuan, Jiangxi and Zhejiang Provinces providing 88.15 per cent of the country's total bamboo flooring production. Given that most bamboo flooring is exported overseas, domestic consumers have a comparatively low recognition of (the existence and benefits of) bamboo flooring; thus, the domestic share accounts for only 10 per cent of total sales.

[able 1-4 China's National Bamboo	Flooring Production in 2010
--	-----------------------------

Unit: 10,000 cubic meters

(Measurements in tons)

Province	Fujian	Hubei	Sichuan	Jiangxi	Zhejiang	Hunan	Anhui
Production	27.23	23.46	20.32	16.33	10.85	6.8	2.69
Proportion	24.45%	21.06%	18.24%	14.66%	9.74%	6.11%	2.42%
Province	Yunnan	Guangdong	Chongqing	Guangxi			
Production	2.04	1.13	0.3	0.23			
Proportion	1.83%	1.01%	0.27%	0.21%			

5. Bamboo Pulp Paper-Making in China

Bamboo pulp paper is made from an innovative mix of bamboo pulp, timber pulp and grass pulp through a series of steaming, boiling, bleaching and washing treatments. The abundant bamboo resource in China keeps the cost of bamboo pulp production low, and makes it a good choice for alleviating raw paper material shortage. Statistics indicate that in 2010, China's domestic bamboo pulp output was 2.17 million tons (see Table 1-5). Sichuan Province, Guangxi Province, Guizhou Province and Chongqing have a strong production capacity, collectively producing 83.22 per cent of the nation's total bamboo pulp paper.

			-				
Province	Sichuan	Guangxi	Guizhou	Chongqing	Hunan	Jiangxi	Yunnan
Production	1,125,700	328,668	208,802	14,500	100,000	60,100	58,160
Proportion	51.81%	15.13%	9.61%	6.67%	4.60%	2.77%	2.68%
Province	Fujian	Guangdong	Zhejiang	Hubei			
Production	57,998	44,000	33,000	11,230			
Proportion	2.67%	2.03%	1.52%	0.52%			

Table 1-5 China's National Bamboo Pulp Production in 2010

6. Bamboo-Made Daily Necessities in China

Customs statistics divide bamboo crafts into three types: bamboo sculptures, bamboo mats and curtains, and bamboo baskets and other woven products, which are widely used as gifts, household decorations, garden products, tableware and kitchenware. China's long history of bamboo crafts has enjoyed a rapid increase in popularity in recent years. With an output of 3.77 million tons of bamboo-made daily necessities in 2010, China is in a leading position for bamboo crafts research and development (R&D), production and utilisation (see Table 1-6). Bamboo-made daily-use products are produced mainly in Zhejiang, Hunan and Fujian Provinces. Their collective share produces 77.77 per cent of the national total output. The domestic and international markets for bamboo crafts have a promising long-term outlook.

Table 1-6 China National Bamboo-Made Daily Necessities Output in 2010

Unit: ton

Unit: ton

Province	Zhejiang	Hunan	Fujian	Jiangxi	Sichuan	Anhui	Guangdong
Production	1,081,682	1,000,000	850,162	252,775	179,676	173,751	118,000
Proportion	28.69%	26.53%	22.55%	6.70%	4.77%	4.61%	3.13%
Province	Guangxi	Hubei	Guizhou	Shan'xi	Yunan	Chongqing	
Production	59,177	17,887	16,615	11,491	7159	1580	
Proportion	1.57%	0.47%	0.44%	0.30%	0.19%	0.04%	

7. Bamboo-Based Furniture in China

Bamboo-based furniture is made using bamboo, bamboo laminated wood or bamboo-based panels. The advancing technology in bamboo laminated wood and bamboo timber has helped bamboobased furniture find an increasingly wide market. Statistics reveal that, in 2010, China's bamboo-based furniture production was 11.2473 million pieces (see Table 1-7). Guangxi Province, Chongqing, Zhejiang Province, Sichuan Province and Hunan Province are the five dominating regions in bamboo-based furniture production, producing 85.86 per cent of the national total share. Many well-known bamboobased furniture brands have been introduced to the domestic market.

Province	Guangxi	Chongqing	Zhejiang	Sichuan	Hunan	Jiangxi	Guizhou
Production	274.51	265.00	184.00	142.18	100.00	69.24	29.71
Proportion	24.41%	23.56%	16.36%	12.64%	8.89%	6.16%	2.64%
Province	Hubei	Anhui	Shan'xi	Fujian	Guangdong		
Production	19.91	13.89	12.00	11.15	3.15		
Proportion	1.77%	1.23%	1.07%	0.99%	0.28%		

Table 1-7 China's National Bamboo-Based Furniture Production in 2010 Unit: 10,000 pieces

8. Bamboo Fibre Products in China

Cellulose fibre, the earliest artificial fibre, has been in use for over 100 years, and world cellulose fibre production has reached over three million tons. China's cellulose fibre products have entered a fast industrialisation phase, establishing an industrial chain composed of bamboo pulp fibre, spinning, weaving and dyeing. The bamboo fibre products are being well received by consumers for their fine texture and beauty. Statistics show that 59 enterprises from the major production regions of Fujian Province, Anhui Province, Sichuan Province, Guangxi Province and Hubei Province are engaged in bamboo fibre production, with an output of 1,200,400 tons (see Table 1-8). The total production in those regions provides 82.46 per cent of the total national output.

Table 1-8 China National Bamboo Fibre Products Production Layout

Unit: ton

Province	Fujian	Anhui	Hunan	Guangxi	Hubei	Zhejiang	Guizhou
Production	24,664.00	22,050.00	21,835.00	19,660.00	11,050.00	7805.00	6993.00
Proportion	20.49%	18.32%	18.14%	16.33%	9.18%	6.48%	5.81%
Province	Jiangxi	Chongqing					
Production	5627.00	700.00					
Proportion	4.67%	0.58%					

9. Bamboo Charcoal Production Industry in China

While the use of bamboo charcoal can be traced back 2000 years in China, the emerging development of the bamboo charcoal industry took place only 20 years ago in Japan. In recent years, China has made significant progress in its bamboo charcoal production technology and facilities, exceeding those used in Japan in some respects, to make China a leader in bamboo charcoal production. Yearly exports to Japan account for almost 4000 tons of bamboo charcoal. The 100 bamboo charcoal products fall into 10 main categories: bamboo charcoal chips, original bamboo charcoal, daily necessities bamboo charcoal, moisture-regulating bamboo charcoal, odour-removing bamboo charcoal and shield charcoal. Statistics indicate that bamboo charcoal production reached 136,200 tons in 2010 (see Table 1-9). The production in Fujian and Zhejiang alone provided 88.81 per cent of the total national output, thus nurturing many domestically well-known brands.

Province	Fujian	Zhejiang	Hunan	Anhui	Jiangxi	Sichuan	Yunnan
Production	79,418	41,560	6500	2156	1832	1200	1100
Proportion	58.30%	30.51%	4.77%	1.58%	1.34%	0.88%	0.81%
Province	Hubei	Chongqing	Guangxi	Guizhou			
Production	1000	1000	435	24			
Proportion	0.73%	0.73%	0.32%	0.02%			

Table 1-9 China Bamboo Charcoal Production Regional Distribution in 2010

Unit: ton

10. Bamboo Beverages in China

Along with functional and juicy beverages, tea beverages have been gaining popularity in recent years. Herbal drinks made from natural bamboo liquid extracted from bamboo leaves and *lophatherum gracile* are winning consumers' favour for their body cooling and skin moisturising benefits. According to the available statistics, following the launch of the first bamboo juice in 2004, the bamboo beverage production exceeded 1,7425 tons in 2010 (see Table 1-10). Hunan Province, Guangxi Province, Fujian Province, Fujian Province and Sichuan Province provide 89.81 per cent of the nation's total production.

Table 1-10 China Bamboo Beverage Production Pegional Distribution in 2010		
	Table 1-10 Ching Bamboo Beverage Production Regional Distribution in 2010	Unit: ton

Province	Hunan	Guangxi	Fujian	Sichuan	Zhejiang	Chongqing	Hubei	Guizhou
Production	7450	4000	2200	2000	1233	500	30	12
Proportion	42.75%	22.96%	11.48%	11.48%	7.08%	2.87%	0.17%	0.07%

Part 3 Main Issues Constraining China's Bamboo Industry Development

Though notable progress has been made in the bamboo industry in China, some issues continue to constrain its development.

1. Regional Development Needs to Strike a New Balance

By the end of 2010, China's bamboo industry output reached 117.3 billion CNY. The top five bamboo industry output provinces combined provide 72.8 per cent of the national total bamboo industry output, among which Zhejiang, Fujian and Sichuan – three giant bamboo-producing provinces – account for 56.6 per cent of the total. A comparison of the bamboo forest area and bamboo output contribution figures shows that Zhejiang makes the greatest output contribution, with an output rate of 24.1 per cent from a bamboo forest area of 12.4 per cent, and Jiangxi makes the smallest contribution, with an output rate of only a 6.2 per cent from a bamboo forest area of 14.7 per cent.

2. Domestic Recognition of Bamboo Industry Needs a Push

Domestic consumers' moderate recognition of the bamboo industry has created a bottleneck in the development of the bamboo industry. While people fully understand the natural properties of bamboo, their understanding of bamboo products (i.e. products' range and potential) has yet not been fully explored. While wood-based products dominated the daily necessities market in China for a long time, the scale of bamboo enterprises stagnated at a low level because inadequate market promotion led to a small consumption market. By contrast, many European and other developed countries have widely recognised the natural ecological value and the economic value and performance of bamboo

products, particularly bamboo fibre, bamboo flooring, bamboo-based furniture, bamboo charcoal and bamboo daily necessities. The distinct Chinese characteristics embodied in bamboo products help to enhance this wide reception.

3. Enterprise Scale, Capacity and Economic Benefits Need to Be Upgraded

At the end of 2010, China had 12,756 bamboo processing enterprises engaged in bamboo pulp papermaking, bamboo-based panels, bamboo flooring, bamboo-based furniture, bamboo fibre products, bamboo shoot processing, bamboo beverage and bamboo charcoal production. Of these, 7,583 enterprises (59.4 per cent of the total number of enterprises) had an annual output of less than CNY 5 million and only 101 enterprises (0.8 per cent of the total number of enterprises) had output values exceeding CNY 100 million. Overall, the scale of the bamboo enterprises lingers at a moderately small level, with numerous product varieties in a limited production line, which makes it difficult to achieve a competitive concentration ratio.

The annual average output per person is 15,140 CNY, indicating a low labour efficiency. Some bamboo processing enterprises are constrained by issues of high energy consumption, low integrated utilisation of raw materials and low mechanisation. Inadequate specialised talents exacerbate the situation, leading to a lack of enterprise technology innovation and product capacity upgrades, and trapping the enterprises at a survival level, making it impossible to develop new breakthroughs.

4. Scientific Innovation and Value-Added Products Need More Input and Optimisation

The bamboo industry's overall extensive and low-industrialised development situation has not changed (in recent years). The output increase within the sector comes mainly from the increase in the number of enterprises, although they remain at a moderately small scale, and the production technology and facility remain at a backward level, using labour-intensive methods to process the resources. Enterprises need encouragement to develop in-depth processes and create high value-added products. The international financial crisis (from 2008) took a toll on China's bamboo industry, given that most of the bamboo enterprises are short of innovative R&D capacity and self-innovated intellectual property. The low scientific contribution to product innovation puts the export of products at a disadvantaged position with insufficient backup. Currently, bamboo-based panels, which are widely used in engineering structural materials and decoration materials, are the predominant products of China's bamboo industry. This sector is in fierce competitive competition with timber, steel and plastics, and a substitution (for bamboo by other materials) caused by the cost-performance fluctuation occurs from time to time.

Chapter 2 China's Bamboo Industry Situation and Prospects

Part 1 The Need to Accelerate the Bamboo Industry Development

1. Accelerating Bamboo Industry Development Contributes to Green Growth

As of 2010, China's forest area was 196 million ha, with a forest coverage of 20.36 per cent (2010 data) and plantations covering 61.68 million ha, which ranks China first in the world for plantation area and puts it in a good position for promoting green growth. In 2009, China's President, Mr Hu Jintao, made a commitment at the United Nations Climate Change Summit that China would make striking progress on forest carbon stock, green development, low-carbon economy and a circular economy. In 2011, at the 1st Asia-Pacific Economic Cooperation Forestry Minister-Level Meeting, President Hu Jintao proposed to promote forestry industry and strengthen the green economy.

Regarded as the world's second largest forest industry, China's bamboo industry is one of the ten major pillar industries in forestry advocated in the 12th Five-Year Plan. Being a renewable resource, bamboo is a perfect raw material for producing low-carbon, circular and environmentally friendly, resource-efficient products. Bamboo is essential to the promotion of a circular industry, to green growth and to a green economy. One bamboo culm can be utilised from root, to culm, to leaves, and even the bamboo powder: Bamboo roots can be used for root carving, bamboo culms can be used in flooring and mats, bamboo branches and bamboo rhizomes can be made into crafts and bamboo leaves are a good extract source for bio-healthcare pharmaceutical intermediates and antioxidants. Additionally, the traditional bamboo industry sector can use 100 per cent of the bamboo sawdust, bamboo powder, bamboo joints, and bamboo waste and residues in bamboo flooring and bamboo charcoal products. To take one example, Anji County contains just 1.8 per cent of the nation's total bamboo resources yet creates 20 per cent of the nation's total output of bamboo products (through efficient use of resources). Additionally, like other trees, bamboo can store carbon as it grows. A recent study shows that one ha of Moso bamboo can sequester 5.09 tons of carbon each year, 1.46 times that of China's fir, Cunninghamia lanceolate. In this sense, accelerating the bamboo sector development will have a significant influence on forest carbon sequestration, climate change adaptation and mitigation, and realisation of green growth.

2. Accelerating Bamboo Industry Development Contributes to Increasing Farmers' Incomes

In China, the mountain area covers 69 per cent of the total national area, and mountain area population accounts for 56 per cent of the total national population. These mountain areas are usually poverty-stricken and economically and socially backward. Improvement of local livelihoods is urgently needed. Bamboo forests in most mountain areas serve as the main economic resources for mountain people and local finance revenue. The bamboo industry is labour-intensive, with a long industry chain ranging through the national primary, secondary and tertiary industries. Bamboo industry development is a cutting-in point for China to revitalise its rural economy, environment and socially sustainable development. It serves as a major measure to improve the ecology, optimise the agriculture structure, boost the agriculture economy and increase farmers' incomes.

Bamboo forests contribute to some national key programmes, such as the Public-Benefit Forest Ecological Compensation Programme, Grain for Green and the Yangtze River Shelterbelt Forest Programme. In recent years, China's bamboo area has seen an annual increase of over 200,000 ha. Pushed by the bamboo processing development sector, the bamboo resource value has increased by a large margin and bamboo farmers' incomes have increased by several or even dozens of times. In 2009, Moso's bamboo farmers witnessed an income increase of 140 CNY in Jiangxi Province. In some key bamboo areas in Chongyi County, bamboo forest farmers' average income reached nearly 3000 CNY from the Moso bamboo sector, providing 70 per cent of their average annual total income. In Anji County, Zhejiang Province, the bamboo industry sector brings an additional income of 6500 CNY to local farmers, which is nearly 60 per cent of the farmers' total incomes. These examples show how accelerating development of the bamboo industry sector not only provides significant job opportunities for local farmers but also optimises the structure of the rural industry by boosting the mountain economy, creating jobs and promoting the farmers' incomes.

3. Accelerating Bamboo Industry Development Could Relieve Tense Supply and Demand Relationships of the Timber Industry

Forests are one of the nation's strategic resources, and timber is regarded as one of the four main raw materials by the international community. The demand for timber and timber products in China are on a fast-growing track. The forest resource's function in safeguarding the global ecology and adapting to and mitigating climate change intensifies in the context of global ecological environment deterioration. The conflict between the forest resource limitations and the increase in demand due to social and economic development is becoming increasingly acute. Given that the world's forest area is decreasing at a fast pace and the timber supply is shrinking continuously, finding an alternative to timber is critical.

Compared with other planting species, bamboo's unique biological and ecological features and wide application with great economic value make it an ideal alternative to timber. It takes three to five years for bamboo to grow to full size, compared to 10-15 years for fast-growing timber. Once planted, bamboo can be harvested annually and have sustainable use. In China, the annual bamboo timber production is 1430 million culms, equal to over 23 million cubic meters of timber. More bamboo used means less trees felled. The substitution of bamboo for timber will bring great ecological benefits and bright prospects. For this reason, promoting the bamboo industry is essential for relieving the tensions for timber supply and demand and safeguarding national timber security.

4. Accelerating Bamboo Industry Development Will Boost Ecological Culture

The 17th Communist Party of China's National Congress made the strategic decision to build an ecocivilisation and explicitly expressed the need to consolidate eco-civilisation concepts across the whole country. Eco-culture is the prerequisite for eco-civilisation construction, serving as the cultural basis for eco-civilisation. Forests are the main source and component of eco-culture, and bamboo is the main component of forest culture. Bamboo is regarded as a symbol of noble national integrity in Chinese history and is a beautiful and practical plant. It is an auspicious sign. Bamboo comes in various forms and shapes, with elegant figures. Evergreen, straight and adaptable to harsh conditions, bamboo is admired universally. Bamboo culture is a collection and evolution of people's understanding of bamboo in their social progress from getting to know, planting and utilising bamboo, to the collective spiritual and material wealth embodied by bamboo through characters, painting, artworks and personality power.

Bamboo was not only nurtured by ancient civilisations but it also has a charismatic effect on people's

characters and personalities, and it has imposed a far-reaching influence on modern civilisation development. China has a time-honoured tradition of loving, planting, nurturing and admiring bamboo, which embodied by the old saying 'I would prefer to go without meat than live without bamboo'. Accelerating the bamboo industry sector's development is conducive to combining the time-honoured cultural tradition with the modern bamboo culture, giving a robust boost to ecological culture prosperity and ecological civilisation promotion.

Part 2 Bamboo Industry Development Potential

1. Significant Potential Lies in Bamboo Resource Exploration

Worldwide, there are over 1200 bamboo species in more than 70 genera. Over 500 of these bamboo species in 39 genera are found in China, making it a giant in bamboo resources. Moso bamboo is the most widely-used, commercial bamboo species in China, which is used for timber, food, aesthetic value and medicinal use. Moso bamboo plantation areas in China exceed 4.4822 million ha among the country's total bamboo plantation of 6.7274 million ha, accounting for up to 66.6 per cent of the total area. The large Moso bamboo forest area makes industrialisation easy to achieve. Nevertheless, China also has many specific bamboo species with high economic values that are used for making certain bamboo products. For example, bamboo shoots are produced from square bamboo *Makino Chimonobambusa quadrangularis (Fenzi)* in Tongzi County, Guizhou province; sweet bamboo *dendrocalamus latiflorus munro* in Chongning County, Yunnan Province and *dendrocalamus affinis* in Xiniu Township, Yingde City, Guangdong Province. These species have been used to form a specialised economic pattern zone.

However, as these specialised bamboo species are scattered across China, it is difficult to form a scale economy in a short time and thus, regional development has not been considered seriously. A rational utilisation plan of regional bamboo species by Chinese governmental forest sectors at various levels is therefore needed. When research institutes cooperate closely to breed fine bamboo species and guide local bamboo farmers to select suitable bamboo species in line with the neighbouring region's bamboo processing industry clusters, homogeneous competition can be avoided and the bamboo resource advantages can be turned into a real economic advantage.

2. Great Potential Needs to be Tapped into, Transforming the Low-yielding Bamboo Forests

Statistics shows that at the end of 2010, among the 6.7274 million ha of bamboo forest, 3.0820 million ha is located in middle- and low-producing bamboo areas in the 16 dominant bamboo producing regions in China, accounting for 45.8 per cent of the total area. Of the Moso bamboo forest area, which covers 4.4822 million ha, 1.4431 million ha are middle or low production, accounting for 32.2 per cent of the total area. Of the other 745,900 ha of monopodial bamboo forests, the low production area accounts for 59.0 per cent of the total area, and of the cluster or mixed bamboo forest areas covering 1.4993 million ha, 80 per cent are low production. These figures indicate that a large number of bamboo resources are waiting to be tapped for full utilisation and exploration, particularly among the monopodial and cluster or mixed bamboos. The low-production bamboo results mainly from natural and human factors in that most state-owned forest farms and collective forests are extensively managed, and inadequate incentives make the forest farmers reluctant to cultivate and conserve the bamboo forests. Many regional forest resource advantages have not yet been fully tapped into, nor have they produced appropriate economic benefits. Forest ownership reform, in which forest

ownership is contracted to individual households, gives the forest farmer an incentive to carry out intensity management and transform the institutional policies constraints, as well as problems of low production and low efficiency.

3. Bamboo Products Research and Development Innovation Boasts Great Potential

The predominant natural advantage of bamboo, plus China's absolute advantage on bamboo resource abundance, lays a perfect base for bamboo product exploration and bamboo industry development. The fast growth over the last 20 years has caused forest products to reach almost every aspect of daily use necessities. Over 1000 bamboo products have revealed the unlimited potential for the bamboo industry in the future. Given that most bamboo products are at a primary industrial level, bamboo product enterprises often remain small-scale, and lack updated technology, with few standard production practices that are compounded by high costs. While bamboo products vary in type, consumers are typically offered a limited choice of each specific item, resulting in a severe homogeneity in products. However, the increasing importance attached to China's bamboo sector will promote key technical breakthroughs and innovations. Close communication between research institutes and enterprises will draw more leading enterprises and enterprise alliances to make product innovations. These practices will cement China's bamboo innovation capacity, enabling it to realise its potential and make notable breakthroughs in colour, pattern design and quality improvement. At the 2010 World Expo, the numerous bamboo timber-based products exhibited by INBAR were well received by visitors and effectively deepened their understanding of bamboo. Further exploration of bamboo's properties will expand the application field of bamboo products. Bamboo timber, as a new type of material, boasts a bright future. The idea of substituting timber and plastic with bamboo will go beyond the conceptual level, and the possibilities of new bamboo timber products will have no limits.

4. Bamboo Product Market Demand Has Large Potential to Explore

Consumers' recognition and acceptance of modern forest products have been constrained by the long-term uneven distribution of resources in the bamboo industry sector, limited government support, weak sector innovations and a dearth of efforts in exploring the domestic market and building the brand. Thus, the potential consumption of bamboo products has not yet been fully discovered. Once the constraints are solved and the industry development environment is improved, consumers will recognise the advantages and beauty of bamboo products, thus awakening the potential market demand.

The ever-intensifying relationship between land (use) and forest resources (depletion), and consumers' increasing understanding of bamboo' fast-growing, renewable and natural merits, can make bamboo stand out. Currently, the ratio of bamboo used as raw material in field of paper-making, textiles and furniture has remained pretty low level. However, the aforementioned fields are heavily dependent on raw materials, and as the demand for timber and cotton increasingly outstrips supply, the demand for bamboo materials will increase. The demand from production enterprises for bamboo materials will thus further expand, and consumers will have more opportunities to gain a deeper understanding of bamboo products, thus modifying their perceptions.

In addition, with the development of the bamboo industry's key technology, proceedings and logistics, the product types and quality will become further diversified, thereby improving production and reducing management costs. Increased consumption of bamboo products will enable the production of greener, healthier, more ecologically sound and more cost-effective bamboo products.

In particular, bamboo shoots, bamboo beverages and bamboo fibre products will see a fast growth on the market.

Finally, competition in the industry will lead to modified sector standards and regulated market competition, and standard enterprise production degree will be further promoted. A number of enterprises and brands with strong competitiveness will emerge, and consumers' trust for products will be boosted. With a clear-cut consumption orientation, market demand potential ability will be further encouraged.

5. Bamboo Industry Encourages Employment

Currently, 7.75 million farmers are directly engaged in the bamboo industry; among which, 7.1432 million, 53,050 and 75,100 are engaged in primary, secondary and tertiary industries, respectively. Of local farmers' incomes in the well-developed bamboo processing region, 30 per cent come from the bamboo industry, such as those in Anji in Zhejiang Province, Fengxin in Jiangxi Province and Sanming in Fujian Province. The contribution portion (to farmers' incomes from bamboo in these regions) could be as high as 50 per cent.

The growth of the bamboo processing industry and bamboo tourism sector will provide more job opportunities. It is expected that employment will exceed 8.81 million in 2015, an increase of 13.65 per cent compared with that of 2010 – a 2.59 per cent year-on-year increase. The proportion ratio of people engaged in primary, secondary and tertiary industries changed from 92:7:1 to 88:10:2, and the employment in the forest industry sector is projected to reach 10.02 million in 2020, an increase of 29.28 per cent compared with that in 2010. These figures suggest that the bamboo industry's rapid development has an important role in increasing local farmers' employment and incomes.

Bamboo Industry	2010 Employment	Proportion	2015 Employment	Proportion	2020 Employment	Proportion
Primary Industry	714.32	92.18%	772.228	87.69%	830.12	82.87%
Secondary Industry	53.05	6.85%	88.67	10.07%	122.20	12.20%
Tertiary Industry	7.51	0.97%	19.77	2.25%	49.43	4.93%
Total	774.88	100%	880.67	100%	1001.75	100.00%

Table 2-1 China's Bamboo Industry Sector Employment from 2010 to 2020

Part 3 Market Demand and Supply Analysis and Projection

1. Market Demand and Supply Analysis and Projection for Bamboo Shoots

Consumers preferences for more natural, safer and healthier food will promote a continuous increase in market demand for bamboo shoots and its processed products. More diversified bamboo shoot processed commodities will be offered on the market because of technological improvements in retaining freshness, and a stronger logistical transportation network will expand the market scope. These processes will promote an increasing bamboo shoot market domestically and internationally.

The increase in demand for bamboo shoots from the national and international markets during the 12th Five-Year Plan will be boosted; an annual increase of 16 per cent is expected. The national

demand for processed bamboo shoot products is expected to be as many as 3.5 million tons in 2015, increasing to 5.3 million tons in 2020.

2. Market Demand and Supply Analysis and Projection for Bamboo-based Panels

When comparing bamboo-timber-based panels with wood-based panels, bamboo stands out because of it wide board width, deformation-resistance, stable size, high intensity and resistance to wear. Bamboo can be adjusted to suit a product's structure and size and to meet different intensity and stiffness requirements. Bamboo's resistance to bugs and erosion allow it to be used for surfacing, finishing and decorating. Bamboo-timber-based panels have been employed widely in the construction of automobiles, trains, ships, buildings, containers and packaging. The fast life cycle of bamboo makes it a perfect choice in the international promotion of non-timber forest products.

Bamboo-timber-based panels' applicable scope and demand can be further expanded through the continuous improvement of processing technology and mechanical techniques and the rise of bamboo timber utilisation. The national demand for bamboo timber-based panels was expected to reach 5.6 million tons in 2015, increasing to 8.2 million tons in 2020, with an annual average increase rate of about 9 per cent.

3. Market Demand and Supply Analysis and Projection for Bamboo Flooring

The global trend of low-carbon, environmentally friendly and ecological consumption ideologies make bamboo flooring ideal for consumers due to its inherent advantages over other materials. However, the increasing international demand for bamboo flooring slowed in the wake of the global financial crisis (2008+), which had a long-lasting influence on the international market. In the domestic market, the competition between bamboo flooring and solid wood or laminated flooring remains, and the bamboo flooring capacity is facing an oversupply situation. The market share of bamboo flooring can be boosted by upgrading the technology employed by bamboo flooring enterprises, developing innovative products and raising consumers' awareness of the merits of bamboo flooring. The 12th Five-Year Plan projected to see an 11 per cent annual increase in demand for bamboo flooring, with a demand of two and three million cubic meters in 2015 and 2020, respectively.

4. Market Demand and Supply Analysis and Projection for Bamboo Pulp Paper

The domestic demand for paper will continue to trend, given that China's macro economy environment is moving upward. The demand for bamboo paper is estimated to reach 157.05 million tons in 2015 and 199.53 million tons in 2020. The rapid increase in paper demand will complicate the raw material shortage. Bamboo pulp, which is formed between the needle forest pulp and broad-leaved forest pulp, has several advantages over grass pulp. It can be used as a substitute for broad-leaved wood pulp and effectively relieve the demand on needle wood pulp. Bamboo pulp, which can be used in many types of paper-making, currently costs 1500 CNY, which is a 900 CNY price advantage over that of pine and eucalyptus. The promotion of bamboo pulp in the paper-making industry could relieve the tense supply and demand situation and contribute to raw material structure optimisation in the paper-making sector. The gap between middle- and high- grade paper could also be filled. There is huge potential to be explored. The demand for bamboo pulp is expected to increase by 12 per cent annually during the 12th Five-Year Plan, taking the constraints of bamboo resources into consideration. The demand for pulp was expected to exceed four million tons in 2015, rising to 6.2 million tons in 2020.

5. Market Demand and Supply Analysis and Projection for Bamboo Furniture

Because of its natural texture and simplicity, bamboo furniture is popular in many countries, particularly Italy, Germany and the UK, where it is widely used in bedroom furniture and kitchen facilities. Bamboo furniture is also well received in hotels and restaurants for set decoration. The moderate price of bamboo furniture in China and many Southeast Asia countries makes it a major furniture choice in many developed countries and regions. Domestically, bamboo furniture is targeted at consumers' fondness for uniqueness, simplicity and environmental-friendly, low-carbon style.

The personalised style of bamboo furniture gives it a good impetus for the coming trend of substituting bamboo for timber; this is supported by increasing technical breakthroughs (relating to bamboo furniture) and growing awareness by consumers. It is projected that the popularity of bamboo furniture will grow rapidly over the next 5-10 years, despite problems of overcapacity and highly homogenous products in the furniture sector. The demand for bamboo furniture was predicted to reach 16 million pieces in 2015, with an average annual increase of eight per cent, thus reaching 2.28 million pieces in 2020.

6. Market Demand and Supply Analysis and Projection for Bamboo Fibre

China's rich resource in bamboo gives bamboo fibre the advantage of a low purchase cost and a high fibre yield rate over other materials, thus giving bamboo fibre a cost advantage over other fibres to replace cotton. Besides textiles, bamboo fibre can be processed into various kinds of compounded materials which can be used in transportation, construction and furniture. In this sense, with the expansion of market promotion and application, the demand for bamboo fibre will maintain a robust momentum. 'The 12th Five-Year Plan Guild for Textile Industry' outlined in 2015 that the bamboo pulp fibre industry should upgrade its technology and strive to raise its domestic bamboo pulp fibre production to 100,000 tons. Demand for bamboo fibre products was thus expected to reach 400,000 tons in 2015 and 600,000 in 2020, an annual increase of 25 per cent.

7. Market Demand and Supply Analysis and Projection for Bamboo Charcoal

Japan, the Republic of Korea and Taiwan are the main export markets for bamboo charcoal, of which 90 per cent of total production is for export. The production and consumption of bamboo charcoal has seen a remarkable increase since 2003, owing to domestic economic development and domestic customers' increased awareness. The market outreach progress made in the Middle East, Europe and America has also contributed to its development.

Improved technological progress and application will give bamboo charcoal a promising application in fields of food processing, soil texture improvement, decoration materials, healthcare, water purification and crafts. The 12th Five-Year Plan predicts an annual increase rate of 12 per cent in the bamboo charcoal sector. The bamboo charcoal demand was expected to reach 250,000 tons in 2015 and 400,000 tons in 2020.

8. Market Demand and Supply Analysis and Projection for Bamboo-Based Daily Necessities (Bamboo Crafts)

An increasing global environmental awareness makes bamboo-based daily necessities and crafts a perfect choice for gifts, home decoration and gardening products. Bamboo, with its environmentally friendly, durable and light-weight properties, is generally regarded as an ideal alternative to glass, plastic and metal.

The natural, dignified and elegant styles embodied by bamboo products offer consumers a comfortable experience. The advantages of bamboo products in terms of insulation and durability fit the global consumption fashion perfectly. Production was expected to be five million tons in 2015, increasing to 7.5 million tons in 2020, with an annual increase of six per cent.

9. Market Demand and Supply Analysis and Projection for Bamboo Beverages

Functional beverages have found a place on the drinking market due to people's increasingly health conscious approaches to life, and the proportion of functional beverages on the beverage market is increasing. China's functional beverage consumption rose to five billion CYN in 2010 from 840 million CYN in 2000. When comparing China's functional beverage consumption from a per capita perspective with consumption in developed countries, it is clear that more exploration is needed; China's functional beverage consumption is less than 1 kg per capita, compared to the world average per capita consumption of 7 kg. It is safe to say that the bamboo beverage market still has a large potential to tap.

China's rich bamboo resources, which are being cultivated by increasing demand from domestic markets, offer a good chance for the bamboo beverage enterprises to upgrade their research and development, and introduce advanced equipment and facilities to make more tailored bamboo drinks, which can take a certain share of the market through branding promotion. An increasing number of well-established national and international beverage companies are expected to invest in the bamboo beverage market. It is projected that in the coming 10 years, China's bamboo beverage sector's production and output value will see an average annual increase of more 40 per cent. The demand volume was expected to reach 100,000 tons in 2015 and 200,000 tons in 2020.

Chapter 3 Guidelines for Developing the Bamboo Industry

Part 1 Guidelines and Principals

1. Guidelines

Guided by the central government's general governing ideology of Deng Xiaoping Theory, Three Representatives and the Scientific Development Outlook, in line with the principles of the 'Industrialised Eco-construction and Eco-Industry Development' and in harmony with the plan for 'adjusting structure, expanding market, seeking efficiency and establishing brand', development of the bamboo industry in China will be market-led, and collective ownership reform will be supported to realise the aim of 'making forests benefit the county, and bamboo benefit the farmers'. Establishing key forest industry models will help realise this aim by: adopting classified management; focusing on good-quality, high-yield and high-efficiency bamboo; and facilitating the function-oriented cultivation of bamboo resources. The bamboo processing industry will receive extensive government support to rejuvenate enterprises' overall capacity and develop intensive management to integrate the utilisation of bamboo resources. A new bamboo industry development pattern featuring 'prioritised secondary industry, proactively developed tertiary industry and consolidated primary industry' has been formed. The bamboo industry can serve as a main pillar in increasing the farmers' income, adjusting the economic structure of the villages, boosting the county-level regional development and making new contributions to the double-increase goal.

2. Principal

2.1 Bamboo for Farmers, Bamboo for Better Ecology

The bamboo industry's unique features need to be fully explored and its economic benefits raised to provide more job opportunities for farmers with increased income to boost regional development and ameliorate the environment, with an aim to harmonise the ecological, economic and societal benefits.

2.2 Rational Allocation with Clear-defined Priority

Regional comparative advantages should be fully triggered and the regional industry layout optimised. Industry development key points should be highlighted to explore new strengths and regional development in accordance with local conditions with rational layout under a target-classified guideline.

2.3 Speed and Quality Coordinated Development

A bamboo industry development scale should be meticulously defined in relation to bamboo resource availability. Intensive management and in-depth processes should be underlined through technological innovation and improved utilisation rate. Quality should be prioritised and strict routine management procedures should be implemented to push organic, green, pollution-free and standard production that will substantially improve the quality of bamboo products.

2.4 Scientific Support and Policy Support

Scientific support on variety selection, breeding, intensive management, scientific cultivation, technology innovation and product R&D should be prioritised to promote scientific outreach and

training. New technology should be introduced nationally and internationally. The government will formulate supporting policies in terms of scientific progress and policy preferences to ensure sector development.

2.5 Government-Led and Market-Driven

Give the market a fundamental role in resource allocation and motivate society's enthusiasm and initiatives to engage with the bamboo industry. Necessary support will be given by the government to accelerate industry clusters and upgrade product quality to increase its market competitiveness to ensure a healthy development.

Part 2 Development Goal

1. Development Period

This guideline period is 10 years, from 2011 to 2020, split into two phases. Near-term: 2011-2015 Long-term: 2016-2020

2. General Goal

China's general development goal for the bamboo industry is to coordinate the primary, secondary and tertiary industries in accordance with green economy and low-carbon economy development by 2020 to turn China's bamboo industry from a bamboo resource giant into a strong power. The bamboo industry's output value should reach 200 billion CNY in 2015, increasing by 66.5 per cent compared with 2010, and further increasing to 300 billion CNY in 2020.

3. Phase Target

3.1 Short-Term Target (2011-2015)

3.1.1 Plant a new bamboo forest area of 540,000 ha and upgrade a bamboo forest area of 1,900,000 ha to create a national bamboo area of 7,270,000 ha.

3.1.2 Raise the comprehensive utilisation rate of bamboo to 55 per cent by 2015, raise the bamboo industry's direct employment rate to 8,800,000 jobs and increase local bamboo farmers' income to 1100 CNY from the bamboo sector, accounting for 15 per cent of their net income.

3.2 Long-Term Target

3.2.1 Plant a new bamboo forest area of 460,000 ha and upgrade an area of 1,100,000 ha bamboo forest to create a national bamboo forest area of 7,730,000 ha.

3.2.2 By 2020, raise the comprehensive utilisation rate of bamboo to 68 per cent, raise the bamboo industry's direct employment rate to 10 million and increase local bamboo farmers' income to 2100 CNY, accounting for 20 per cent more of the farmers' net income structure.

Part 3 Development Planning

1. Planning Applicable Scope

China's National Plan for the bamboo industry's applicable scope is determined by compound consideration of the geological distribution, natural conditions and forest resources of bamboo and

the industry's current status and potential. Of the following 16 provinces, 892 counties are defined as suitable locations in which to develop the bamboo industry: Fujian Province, Zhejiang Province, Jiangxi Province, Hunan Province, Sichuan Province, Guangdong Province, Anhui Province, Guangxi Province, Hubei Province, Guizhou Province, Chongqing Municipality, Yunnan Province, Jiangsu Province, Shan'xi Province, Henan Province and Hainan Province (see Appendix 1).

2. Regional Development Planning

Taking China's natural geological differences, the geological distribution and resource exploration and utilisation facilities of bamboo resources, as well as the regional economic and social conditions need to be considered. A regional bamboo industry development strategy will be formed to implement at the provincial level through tailored policies to key development areas and regular development areas.

Key development area: In seven provinces – Fujian, Zhejiang, Jiangxi, Hunan, Sichuan, Guangdong, Anhui – 479 counties (city, district) are covered by some 5,558,400 ha of bamboo forest, which is 82.6 per cent of the total national bamboo forest area.

The main tasks in the key development area are to upgrade the low-production bamboo forests, establish modern industrial bamboo parks with large enterprises and company groups and set up sector-connected industry clusters led by key enterprises, accompanied by small, medium and large enterprises. The aim is to develop a large, strong sector by exploring bamboo industry development, accumulating experiences and innovating new development models.

Regular development area: This area covers 413 counties in nine provinces – Guangxi, Hubei, Yunnan, Guizhou, Chongqing, Jiangsu, Shannxi, Henan and Hainan – with a bamboo resource area covering 1,169,000 ha, 17.4 per cent of the total national bamboo area.

The main tasks in the regular area are to (1) cultivate, extend and transform the bamboo resources from extensive to intensive management, (2) improve bamboo forest management and production rate and (3) establish a sustainable forest management scheme that supports the bamboo industry.

3. Development Layout

Based on regional development planning ideas, the development planning layout of the bamboo industry is divided into key bamboo industry development counties and regular bamboo industry development counties, depending on the bamboo resources, suitable bamboo forest areas and areas to upgrade, and the bamboo industry development status and potential.

3.1 Define factors

3.1.1 Counties with current bamboo forest areas exceeding 14,000 ha are defined as national key bamboo development industry counties with key national support.

3.1.2 Counties currently with bamboo forest areas of no less than 14,000 ha are defined as national regular bamboo development industry counties.

3.2 Define outcomes

Based on the defining factors, 150 counties have been selected as national key bamboo development supporting counties; 136 counties are distributed in key bamboo development regions, accounting for 90.7 per cent of the total key bamboo industry development counties. Based on bamboo resource

distribution, 14 counties have been selected as key bamboo industry development counties from the general development region. For national key bamboo industry development counties' distribution see Table 3-1 and Appendix 2.

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	27	19	24	23	20	16	7
Province	Guangxi	Hubei	Guizhou	Yunnan			
Number	6	6	1	1			

Table 3-1 National Key Bamboo Industry Development Counties

4. Regular Development Counties

Besides the above-mentioned counties, the other 742 counties are listed as regular development counties; 343 are distributed in key development areas and 399 are distributed in regular development areas (see Table 3-2 and Appendix 1).

Table 3-2 China's National Regular Bamboo Industry Development Counties

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui	Guangxi
Number	22	60	69	69	42	52	29	90
Province	Hubei	Guizhou	Yunnan	Chongqing	Jiangsu	Shannxi	Henan	Hainan
Number	49	47	126	39	7	13	21	7

Chapter 4 Key Construction Task

Part 1 Resource Cultivation Engineering

Bamboo, as an important renewable non-wood forest resource, has the benign features of being fastgrowing and having a short rotation, wide application and good comprehensive benefits. Bamboo resource cultivation engineering is a prerequisite for bamboo industrialisation. It is also a significant measure for adjusting bamboo stand structure, optimising bamboo-wood allocation, upgrading capacity, increasing farmers' incomes and promoting regional sustainable economic development and socialism in new village building.

1. Bamboo Forest Base Construction

To cultivate bamboo forest resources, it is essential to enhance intensive management of the bamboo forests and convert operations from extensive to intensive operations. Priority will be assigned to upgrading low-production bamboo forests with improved production conditions to raise bamboo forest management levels and production rates. Great strides will be made to construct modern bamboo parks to materialise the intensive development pattern. Active conservation in bamboo forest biodiversity and forest ecological function will be promoted to set up an efficient, healthy and sustainable bamboo forest resource scheme that supports the bamboo industry.

Bamboo forest-oriented cultivation and classified management are the main development direction and basic principle for bamboo base construction. Previous practices have proved that the best profit can be gained by combining scale production, standard production, industrialised operation and scientific management. In China, function-oriented bamboo forests can be classified into the following four categories: bamboo forest for bamboo shoots, bamboo forest for paper pulp and bamboo forest both for timber and bamboo shoots.

China plans to establish four million ha of bamboo forest; one million ha will be newly established and three million ha will be upgraded. The short-term plan is to establish 2.45 million ha, followed by an additional 1.55 million ha in the long-term.

Among those four million ha bamboo forests to be established in China, 1.41 million ha will be planted in key bamboo industry development counties, accounting for 35.3 per cent of the total area, and 2.59 million ha will be planted in regular bamboo industry development counties, accounting for 64.7 per cent of the total area.

1.1 Bamboo-Shoot-Oriented Bamboo Forest Base Construction

1.1.1 Construction Area

Construction areas will be established in 500 counties in 14 provinces: Fujian Province, Zhejiang Province, Jianxi Province, Hunan Province, Sichuan Province, Guangdong Province, Anhui Province, Guangxi Province, Hubei Province, Guizhou Province, Chongqing Province, Yunnan Province, Shan'xi Province and Henan Province. Of these, 112 sites will be located in key bamboo industry development counties (see Tables 4-1 and 4-2 and Annexes 6 and 7).

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	21	35	86	78	25	68	8
Province	Guangxi	Hubei	Guizhou	Chongqing	Yunnan	Shan'xi	Hennan
Number	62	24	35	33	18	6	1

Table 4-1 National Bamboo-Shoot-Oriented Bamboo Base Distribution

Table 4-2 National Bamboo-Shoot-oriented Bamboo Forest Base Distribution in Key Bamboo Industry Development Counties

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	13	17	23	23	10	16	5
Province	Guangxi	Hubei					
Number	1	4					

1.1.2 Construction Scale

The bamboo-shoot-oriented bamboo forest will cover 360,000 ha, of which 160,000 ha will be newly established bamboo forest and 200,000 ha will be upgraded bamboo-shoot-oriented bamboo forest. Additionally, 150,000 ha of the bamboo-shoot-oriented bamboo forest base will be established in key bamboo industry development counties, 41.6 per cent of the total area. The newly established bamboo-shoot bamboo forest base will be 50,000 ha and the upgraded area will be 100,000 ha.

1.1.3 Bamboo Species

Bamboo species selected for the bamboo-shoot-oriented bamboo forests are Moso bamboo, Phyllostachys praecox, Phyllostachys viridis, henon bamboo, Phyllostachys tianmuensis, phyllostachys prominens, Phyllostachys acuta, Phyllostachys iridescens C. Y. Yao, Phyllostachys heteroclada Oliver, Bambusa rutila McClure, Phyllostachys nidularia, Phyllostachys bambusoides, Dendrocalamopsis, Dendrocalamus latiflorus Munro, Dendrocalamopsis beecheyana (Munro)Keng, Dendrocalamopsis vario-striata (W. T. Lin) Keng f, Phyllostachys bambusoides f. lacrima-deae, Chimonobambusa quadrangularis (Fenzi) Makino, Sinobambusa tootsik(sieb.) Makino, Acidosasa edulis (T. H. Wen) T. H. Wen. and Pleioblastus amarus (Keng) keng.

1.2 Paper Pulp Bamboo Forest Base Construction

1.2.1 Construction Area

The construction areas will be in 458 counties of 11 provinces: Fujian Province, Jiangxi Province, Hunan Province, Sichuan Province, Guangdong Province, Guangxi Province, Hubei Province, Guizhou Province, Chongqing Province, Yunnan Province and Shan'xi Province. Of those, 95 sites will be located in the key bamboo industry development counties (see Tables 4-3 and 4-4 and Annexes 6 and 7).

Province	Fujian	Jiangxi	Hunan	Sichuan	Guangdong	Guangxi	Hubei
Number	15	83	77	46	68	71	22
Province	Guizhou	Chongqing	Yunnan	Shan'xi			
Number	8	37	28	3			

Table 4-3 National Paper Pulp Bamboo Forest Industry Base Distribution

Table 4-4 National Paper Pulp Bamboo Forest Industry Base Distribution in National Key Bamboo Industry Counties

Province	Fujian	Jiangxi	Hunan	Sichuan	Guangdong	Guangxi	Hubei
Number	10	23	23	18	16	1	2
Province	Guizhou	Yunnan					
Number	1	1					

1.2.2 Construction Scale

Nationally, an area of 630,000 ha of paper pulp bamboo forest will be planted. The newly established area will be 340,000 ha and the upgraded area will be 290,000 ha. An area of 250,000 ha will be designated in national key bamboo industry development counties, accounting for 40.6 per cent of the total area. Among the 250,000 ha in the national key bamboo industry development counties, 100,000 ha will be in the newly established area and 150,000 ha will be in the upgraded area.

1.2.3 Bamboo Species

The bamboo species to be planted for the paper pulp bamboo forest are Bambusa pervariabilis McClure, Bambusa chungii McClure, Bambusa pervariabilis×Dendro-calamopsis daii, Dendrocalamus minor (McClure) Chia et H. L. Fung., Rhapis humilis (Thunb.) Bl., Phyllostachys bissetii McClure, Bambusa rigida, Neosinocalamus affinis (Rendle) Keng f., Bambusa distegia, Bambusa intermedia Hsueh et Yi and Phyllostachysnidularia Munro f. glabrovagina Wen.

1.3 Timber Bamboo Forest Base Construction

Bamboo timber forests serve as the raw material base for the production of wood-based panels (including bamboo-timber plywood, glued laminated bamboo, woven bamboo plywood, bamboo particle board, bamboo particle composite board and wood, and bamboo composite board), bamboo flooring materials, bamboo furniture materials, bamboo fibre products materials, bamboo beverage materials, bamboo daily necessities materials and bamboo charcoal materials. Bamboo timber forests are regarded as the material basis for bamboo products and sustainable development of the bamboo industry.

1.3.1 Construction Area

The construction area includes 526 counties in 14 provinces: Fujian Province, Jiangxi Province, Hunan Province, Sichuan Province, Guangdong Province, Anhui Province, Guangxi Province, Hubei Province, Guizhou Province, Chongqing Province, Yunnan Province, Shan'xi Province and Henan Province. Of these, 114 sites will be in key bamboo industry development counties (see Tables 4-5 and 4-6 and Annexes 6 and 7).

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	23	33	93	86	20	68	35
Province	Guangxi	Hubei	Guizhou	Chongqing	Yunnan	Shannxi	Henan
Number	55	12	16	34	24	8	19

Table 4-5 National Bamboo Industry Timber Production Base Distribution

Table 4-6 National Bamboo Industry Timber Production Base Distribution in National Key Bamboo Industry Development Counties

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	13	14	24	23	8	16	5
Province	Guangxi	Hubei	Guizhou				
Number	5	5	1				

1.3.2 Construction Scale

Nationally, a 1,710,000 ha area of timber bamboo forest is planned, of which 200,000 ha will be newly established and 1,510,000 ha will be upgraded. An area of 540,000 ha will be established in national key bamboo industry development counties, accounting for 31.5 per cent of the total timber bamboo forest; 80,000 ha will be newly established and 460,000 ha will be upgraded.

1.3.3 Bamboo Species

The selected bamboo species for bamboo timber forest are Moso bamboo, *Phyllostachys viridis, henon* bamboo, *phyllostachys prominens, Phyllostachys heteroclada Oliver, Neosinocalamus affinis (Rendle)* Keng f., *Pleioblastus amarus (Keng) keng., Bambusa pervariabilis McClure, Dendrocalamus minor* (*McClure) Chia et H. L. Fung., Phyllostachys bissetii McClure and Phyllostachys bambusoides f. lacrima- deae.*

1.4 Bamboo-Shoot and Bamboo-Timber Forest Base Construction

1.4.1 Construction Area

The construction areas cover 566 counties in 14 provinces: Fujian Province, Jiangxi Province, Hunan Province, Sichuan Province, Guangdong Province, Anhui Province, Guangxi Province, Hubei province, Guizhou Province, Chongqing Province, Yunnan Province, Shan'xi Province and Henan Province. Of these, 125 areas are in the national key bamboo industry development counties (see Tables 4-7 and 4-8 and Annexes 6 and 7).

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	41	45	91	86	22	68	17
Province	Guangxi	Hubei	Guizhou	Chongqing	Yunnan	Shan'xi	Henan
Number	45	24	41	34	32	9	11

Table 4-7 National Bamboo Shoot and Timber Bamboo Forest Bases Distribution

Table 4-8 National Bamboo Shoot and Timber Bamboo Forest Bases Distribution in National Key Bamboo Forest Development Counties

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	26	19	24	23	5	16	5
Province	Guangxi	Hubei	Guizhou	Chongqing	Yunnan	Shan'xi	Henan
Number	6	1					

1.4.2 Construction Scale

Nationally, China will establish 1.3 million ha of bamboo shoots and bamboo timber forest, among which 300,000 ha will be newly established and one million ha will be upgraded. An area of 470,000 ha will be in the national key bamboo industry development counties, accounting for 35.9 per cent of the total area; 60,000 ha will be newly established and 410,000 ha will be upgraded.

1.4.3 Bamboo Species

The selected bamboo species are Moso bamboo, Phyllostachys viridis, henon bamboo, Phyllostachys iridescens C. Y. Yao, Phyllostachys heteroclada Oliver, Bambusa rutila McClure, Phyllostachys nidularia, Phyllostachys bambusoides, Dendrocalamus latiflorus Munro, D.beecheyana var .pubescens (P.F. Li) Keng f), Dendrocalamopsis beecheyana (Munro) Keng, D .vario-striata (W.T.Lin) Keng f., Chimonobambusa quadrangularis (Fenzi) Makino., Pleioblastus amarus (Keng) keng and Acidosasa edulis (T. H. Wen) T. H. Wen.

2. Bamboo Breeding Base Construction

A bamboo breeding programme on breeding base and production capacity will be defined in accordance with demand required during the plan period, taking the current bamboo seedling production capacity into consideration.

2.1 Bamboo Seedling Supply and Demand Balance Analysis

2.1.1 Defining Bamboo Seedling Demand

The bamboo resource cultivation programme aims to establish a bamboo forest covering an area of 100 million ha during 2011-2020 in the national bamboo industry development counties, developing 100,000 ha each year. The upgrading of low-yielding bamboo forest during the above period will be three million ha, upgrading 300,000 ha each year. Calculated accordingly, the total demand of bamboo seedling will exceed 4000 million culms during the programme period and the average annual demand will be 400 million culms.

2.1.2 Defining bamboo seedling supply

Relevant statistics indicate that, nationally, there are 3,825 bamboo nurseries with a collective annual capacity of 120 million culms. However, a shortage of 280 million culms exists. As current bamboo nurseries are mainly small scale, with poor science and technology innovation capacities, and they are inadequate in either quantity or quality to meet the current need, simultaneous planning for the bamboo breeding base is urgently needed.

2.2 Base sites

Breeding bases will be established in areas with current breeding base facilities and areas which have potential as a breeding base. Accordingly, 237 counties in have been identified in the following 13 provinces: Fujian Province, Jiangxi Province, Hunan Province, Sichuan Province, Guangdong Province, Anhui Province, Guangxi Province, Hubei Province, Guizhou Province, Chongqing Province, Yunnan Province, Shan'xi Province and Henan Province. Of those, 57 breeding bases are located in national key bamboo industry development counties (see Tables 4-9 and 4-10 and Annexes 6 and 7).

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	7	6	93	10	92	4	6
Province	Guangxi	Hubei	Guizhou	Chongqing	Yunnan	Shan'xi	Henan
Number	20	10	6	9	21	9	7

Table 4-9 Distribution of National Bamboo Seedling Breeding Bases

Table 4-10 Distribution of National Bamboo Seedling Breeding Bases in National Key Bamboo Industry Development Counties

Province	Fujian	Zhejiang	Jiangxi	Hunan	Sichuan	Guangdong	Anhui
Number	5	4	18	2	11	3	4
Province	Guangxi	Hubei	Guizhou	Yunnan			
Number	3	5	1	1			

2.3 Base Scale

Between 2011 and 2020, 411 new bamboo breeding nurseries should be established in national bamboo industry development counties with a construction area of 5548 ha and 242 bamboo nurseries will be upgraded over an area of 3438 ha. Among these, 104 bamboo seedling nurseries will be established over an area of 1720 ha and 75 bamboo nurseries will be upgraded over an area of 1736 ha in 150 national key bamboo industry development counties.

2.4 Breeding Method

Bamboo breeding methods vary greatly will different climate, soil and landform conditions. The most frequently adopted methods are seed breeding and ramets breeding.

2.5 Species

The species to be cultivated will be mainly decided by market demand, Moso bamboo as the mainstay, accompanied by Sinocalamus oldhami, Phyllostachys praecox C. D. Chu et C. S. Chao ('Prevernalis'), Lingnania intermedia, Phyllostachys bissetii (McClure), Bambusa pervariabilis×Dendrocalamopsis daii, Chimonobambusa quadrangularis (Fenzi) Makino, Neosinocalamus affinis, Bambusa rigida, Dendrocalamus latiflorus Munro, Pleioblastus amarus (Keng) keng, Phyllostachys bambusoides f. lacrima-deae, Bashania fargesii E. G. Camus, Fargesia spathacea Franch and Phyllostachys heteroclada Oliver. Of the 441 nurseries to be established, 160 are for Moso bamboo and 251 are for other bamboo species. Of the 242 nurseries to be upgraded, 102 nurseries will be for Moso bamboo and 140 nurseries will be for other bamboo species.

3. Bamboo Forest Road Construction

Bamboo forest management and operations working at high frequency and intensity levels have a strong dependence on transportation. Construction of bamboo forest roads is thus essential for improving bamboo forest productivity, promoting national bamboo sector benefits and increasing bamboo farmers' incomes. Bamboo forest road construction also significantly influences bamboo forest management by fully tapping into the bamboo forest production potential and materialising new village construction with socialist characteristics.

Poor transportation, difficult access and lack of management means that many bamboo mountains have remained half-barren and suffered from being virtually abandoned for a long period; fierce

illegal logging also occurs from time to time. Easier access to bamboo forests and bamboo forest cultivation and smooth transportation of bamboo timber, shoots, seedlings and fertilisers is therefore needed, requiring the construction of new bamboo forest roads. A 174,640 km bamboo forest road is planned in the national key bamboo industry development counties, of which 103,665 km is to be newly built and 70,975 km is to be upgraded. In the newly planned bamboo forest road construction, 76,313 km is in the Moso bamboo forests and 27,353 km is lying in areas of other bamboo species. Of the road to be upgraded, 51,285 km is located in the Moso bamboo forest road net density in China could reach 22 meters/ha.

As planned, a bamboo forest road totalling 96,351 km in length will span 150 national key bamboo industry development counties, covering 55.2 per cent of the total distance. Of that, 56,918 km will be newly established roads and 39,433 km will be upgraded. By 2020, the bamboo forest road net density could reach 24 meters/ha in the national key bamboo industry development counties.

Part 2 Bamboo Product Processing Industry

The processing of bamboo products will be carried out in accordance with the general principle of local processes, all-sector coordinated development and profit maximisation. A number of prioritised fields which consume fewer resources but are high in value are defined based on local bamboo resources and the bamboo processing industry's status. These are determined by prominent regional features and include bamboo eco-tourism, bamboo fibre manufacturing, bamboo beverages, bamboo crafts, bamboo shoot processing and bamboo charcoal production. Sectors with large resource consumption such as bamboo-based panels, bamboo flooring, bamboo furniture and bamboo paper pulp will be developed at a moderate level.



Vertical: Output 10000CNY/tonnes

Horizontal: Consumption/tonnes

Chart 4-1 Comparison of units of bamboo timber output in different bamboo processing sectors.

A rational and efficient allocation of resources and construction of bamboo industry parks is needed to establish and refine the whole industry chain of raw material involving primary processing, deep processing and product sales. Strong support will be leveraged to leading enterprises with an optimised resource allocation and branding strategy to promote the transformation of the bamboo processing sector into an intensive and branding-aware industry.

1. Bamboo Shoot Processing Industry Development Focus

People's rising standards of living will increase the demand for nutritious and conveniently-dressed bamboo shoots considerably. The giant bamboo shoot-producing provinces should therefore accelerate their bamboo shoot deep-processing development on the existing base and develop their ranges of bamboo shoot products using fresh bamboo shoots, dried bamboo shoots and canned bamboo shoots as the primary processed products. These provinces should also explore new tastes of multi-flavoured bamboo shoot shreds, hot and sour bamboo shoots and braised bamboo shoots to add value to their products.

2. Bamboo Paper Pulp Industry Development Focus

The bamboo paper pulp industry is fairly sensitive to raw material prices due to its large investment quantity and bamboo timber consumption, which calls for mass production. For this reason, bamboo paper pulp industry development should focus on developing bamboo resources and make a rational plan for bamboo paper pulp development, considering the current bamboo timber paper pulp enterprise distribution and development.

3. Bamboo-Based Panel Industry Development Focus

Development of the bamboo-based panel industry should focus on upgrading technology and adjusting the product structure while making efforts to explore high-value added products with a promising market perspective, such as bamboo timber composite plywood used in concrete template, bamboo timber composite container bottom boards, train-use bamboo plywood, glued laminate bamboo and scrimber. This industry sector should also establish a good correlation between the development pace and bamboo resource raw material supply.

4. Bamboo Flooring Industry Development Focus

During the 12th Five-Year Plan, bamboo flooring and cultivation of integrated development will be intensified. Additionally, enterprise investment either by holding stocks or jointing stock, or signing a long-term strategic cooperation to obtain a bamboo forest base to form a 'base plus process' industry patter practice has been encouraged. The structural over-production capacity on bamboo flooring will exist for many years and a self-driven development mode will be advocated. Expanding market outreach and exploration will be promoted and bamboo flooring enterprises will be encouraged to improve their market competitiveness by upgrading technology and continually innovating their products. A prudent attitude will be attached to expanding new projects.

Giant bamboo flooring provinces should accelerate their branding strategy and launch new products of either reconstructed bamboo timber flooring or bamboo timber composite flooring to direct the bamboo flooring industry toward a more intensive management style focusing on scale and branding.

5. Bamboo Furniture Industry Development Focus

The development focus of the bamboo furniture industry will be placed on the traditional furniture domain. Constrained by the processing techniques and traditional stereotypes, China's bamboo
furniture production output currently has only a small share in the furniture market. During the 12th Five-Year Plan, the bamboo furniture industry will focus on promoting chemical processing and product innovation, making full use of scrimber technology and integrated bamboo technology to innovate product design and verify bamboo furniture types to raise the added value of bamboo furniture and to increase the market recognition and consumption of bamboo furniture.

6. Bamboo Fibre Products Industry Development Focus

The bamboo fibre industry has taken its initial form. In the future, emphasis will be placed on product innovation, branding and scale development. During the 12th Five-Year Plan, two tasks will be accomplished. The first task will promote new fibre processing technology such as bamboo pulp fibre, with applicable technological projects being extended, particularly in the bamboo fibre products' application field and scope. The second task will regulate the bamboo fibre test standard and neatly define the competent department to ensure an ordered, benign and healthy bamboo fibre industry.

7. Bamboo Beverage Industry Development Focus

The bamboo beverage industry development is closely linked with the regional raw material supply and processing capacity. During the 12th Five-Year Plan, existing bamboo beverage enterprises will make strides in scientific and research investment and proactively introduce advanced equipment to produce more popular bamboo beverages and earn a large share of the beverage market by accelerating the sales network and branding strategy.

8. Bamboo Daily Necessities (Crafts) Industry Development Focus

The bamboo daily necessities industry enjoys the widest distribution and longest development period in China. Currently, it has two production bases: one base for bamboo daily necessities such as bamboo chopsticks, toothpicks, mats and furniture, and the other for bamboo crafts such as bamboo weaving, sculptures and bamboo tea ceremonies. During the 12th Five-Year Plan, efforts will be made to construct a production base to foster leading enterprises and expand the industry cluster effect.

9. Bamboo Charcoal Industry Development Focus

Bamboo charcoal processing enterprises will vigorously innovate bamboo charcoal products, diversify the product industry chain and create new products to make full use of the multiple uses of bamboo charcoal. The aim is to extend the products to the high-value added domain and establish several leading enterprises on bamboo charcoal, with industry use as the mainstay and daily use and healthcare use as a new trend.

Inter-sector and cross-sector technical coordination will be enforced. More practical and economical production techniques, in-depth processing and by-product recycling and reuse will be encouraged. At the same time, the market demand and supply fluctuation will be closely followed to optimise product structure and foster fine domestic brands.

Part 3 Support Scheme for Planning Implementation

1. Scientific Support Scheme

1.1 Strengthen Bamboo Industry Scientific Innovation Platform Construction

Efforts will be made to build technical platforms of a common nature with research institutes and universities to attract and cultivate innovation talents to accelerate technology extension and industrialisation. A Bamboo Industry Technological Innovation Alliance will thus be formed featuring resource sharing, complementary and joint exploration, benefit-sharing and risk-burdening to provide an innovative platform for sustainable, efficient and scientific development in the bamboo industry.

1.2 Improve Bamboo Industry Technology Transfer Rate

Efforts will be made to combine scientific funding, resources and markets to establish an incentive mechanism for bamboo industry innovation and scientific application by the consortium of industry, research and market, with the enterprise as the mainstay and the market as the guide. Efforts will also be made to boost bamboo industry technology innovation and industrialisation of the scientific and technological achievements and intensify new product application and key technology transfer to increase the bamboo industry's scientific and technological progress contribution rate. Efforts will also be extended to make an efficient forest science service for villages and farmers and to set up a demonstration bamboo industry which will provide a full range of science and technologies to support, lead and motivate various aspects of bamboo industry development.

1.3 Enhance Bamboo Industry Scientific Extension Scheme

Efforts will made to establish an effective bamboo industry science and technology scheme with a team of professional, talented, highly efficient and service-oriented staff. The team should have a strong science, research and economic capacity to promote and extend the bamboo industry's new practical technology for solving the technical and managerial problems currently limiting the bamboo industry sector. Led by governments at various levels, the bamboo industry's science and technology transfer will be intensified by means of forestry technology extension stations at provincial, city, county or township levels. The aim is to extend and apply new varieties, techniques, methods and crafts with a technical guideline of combining contrasting experiment, demonstrations and extensions.

2. Raw Material, Products Trade Market Supporting Scheme

2.1 Bamboo Shoot and Bamboo Products Market

Efforts will be made to set up effective bamboo industry market operation mechanisms to regulate market function, cultivate market entities and expand market scale. In key bamboo industry development areas and the main collecting and distributing centres for mature bamboo shoot markets, a specialised market on bamboo shoot and bamboo products will be formed and the market fluxes of bamboo raw materials, bamboo shoot products and bamboo product sales, demos and trades will be accelerated. Through specialised market resource allocation optimisation, bamboo products and relevant factors will be released on a free and competitive basis to break down sector monopolies and regional blocks.

2.2 Marketing Networking

Efforts will be made to innovate traditional marketing modes to create a modern bamboo industry trading complex of agents, dispatches and chain businesses. By marketing organisations and network

platforms, a sound marketing network with franchises, sales and product dispatch centres will be built to enhance bamboo product marketing nationally and internationally.

2.3 Professional Cooperative Association

Efforts will be made to fully mobilise production managers' enthusiasm, inject impetus into the market and encourage the specialised economic cooperative entities, associations or professional intermediaries to enhance guilds, supervision and administration in line with market demand and development. The specialised cooperative entities will make full use of their bridging role in the bamboo industry development, technology progress, standard formulation, trade promotion, sector access and public service and lead the enterprises to implement industry policies and practice strict self-discipline to propel the bamboo industry forward.

3. Product Standards and Product Quality Assessment Scheme

3.1 Formulate and Modify Bamboo Product Standards

Efforts will be made to standardise the bamboo industry, placing emphasis on modifying the standards, establishing a complete standards scheme with national and sector standards at the core, and developing local and enterprise standards. Compulsory and recommended standards for bamboo production, processing and utilisation are also required, and a mechanism for standard compliance inspection, evaluation and information feedback should be developed to set a good example and demonstrate its efficacy. Sound bamboo product enterprises and a product certification system should also be integrated with the international general standards.

3.2 Improve Bamboo Products Quality Supervision

Efforts will be made to improve bamboo product quality, set up supervisory schemes and establish bamboo product quality security checks, monitoring, evaluations, inspections and detection service systems, and bamboo product quality control agencies. A quantitative evaluation scheme will be formed to ensure the accuracy of the quantitative evaluation. The quality control and safety evaluation of bamboo food and bamboo timber products, concerning people's health and lives, will be intensified. Pollution-free, green, organic and healthy food certifications will be vigorously developed, with the aim of strengthening quality inspections and detections to ensure safe bamboo products.

3.3 Regulate Bamboo Products Management Body

Efforts will be made to set up a licensing system of raw bamboo material production, improve bamboo product operations and processing, and establish rigid market regulations for access by bamboo production enterprises with high energy consumption, substandard products or environmental harm. Systems will be put in place to safeguard fair market competition order, regulate market practices of bamboo product business entities and crack down on all kinds of infringements to protect consumers' legal rights. Additionally, a product quality tracing system will be developed to appraise bamboo products of well-known domestic brands to raise the overall quality of bamboo products.

3.4 Establish Bamboo Industry Economic Operation Information System

3.4.1 To Establish an Information System for Bamboo Industry Economic Operation

Efforts will be made to set up a fair, transparent and open bamboo industry information system, provide various online interactive functions and supply services for bamboo industry development forecasts, early warnings, monitoring and analysis with an emphasis on the dynamic monitoring and

recording of bamboo enterprises' production sale stock. A national bamboo industry database with standardised data collection and data application will be set up and basic information data collection and application processes will be regulated and standardised to provide a complete picture of the bamboo industry's development.

3.4.2 To Establish an E-business Platform for Bamboo Industry

Efforts will be made to set up a unified online trading system for the bamboo e-market to enable uniform trading between listing and trading members, trading brokers and trading intermediaries. The network will be online and available to the public.

Chapter 5 Cost and Benefits Assessment

1. Economic Benefit Assessment

Bamboo forest products – bamboo forests, bamboo shoots, bamboo timber, bamboo leaves and other bamboo-made products – have a wide application in society and thus have tremendous economic benefits. It is estimated that a piece of original bamboo culm worth 15 CNY could be manufactured with an added-value of 60 CNY after a series of in-depth processes and extensions. Calculated according to the national general bamboo forests and bamboo products processing and operation levels, the bamboo industry output was predicted to reach 200 billion CNY by 2015, of which the output of the bamboo products' raw material was expected to contribute 43 billion CNY. the output of the bamboo products' processing industry was expected to be valued at 131 billion CNY and the bamboo-themed forest tourism industry was expected to account for 50 billion CNY.

2. Ecological Benefit Assessment

Bamboo intercepts rainfall, retains water and conserves soil and water. Research shows that a piece of Moso bamboo can conserve six cubic meters of soil, 1.6 and 1.2 times more than pine and fir, respectively. Bamboo forests also have a strong water retention capacity: one ha of bamboo forest can retain 1000 tons of water. The ecological benefits of bamboo have a remarkable effect in greening barren mountains, conserving soil and preventing water erosion. With its notable ecological benefits, bamboo has been selected as the choice species in establishing an ecological and economical shelterbelt forest in China, fostering many key ecological engineering programmes.

2.1 Water Conservation

Bamboo's numerous leaves give it a strong capacity to intercept rainfall, and its thick branches and leaves near the bottom make it capable of reducing surface run-off and increasing soil water filtration, thus facilitating strong water interception and retention. One ha of bamboo forest can retain 1000 tons of water, by the end of this planning period, an increase of one million ha bamboo forest, which can retain one billion cubic meters of water, is projected.

2.2 Reduce Soil Erosion

Robust bamboo rhizomes can bear numerous roots underneath which have a strong capacity to conserve soil. One bamboo culm can conserve six cubic meters of soil and reduce 60 tons of soil per ha. By the end of the planning period, an extra one million ha of bamboo forests is expected, which will be able to retain 60 million tons of soil each year.

2.3 Purify Air

Bamboo forests can absorb 5.09 tons carbon dioxide in each ha. By the end of the planning period, an increase of one million ha of bamboo forest is anticipated, which will be able to absorb 5.09 million tons of carbon dioxide, creating a dynamic balance of aerial carbon dioxide and oxygen to reduce the greenhouse effect, which has a unique impact on humans' basic survival conditions.

2.4 Reduce Disasters and Increase Agriculture Production and Benefit

The increased area of bamboo forests indicates an increased function of soil and water conservation,

reducing surface run-off and occurrence frequencies of debris flow and landslide. Agricultural production could benefit from the abundant soil and water supply.

2.5 Aesthetic Values

Research indicates that green vegetation can make people feel relaxed and happy. A three-minute stay in a green environment can relax people's muscles, lower blood pressure and elevate moods. Bamboo forests are an important type of green vegetation which has been widely used in greening programmes.

3. Social Benefit Assessment

3.1 Bamboo forest resource cultivation engineering can relieve rural area employment pressures by providing 8.3 million job positions. The bamboo product processing industry could provide 1.22 million job opportunities, with half a million offered by bamboo eco-tourism, thus creating good employment opportunities for a local surplus of workers.

3.2 Bamboo development is good for agricultural economic development and for increasing farmers' incomes. Currently, the bamboo industry has become a pillar industry in many bamboo production areas. Accelerating the bamboo processing industry can optimise the agricultural industry's structure and cultivate new growth points.

3.3 It is good to build people's environmental awareness. China has a long history of affection for bamboo. Developing the bamboo industry can advance the bamboo culture and raise people's awareness of environmental conservation.

Chapter 6 Safeguarding Measures

Part 1 Intensify Organisation Leadership for Bamboo Industry Development

The bamboo industry has a long industry chain involving numerous agencies and sectors that have a direct bearing on farmers' interests and rights and that thus require a strong policy leadership. Party committees and government departments involved in the bamboo industry should open their minds, deepen their understanding of the bamboo industry and treating it with importance. A strong organising agency and industry development panel will be formed to provide a macro guild that will lead the bamboo industry developments and coordinate issues arising from the developments. Governments in key bamboo industry areas should integrate bamboo into local governments' economic and social development, considering bamboo as an important component of villager-agriculture-farmer issues and of modern forestry development, eco-civilisation and scientific development. These governments should establish a coordinating panel composed of experts on bamboo species breeding, cultivation and processing. The panel will provide policy consultancy and service in science and research, selective species extension, base construction, and industrialised operation and marketing.

Part 2 Intensify the Policies Supporting Bamboo Industry Development

A generalised system of preferences on bamboo industry subsidies will be gradually established, bamboo forest plantation areas will be gradually increased, and the pilot subsidy scope and volume from central government subsidies for bamboo forest tendering will be further expanded. An improved bamboo species subsidy scheme will be created, providing subsidies for improved bamboo species' bases and cultivation.

Efforts will be made to extend bamboo industry scientific and technological methods and improve bamboo forests pest and diseases control. Financial institutions will be encouraged to offer favourable credit conditions and create applicable financial products for the bamboo industry. Governments at various levels will need to provide fiscal interest discounts accordingly to establish and optimise the bamboo forest insurance mechanism with fiscal support and gradually raise the subsidy standards. Financial institutions will also be encouraged to provide small-sum loans with flexible requirements and simple procedures to SMEs of the bamboo industry.

Part 3 Expanding Funding Channels for Bamboo Industry Development

The national government will increase its investment in bamboo industry infrastructure construction and combine the infrastructure construction with other forest-related programmes such as converting the grain to green, the shelter-belt forest construction programme and the seed and breeding construction work. A national central fiscal policy will be developed to support the bamboo industry with increased investment from the agriculture development fund, placing emphasis on selective breeding, novel variety technology introduction, new products exploration, raw material base construction and leading enterprise technological upgrades.

Local government at different levels will allocate a certain proportion of the forest vegetation restoration fund and tendering fund to the planting of bamboo forests and bamboo forest road construction. Efforts will be made to include the bamboo forest road construction into local and

sector development plans. Policies and measures will be formed to encourage social capital and private investment, as well as foreign investment in bamboo forests. An attempt to pool various social resources to participate in bamboo products production and exploration will be made.

Part 4 Cultivating Leading Enterprises for Bamboo Industry Development

Efforts will be made to order the business by collecting market data and information in line with the market economic rule and organising the production accordingly. Efforts will also be made to create a regional bamboo product market and facilitate the free trade market by cancelling the transport permit license on bamboo products and semi-finished products. To increase momentum in the domestic market, a corresponding consumption policy such as a list of bamboo flooring and bamboo ply board products will be provided as part of the recommended list of construction materials. Bamboo products such as bamboo office furniture will be included in the national green procurement policy.

Part 5 Strong Propagation for Bamboo Industry Development

Efforts will be made to foster leading enterprises on bamboo products and bring their leading roles into full play. Taking respective regional economic advantages into consideration, a rational allocation of resources will be encouraged to foster enterprises with good starting conditions, high technology, high value addition and good marketing extensions, and competent leading capacities; this will form a large-scale comprehensive regional bamboo industry belt. A national industry support policy for the bamboo industry will be developed to cultivate a number of leading enterprises and establish a preferential policy for leading enterprises of the bamboo industry that equals that of leading agricultural enterprises. Small-sized enterprises with low economic performance will be integrated and transformed through acquisition to form new leading enterprise groups. By establishing a modern enterprises as the main body, a close link between the product production, supply and sales could be formed and industrialisation could be obtained.

Part 6 Propagation on Bamboo Industry Development

Governments, associations and enterprises should work together to make a thorough propagation of the bamboo industry, bamboo products and bamboo enterprises in various forms to consolidate the sector's impact. Public-benefit advertisements about bamboo products led by the government and media reporting through internet, TV and newspapers can help to raise public awareness on the bamboo industry. Information about the benefits of the bamboo products for low carbon levels, the environmental and human health would raise the market recognition of bamboo products. A branding strategy with brand alliances, uniform brand advertisements and brand appraisals can help to project an ecological, natural and good-for-heath image about bamboo products. Additionally, a compound structure of regional, alliance, enterprise and product branding will intensify this effect and a scientific marketing and wide propagation will ensure bamboo products are well received by consumers.

Development Plan for the Bamboo Industry in Sichuan Province

1. Current status

Sichuan Province is rich in bamboo resources, with sympodial bamboo as the majority along with monopodial bamboo and mixed bamboo. By far, Sichuan has 160 species and 18 genera of bamboo, accounting for 46% and 32% respectively in China. Its bamboo forests cover more than 17.4 million mu¹, ranking the first in China In recent years, the bamboo industry in Sichuan has seen significant progress, proven by a huge expansion of bamboo forests, a bamboo product processing system that has taken shape, the rapid development of emerging industries and businesses and the continuous development of bamboo industry economy. Meanwhile, Sichuan's bamboo industry is also faced with problems, such as low yield per unit due to extensive farming, difficulty in harvesting due to insufficient technological innovation in the bamboo industry, and sluggish development in branding due to inflexible operation mechanisms.

2. Development goals and strategy

2.1 Goals

By 2022, Sichuan aims to set up a modern bamboo industry development structure supported by a bamboo industrial cluster in southern Sichuan and three bamboo industry belts at Qingyi River, Qu River and Longmen Mountain. It also expects to establish 40 priority counties for the bamboo industry. Bamboo forests will cover a stable territory of 18 million mu in Sichuan and modern bamboo forest bases will go beyond 10 million mu. The conversion rate of primary processing of bamboo products on site as well as brand penetration rate will both surpass 70%. Bamboo tourism and retreats will attract 53 million visits. In the end, the production value of the bamboo industry will reach 50 billion yuan and the annual income per capita for bamboo farmers will reach 1,500 yuan.

2.2 Strategy

The overall strategy is to establish a development structure composed of "One Cluster + Three Belts + other areas".

Bamboo industry cluster in southern Sichuan

The cluster covers 14 counties or districts in 4 cities, including Muchuan County, Qianwei County and Jingyan County in the city of Leshan; Gao County, Pingshan County, Yibin County, Nanxi District, Changning County, Jiang'an County and Xingwen County in the city of Yibin; Naxi District, Xuyong County and Hejiang County in the city of Luzhou; and Fushun County in the city of Zigong. The development direction is to develop the "highland for the development of the bamboo industry in western China". To achieve this, great efforts will be made to promote road construction in bamboo growing areas and intensive farming of bamboo forests; enhance the industry of bamboo pulp and

¹ Mu, a Chinese area unit, equals approximately 666.67 m².

paper making; develop a new manufacturing industry of bamboo winding composite pressure pipes and bamboo charcoal and strive to build a "national innovation center for application of clump bamboo of medium and small diameter"; improve tourism service facilities and functions; and establish a bamboo product logistics and trade centre in southwestern China.

Bamboo industry belt at Qingyi River

This belt will cover 8 counties or districts in 3 cities, including Yahong County in the city of Meishan; Baoxing County, Lushan County, Tianquan County, Yingjing County, Mingshan District and Yucheng District in the city of Yaan; and Jiajiang County in the city of Leshan. The direction is to make efficient use of bamboo resources. To achieve this, great efforts will be made to improve the roads in the bamboo growing areas; speed up the primary processing and conversion of bamboo and bamboo shoots; make better use of brands such as "giant panda", "tea horse road" and "three ya"; and promote bamboo culture, bamboo tourism, bamboo retreats, and the value chain of bamboo industry.

Bamboo industry belt at Longmen Mountain

This belt will cover 6 counties and county-level cities under Chengdu, including Pengzhou, Dujiangyan, Chongzhou, Dayi County, Qionglai and Pujiang County. The direction is to further develop bamboothemed cultural tourism and retreats. To achieve this, great efforts will be made to discover and protect bamboo culture and enrich the cultural elements of bamboo-themed tourism; build highquality bamboo shoot bases which mainly consist of *Phyllostachys praecox* 'Prevernalis' and *Chimonobambusa neopurpurea*; move forward with refined processing and application of bamboo materials; and develop premier bamboo material manufacturing.

Bamboo industry belt at Qu River

This belt will cover 5 counties, county-level cities and districts under 2 cities, including Dazhu County and Qu County in the city of Dazhou, and Guang'an District; and Qianfeng District, Huaying City in the city of Guang'an. The direction is to make great efforts to develop bamboo cultural tourism; develop eco-friendly and tourism products; utilize both the culms and shoots of Bisset's bamboo (*Phyllostachys bissetil*) instead of only using the culms; and build manufacturing industries of bamboo-based fibrous composites and bamboo-based daily commodities with *Bambusa emeiensis* and Moso bamboo (*Phyllostachys edulis*).

Other development areas

Apart from the above-mentioned "One Cluster + Three Belts", there are also 96 counties, countylevel cities or districts in 19 cities or prefectures that have favorable environment for bamboo forests. The direction is to ensure the size of bamboo forests, improve the quality of bamboo forests, move forward with the multi-purpose utilization of bamboo resources and serve the public. Counties, countylevel cities and districts with considerable areas of contiguous bamboo forests and with the ability to process bamboo materials and bamboo shoots will be developed as priority counties.

3. Key tasks

3.1 Building bamboo forest bases

Cultivating bamboo forests: With "One Cluster + Three Belts" as well as priority bamboo counties

taking the lead, the province will speed up on growing bamboo shoots-oriented forests which mainly consist of square bamboo (*Chimonobambusa quadrangularis*), bitter bamboo (*Pleioblastus amarus*), Bisset's bamboo and *Bashania fargesii*; use scientific methods to develop material-oriented forests which mainly consist of *Bambusa emeiensis*, *Bambusa rigida*, *Bambusa intermedia* and *Bambusa changningensis*; and moderately build bamboo forests for both materials and shoots which mainly consist of Moso bamboo and mottled bamboo. From 2017 to 2022, the province will build 2.44 million mu of bamboo forests; and by 2022, the size of its bamboo forests will be set at a territory of 18 million mu.

Developing modern bamboo forest bases: Focusing on the "One Cluster + Three Belts" and the priority counties, the province will improve the quality of bamboo forests, scale up the forests at a faster pace and speed up the construction of roads in bamboo growing areas and irrigation facilities. From 2017 to 2022, the modern bamboo forests will be increased by 2.94 million mu, roads built in the bamboo areas by 4,335 kilometers and hydraulic engineering facilities by 6,370 sets. By 2022, Sichuan aims to build 10 million mu of modern bamboo industry bases and the road network density will reach 22.5 meters per hectares (1.5 meters/mu).

Promoting ecological planting under bamboo: Species to be planted under bamboo, planting methods, density and rotation cycle should be decided based on scientific researches in order to develop green and circular economy. From 2017 to 2022, the province will focus on cultivating semiwild plants for traditional Chinese medicine, such as dendrobes, paris polyphylla, sealworts and bletilla, under bamboo; developing cultivation and wild farming of bamboo fungus, wood ear, wine cap stropharia and true morels; and promoting free range pasture under bamboo. By 2022, the area for multi-story cropping of combinations, such as bamboo and fungus as well as bamboo and medicinal materials, will reach 200,000 mu; while the area for the combination of bamboo planting and poultry raising will reach 300,000 mu.

3.2. Facilitating the processing and conversion of bamboo resources

Initiating primary processing on site: On-site primary processing facilities of materials and shoots will be properly located according to the concept of "one primary processing facility per 10 to 20 thousand mu of bamboo forests". By 2022, the province plans to build 700 integrated bamboo processing facilities and 200 facilities for shoots processing, including peeling, cleaning, cold chain warehousing and drying. By then, on-site primary processing of bamboo materials and shoots across the province will account for more than 70%.

Upgrading traditional bamboo processing industries: (a). Bamboo shoot processing: The task is to focus on developing bamboo shoot snacks and producing bamboo shoot-based products for functionality. From 2017 to 2022, there will be 25 more modern bamboo shoot food processing businesses and 480,000 tons of new capacity. By 2022, the processing capacity in this regard will reach 950,000 tons. (b). Bamboo pulping and paper making: The province will make the bamboo industry cluster in southern Sichuan and the bamboo industry belt at Qingyi River as two major places to execute the restructure and expansion of leading companies in bamboo pulping and paper making. From 2017 to 2022, the capacity of bamboo pulping will increase by 650,000 tons and that of bamboo papermaking by 860,000 tons. By 2022, the capacity of bamboo pulping will reach 1.67 million tons and that of bamboo papermaking 1.87 million tons. (c). Bamboo-based panel and bamboo flooring processing: The task is to speed up the restructure and capacity increase of the existing ply-bamboo and bamboo flooring companies. From 2017 to 2022, the capacity of bamboo-based panels will increase by 260,000 m³ and

that of bamboo flooring by 2.55 million m². By 2022, the total capacity of bamboo-based panels will reach 1.65 million m³ and that of the bamboo floor 3.3 million m². (d). Production of bamboo furniture and bamboo handicrafts: The task is to cater to customers' diverse needs by R&D in the production of bamboo furniture and bamboo handicrafts for office, home, decoration, packaging, education and entertainment. From 2017 to 2022, the capacity of bamboo furniture production will increase by 2.4 million pieces (sets) and that of bamboo handicraft production by 1.42 million pieces. By 2022, the capacity of bamboo furniture production 3.15 million pieces.

Developing new types of bamboo processing businesses: (a). Production of bamboo activated carbon: In this regard, the province will focus on the restructure and expansion of Desen Carbon Industry Co., Ltd in Luzhou and the development of the bamboo activated carbon project of Jixing Biotech Co., Ltd in Yaan. By 2022, the production volume of bamboo activated carbon will surpass 50,000 tons. (b) Production of bamboo beverage and functionality-oriented products: The task is to guide bamboo corporations to develop bamboo beverage and health products which contain bamboo essence and bamboo leaf flavone. From 2017 to 2022, the production volume of bamboo beverage will reach 20,000 tons. (c) Production of bamboo fibre: From 2017 to 2022, the province will speed up its efforts to move forward with the bamboo pulp fibre projects in Yaan and Yibin as well as the production line of bamboo winding composite pressure pipes. By 2022, the capacity of bamboo fibril will reach 260,000 tons and that of the bamboo winding composite pressure piping materials 40,000 tons.

3.3. Building bamboo-themed cultural tourism and retreat industry

Improving the infrastructure of bamboo-themed places and attractions as well as forest retreats: The task is to speed up bamboo forest landscaping and infrastructure in bamboo forest parks, bamboo forest marshes, bamboo forest retreats or bamboo forest attractions in villages. By 2022, the province will have 41 bamboo forest parks, 54 bamboo forest retreats and 441 bamboo forest-themed guesthouses, receiving more than 53 million visits every year.

Diversifying bamboo ecological tourism and featured products of bamboo retreats: The task is to develop ecological tourism products featuring bamboo forest sightseeing, bamboo industry experience and bamboo culture experience. Cultural tourism products, such as Qingshen bamboo weaving crafts and the Lius' bamboo weaving crafts, will be developed and promoted as key tourism products. Bamboo forest retreats for themed health resorts, vacation resorts, nursing homes and summer resorts will be introduced into the market. By 2022, brands of bamboo forest ecological tourism and bamboo forest retreats with the special features and advantages of Sichuan will take shape.

Building bamboo ecological tourism routes and retreat districts: By 2022, the province will have 10 highquality and refined bamboo-themed cultural tourism retreats as models. At the same time, bamboothemed tourism routes such as Guang'an (hometown of Deng Xiaoping, former President) – Huaying Mountain (a research base of giant pandas) – Dazhu (home to Sichuan Wufengshan National Forest Park), and bamboo-themed retreat districts will gradually take shape.

3.4 Improving service systems to support the bamboo industry

Market service system: First, setting up dedicated markets. It is planned to build a regional general market of bamboo products in the bamboo industry cluster in southern Sichuan and one specialized bamboo product market for each of the three bamboo industry belts, namely, Qingyi River, Qu

River and Longmen Mountain belts. Trade zones or trade locations of bamboo materials, shoots and handicrafts will also be set up in the priority counties. Second, establishing an "Internet +" marketing system. The province encourages bamboo business entities to establish an "online and offline" marketing system with the help of internet. Third, building an economic operation information system for the bamboo industry. The plan is to build a basic database and an information system of the bamboo industry that are based in southwestern China while catering to the entire country based on the information platform of Luzhou Bamboo Industry Park.

Technological Innovation system: First, establishing technological innovation platforms for the bamboo industry. With Sichuan Academy of Forestry taking the lead, Sichuan Agricultural University, Sichuan Food Industry Research Institute, Sichuan Light Industry Research Institute and leading companies will jointly establish Sichuan Bamboo Engineering Technology Research and Development Center to make breakthroughs in key technologies such as bamboo cultivation and refined processing. Second, enforcing technology dissemination and demonstration. The direction is to improve selective breeding and promote quality breeding. Third, developing more scientific and technological talents.

Standards and quality control system: First is to develop and improve a standards system; second is to improve quality control system; and third is to regulate business operations in the industry.

3.5 Developing priority counties

By 2022, the province will pick a few counties from the priority counties that have the capability to apply for province-level bamboo business certification to make further improvement. First, county-level governments will formulate bamboo industrial development plans; second, county-level governments will issue documents that can promote bamboo industrial transformation; third, capital and project resources will be pooled together to increase investment in the priority counties of the bamboo industry; fourth, bamboo industrial counties will be developed at a faster pace.

4. Environment protection

4.1 Eco-friendly cultivation of bamboo forests

Eco-friendly cultivation of bamboo forests will be conducted to protect and bring into play the ecological benefits of bamboo forests to the largest extent. When building a new bamboo forest base, it is strictly prohibited to execute prescribed burning and complete land reclamation for soil preparation. When converting farmland back to bamboo forests on slopes, it is required to take such measures as soil preparation by dotted pits, arranging pits in the shape of the Chinese character *pin* (\blacksquare) or building protection belts. Low-efficiency bamboo forests will be reformed progressively with proper reform intensity or by conducting alternation between different species of bamboo. Small-scale hydraulic engineering facilities and paths for construction inside the bases will be built but the construction should not take place on geologically fragile locations. During the construction, the excavated earthwork should be properly disposed of, and it is forbidden to dump construction packages and transported materials such as cement and river sand to prevent and control landslide, mudslide and pollution.

4.2 Eco-friendly operation, utilization and protection of bamboo forests

Intensive operation and ecological utilization of bamboo resources will be promoted by setting up and

implementing the ecological operation plan of bamboo forests to prevent their ecological functions from degenerating. More efforts will be put into multi-purpose utilization of the remains after cutting down bamboo forests. Environmental capacity and ecological capacity should be referred to as a basis to properly determine how much tourism volume the bamboo forests can take ecologically as well as the density and quantity of animal breeding under bamboo forests. Reckless exploitation and other kinds of sabotage behaviors will be prohibited. Fire protection and ecological control of diseases, pests and rats will be reinforced to protect ecological resources of bamboo forests.

4.3 Environment protection in bamboo processing and production

A group of model enterprises and industrial parks of bamboo processing will be established to promote clean production. With the philosophy of "developer protects; destructor rebuilds; and user pays" rooted in the business, each and every development project of bamboo industry should clarify the rights, obligations and benefits of ecological environment protection, and protect environment by way of legal, economic, administrative and technical measures. Following the requirements of controlling the volume of pollutant discharge, bamboo processing companies should apply new techniques and technologies to promote bamboo resource utilization ratio to reduce wastes, reuse them as resources and make them more hazard-free. Bamboo industrial parks and processing enterprises should enhance environmental protection infrastructure and upgrade devices, and improve their capability to dispose of residues, sewage and exhausts to meet the indicators of environment protection.

5. Supporting measures

5.1 Reinforcing organization and leadership

Following the requirements of "Policies for facilitating stable economic growth and fostering supplyside structural reform by improving quality and efficiency" (Document No. 17 issued by Sichuan Provincial Government in 2016) and "Ten action plans to help Sichuan become a top agricultural province by promoting supply-side structural reforms" (Document No. 303 issued by Sichuan Provincial Party Committee), Forestry Department takes the lead to set up the bamboo industry development leadership team to take charge of the overall coordination in bamboo industrial development and deal with the practical problems encountered during plan implementation. Key bamboo cities and counties are to establish and improve bamboo industrial development leadership teams and management organizations to incorporate bamboo industry into the planning of local economic development and poverty relief projects, and produce project lists and related project schedules to move forward accordingly. Local forestry authorities should play their role as government advisors to coordinate among different parties, work with related departments to plan the bamboo industrial development, and implement supporting policies to jointly promote the transformation and upgrading of bamboo industry.

5.2 Developing business entities and service providers

Related departments across the province should further implement the "Opinions of General Office of the Central Committee of the Communist Party of China and General Office of the State Council on speeding up the efforts to establish policy systems to develop new types of agricultural business operators" and related documents issued by Sichuan Provincial Party Committee and Sichuan Provincial Government, and actively encourage and develop more types of new business operators and service providers. On the premise that family-owned businesses still stay majority, the related departments should: develop a group of family forest farms and ranches and farmers' specialized cooperative organizations which feature directed breeding of bamboo forests, ecological planting under bamboo forests, primary processing or professional production of bamboo products, and bamboo product marketing; introduce a group of leading processing companies or tourism development companies that focus on refined processing and multi-purpose utilization of bamboo resources; set up platforms that combine non-profit and business services; train and expand the team of marketing and sales; encourage trade companies, trade associations and major marketing and qualification certification to train professional managers, technical talents and craftsmen in bamboo industry; and support new business operators to provide professional services and production authorization services, in an effort to upgrade the overall bamboo industry in terms of scale, integration, standard and industrialization.

5.3 Enhancing policy support

Various policies and measures, such as financial and tax policies and policies about supporting major economic factors, should be used to support an integrated bamboo industrial chain. Fiscal investment should be increased. Efforts should be made to obtain more fiscal investment from all levels of authorities and stronger capital integration to speed up breeding of high-quality species; establishment of modern bamboo forest bases; infrastructure construction in bamboo forests; and processing, branding and market development of bamboo products by such incentives as providing project subsidies, bonuses instead subsidies, and subsidized loans. Bamboo forest bases should be brought under the wings of projects such as Returning Farmland to Forestry Program, afforestation subsidies, subsidies for forest tending, modern bamboo forest industrial subsidies from provincial finance, targeted poverty relief, multi-purpose agricultural development and forest restoration programs. Roads in bamboo forests will be covered by local government bonds and agriculture-related projects. Irritation facility construction for bamboo-shoots-oriented forests will be covered by small agricultural irrigation projects, multi-purpose agricultural projects, etc. The restructure or expansion of qualified production lines for bamboo papermaking, bamboo artificial boards, bamboo furniture, bamboo handicrafts and bamboo shoots refined processing will be incorporated into province-level key project plan. The Green Pass policy will be implemented. Vehicles that transport fresh bamboo shoots and peeled fresh bamboo shoots can enjoy the benefits from the "Green Pass" policy that is designed for fresh farm products. Such vehicles can enjoy toll exemption under the condition that the vehicle is legally loaded. Major production factors should be ensured. The power supply for the bamboo product primary processing in specialized bamboo product companies, family farmlands and specialized cooperatives should be charged at the price level for agricultural production. Land for building facilities for primary processing of bamboo products that meets the related land requirements will be managed as agricultural land without going through approval for land conversion. Favourable tax policies will be implemented. For bamboo product primary processing, specialized production, or multi-purpose utilization of production waste led by bamboo specialized cooperatives, family forest farms, major bamboo companies, or professional managers, the purchaser can deduct VAT incoming tax value with obtained legal VAT deductible vouchers, thus legally deducting costs the purchaser has already invested pre-tax. With regard to bamboo companies that meet the requirements for high-tech companies' income tax breaks, the income tax will be collected at a 15% rate.

5.4 Carrying out branding strategy

To actively establish Sichuan's own renown brands, the province will implement the five projects of brand incubation, promotion, innovation, integration and information; spare no efforts in building renown brands of Sichuan's bamboo industry while promoting the whole industry's brand value and brand effect. A fair and rigorous evaluation system of bamboo product brands will be established; and product brands which have distinctive features, stable quality, good reputation and high market share will be put into Sichuan renowned product brands index for further cultivation. Provincial-level public brands such as "Sichuan Bamboo Pulp Paper" and "Bamboo Shoots of Sichuan Flavor" will be promoted in an integrated manner; efforts will also be made to push forward the cultivation of regional public brands with local features, especially in the "One Cluster and Three Belts" areas. Under the "regional brand + enterprise brand" strategy, the province will concentrate on cultivating, promoting enterprise brands with cultural meaning and influence, and supporting brands such as "YouFun Paper", "South Sichuan Bamboo Sea", "Qingshen Bamboo Weaving" and "Sichuan Huo Zhi Niang" to upgrade and further improve their popularity and market share. It is also planned to support the establishment of brand promoting associations pillared by enterprises; get involved into national strategies such as One Belt One Road initiative, Yangtze River Economic Zone, as well as China (Sichuan) Free Trade Pilot Zone; use TV, radio, newspaper and internet media to advertise and promote Sichuan bamboo products; and actively expand both domestic and overseas markets.

5.5 Innovating development mechanisms

The province will guide new types of bamboo industry business entities to lawfully form industry associations or alliances, cultivate provincial or regional bamboo industry communities, speed up on forming a new business system of "cooperation in production, sale and credit". It is planned to standardize the evaluation and circulation systems of bamboo forest, simplify the circulation process, improve circulation support policy as well as the three-level (county, township and village) circulation service system, lead and encourage circulation of whole villages and whole groups by way of bamboo forest circulation, bamboo forest for stake, bamboo forest in trusteeship and unified management by cooperatives, promote operation of businesses on a suitable scale, and efficiently use the resource assets. Vigorous efforts will be made to promote such models as "pre-circulation + inkind pricing + performance guarantee insurance", "forest stock cooperative + professional manager", "enterprise + base + farmer", "enterprise + cooperative + farmer", "minimum dividend guarantee" and "second rebate"; form a stable mechanism that connects production and sale; encourage enterprises to produce upon orders; carry out directed breeding of bamboo forests and production of customized products, in order to satisfy unique and personalized demands. At the same time, the province will strive to innovate the financial support system, improve the forest ownership mortgage loan system and expand its coverage; support leading enterprises of agriculture industrialization and farmers' specialized cooperatives to build production service facilities, establish raw material manufacturing bases, expand manufacturing scale and upgrade technology through interest subsidy, allowances and rewards; and explore and promote the model of "forest policy insurance + business insurance" to enhance risk resistance capacity. Finally, with the help of "Internet +", the province will encourage the development of new business models of bamboo and bamboo shoots products, including distribution and delivery, chain-store operation, and direct online selling; achieve unification in standard, operation, branding and sale; and eventually expand the sales channels of bamboo and bamboo shoots products.

Action Plan for Upgrading the Bamboo Industry in Zhejiang Province 2015-2017

Zhejiang Provincial Forestry Administration Zhejiang Provincial Bamboo Industry Association

1. Background information

1.1. Current status

A large bamboo industry: In recent years, bamboo forests in Zhejiang have expanded annually, achieving an increase from 11.75 million mu¹ in 2004 to 13.215 million mu in 2014. Meanwhile, the scale of bamboo processing has also been growing. In Zhejiang, 188 million Moso bamboo (*Phyllostachys edulis*) culms are logged annually. Among over 4000 bamboo processing companies in the province, over 20 has an annual production value above 100 million yuan and over 50 has an annual production value above 100 million yuan and over 50 has an annual production value above 50 million yuan. On average, Zhejiang exports over 500-million-yuan worth of bamboo based products annually. Riding along the trend of low-carbon, eco-friendly consumption, there is also an ever-growing diversity of bamboo products, such as bamboo flooring, curtains, mats, daily commodities, handicrafts, ply-bamboo, furniture, edible shoots, bamboo charcoal and bamboo fibre, presenting an application for almost every aspect of daily life.

Growing contribution to the economy of mountainous areas: In 2013, the total production value of the bamboo industry in Zhejiang reached 41 billion yuan, up by 14% from 35.8 billion yuan of the last year. In the province, more than 30 counties (including cities and districts) have an annual production value of over 0.1 billion yuan, including Anji (13.78 billion yuan), Lin'an (2.81 billion yuan), Yuhang (3.7 billion yuan), Longyou (2.6 billion yuan), Deqing (2.52 billion yuan), Qingyuan (2.57 billion yuan), Longquan (1.52 billion yuan), Qujiang (1.44 billion yuan), Fenghua (0.9 billion yuan), and Suichang (0.9 billion yuan). The bamboo industry plays an important role in supporting the economic development of mountainous areas.

Increasingly strong driver of farmers' income: The bamboo industry covers primary, secondary and tertiary sectors, creating a considerable number of jobs along its long value chain. At present, it is one of the most suitable industries for income generation for farmers in mountainous areas. Currently, over 3 million rural people are involved in bamboo-related industries in Zhejiang, over 100,000 of whom employed in bamboo and bamboo shoots processing industries. In bamboo producing regions, such as Anji and Lin'an, half of farmers' income comes from the bamboo industry. This industry has become a pillar in the rural economy of Zhejiang's mountainous areas and a predominant source of farmers' income.

Distinct regional clustering effect: Anji has 2,450 bamboo products supporting companies, over 70 of which are above the national designated size, 9 of which have a production value of over 100 million yuan, and 28 of which have a production value of over 50 million yuan. The focus of the bamboo industry in this county is bamboo weaving and bamboo flooring, accounting for 86% of the total production value of bamboo processing. Most of the bamboo flooring, curtains, mats, and placemats are exported to Europe and America. Qingyuan has the most concentrated cluster for

¹ Mu, a Chinese area unit, equals approximately 666.67 m².

making bamboo-based tableware in the province. The county is home to 273 bamboo processing businesses, scoring a production value of 2.57 billion yuan in 2013. In 2013, 52 of these companies had a production value exceeding 5 million yuan and 6 had a production value exceeding 100 million yuan. The state taxes paid by bamboo processing companies accounted for 42.2% of all the state taxes generated in manufacturing in Qingyuan. Lin'an is a major source of bamboo shoots in Zhejiang. It has China's the largest bamboo plantation for producing edible shoots, a processing centre for dried bamboo shoots in Tianmu Mountain, and a key processing and export base for boiled bamboo shoots. Among 1 million mu of bamboo forests in this city, 480,000 mu are for producing edible shoots. These forests are dominated by Phyllostachys praecox 'Prevenalis', producing approximately 250,000 tons of fresh shoots annually. Suichang and Qujiang are pioneers in developing bamboo charcoal in China. More than 300 kinds of bamboo charcoal and bamboo vinegar products were developed here, taking up over 1/3 of the domestic market.

1.2 Existing issues

Companies playing an insufficient leading role: The production value of Zhejiang's bamboo industry amounts to over 40 billion yuan. However, many of the businesses are small scale with a very modest output and most of them are loosely scattered across the province rather than organized in mature industry clusters. At present, the largest bamboo processing company of them all has an annual production value of merely 300 million. There is still no company listed on Shanghai Stock Exchange or Shenzhen Stock Exchange. Overall, the companies are insufficient in being industry leaders.

Fast rising production costs: The bamboo industry is labour intensive. Whether it is the breeding and management of bamboo forests, bamboo felling, bamboo shoot harvesting or bamboo processing, many of the processes in the industry still reply heavily on labour and lack mechanization. Zhejiang is a part of the regions in China where the economy is relatively developed with standard business management practices and a high cost of labour. Compared to its neighbouring provinces, Zhejiang is losing its advantage in the bamboo industry. Many of the larger companies are speeding up in moving their businesses to neighbouring provinces and many of the companies that have already moved out are now in competition with the businesses in Zhejiang.

Evident decline in economic benefits: In the economic new normal, the export of Zhejiang's bamboo products decreases and the sale in the domestic market also faces pressure from neighbouring competing provinces. The rise of business costs and the tightening of land supply weaken the competitiveness of Zhejiang's bamboo industry, which leads to a fall in the prices of Moso bamboo and more bamboo forests going wasted. If this trend continues to spread, it is possible that one day, all the bamboo forests will go wasted, empty of industrial benefits or ecosystem services, like what happened to Japan and Taiwan.

Severe environmental challenges: As a result of the small scale, small output and scattered distribution of bamboo shoot processing companies and their outdated production practices, these businesses fail to meet current requirements on wastewater discharge. It is highly difficult to improve wastewater treatment technologies, making this a task of great urgency.

2. General requirements

2.1 Guidelines

The fundamental guideline for this action plan is that for China's development, "lucid waters and lush mountains are invaluable assets". Working on Zhejiang's rich bamboo resources, mature bamboo industry and geographical advantage, and aiming to sustainably increase farmers' income and upgrade the bamboo industry, the action plan has incorporated measures such as innovating management systems and mechanisms, enhancing infrastructure and promoting the use of advanced applicable technologies. It endeavors to work along the guideline of "strengthening and improving the primary sector, fostering and expanding the secondary sector and developing the tertiary sector" to achieve an integrated development of all industrial sectors and build a bamboo industrial system that has sound management mechanisms and advanced technological support and can bring remarkable overall benefits and enrich the people.

2.2 Principles

The government playing a guiding role and the market having the decisive role on resource allocation: While market forces will be critical in allocating resources, the role policy can play in guiding the allocation should be strengthened. Policy support for infrastructure, new types of business entities and technology dissemination should be enhanced.

Focusing on improving quality and economic benefits and aiming at income generation for farmers: With a focus on improving the quality and economic benefits of the bamboo industry, area-specific policies and management measures should be employed to develop the industry into an important vehicle for promote the economic growth of mountainous areas and supporting the inclusive, sustained and fast income increase of farmers.

Forming industrial clusters and integrating three industrial sectors: Zhejiang's rich resources should be made full use of and production factors should be clustered to facilitate the industry's scaling up and regional development. The integrated development of the primary, secondary and tertiary sectors should be promoted to build a bamboo industrial system spanning the whole value chain.

Using market forces and environmental needs to push innovation and development: In adaptation to the economic new normal, to optimize the industrial structure, outdated capacity should be pushed out of production by forces of the market and the need of ecological conservation. Technological innovation should be strengthened and strong businesses should be fostered to achieve large-scale operation and enable industrial upgrade.

2.3. Goals

With three years' efforts, the goals of this action plan are to maintain the area of bamboo forests in Zhejiang at over 13.3 million mu, to realize a total production value of the bamboo industry of 50 billion yuan, to adjust the ratio of the first, secondary and tertiary sectors to 2:5:3, to ensure that more than 10 of the priority counties (including cities and districts) reach a production value of over 1 billion yuan, to raise the per capita net income of rural residents in bamboo producing regions above their local average, and to sustain Zhejiang's leadership in China in terms of mechanism innovation, technological advancement, overall benefit production and farmers' income generation.

3. Key tasks

3.1 Actions to strengthen and improve the primary sector for farmers' income increase

Starting with industrial parks and demonstration areas, actions will be taken to develop jointstock cooperatives (JSCs) and promote large-scale operation. More efforts will go to infrastructure development and technology dissemination with emphasis on increasing productivity and yield per unit area, fostering industries that can bring wealth to people and increasing farmers' operating income.

1. Promoting area-specific management: Following the principles of tailoring development planning to local conditions and balancing ecological needs with industrial development, three plans have been made: the bamboo forests in high mountains, distant mountains and ecologically important areas will be managed for ecological conservation purposes; the bamboo forests in areas with suitable natural conditions will be efficiently managed for economic benefits; the rest of the bamboo forests will be under labour-saving and eco-friendly management for producing edible shoots and bamboo materials.

2. Developing cooperative businesses: The establishment of joint-stock cooperatives (JSCs) will be encouraged. To join the cooperative, farmers can buy stocks with either money or the forest assets they have contracted for and each shareholding member in the cooperative will share profits according to their stocks. The form of JSCs enables large-scale operation and helps to boost farmers' property income.

3. Enhancing infrastructure development: More support will be provided for the infrastructure development of industrial parks and demonstration areas. Road construction in bamboo forests and efficient water-saving irrigation system building will be combined with the introduction of applicable machinery for logging and plowing. It is planned that with better facilities, resources pooling and more advanced manufacturing equipment, there will be improved production conditions, reduced production costs and higher labour efficiency

4. Rolling out the demonstration project "10,000 Yuan from 1 Mu of Mountain Land": With policy support and technical guidance, aiming to raise economic benefits per unit area, different models of management will be promoted, including efficient and eco-friendly management of *Phyllostachys praecox* 'Prevenalis', efficient agroforestry management, and straw-blanketing cultivation of Moso bamboo for producing edible shoots.

3.2 Actions to foster and expand the secondary sector for better quality and higher economic benefits

Market forces and ecological conservation needs can force outdated capacity to take its exit and help strong companies to grow into industry leaders. This can also help build successful brands, pool resources to make breakthroughs on crucial generic technologies, promote the replacement of manual labour with machine automation and advocate environment-friendly manufacturing to realize better quality and higher economic benefits in the bamboo processing industry.

1. Fostering industry leaders: More policy supports will be provided to encourage leading bamboo companies to form large leading companies and corporate groups that are highly related and

complementary, with cooperation among large businesses and division of work among small and medium sized businesses. Efforts will be made to encourage the formation of groups of industry leading companies that have good prospects, advanced technologies and competitive products, by means of mergers and acquisitions, equity control or participation, corporate reorganization or public listing.

2. Building successful brands: Working on the basis of the reputation of counties and districts and the well-known brands of industry leaders, branding resources will be pooled, more efforts will be made on advertisement and brand marketing will be encouraged. It is hoped that through these actions, the reputation of counties and brands of companies will be successfully established, their market share and influence will be expanded and they will win wider recognition. In particular, the leading companies in Zhejiang's bamboo industry will be encouraged to take the lead in brand building.

3. Making breakthroughs on crucial generic technologies: Joint efforts will be made to enable breakthroughs on generic and crucial technologies for bamboo-based material processing. Leading companies in forestry with advanced environment-friendly and low-carbon manufacturing technologies will be better supported. Actions will be taken to disseminate and commercialize newly-developed technologies. More financial support will be targeted on disseminating new technologies for the treatment of wastewater from bamboo shoots processing and for the manufacturing of bamboo winding composite pressure pipes. In addition, there will also be better protection of intellectual property rights.

3.3 Actions to develop the tertiary sector for industry upgrade

Actions will be taken to promote the integration of the primary, secondary and tertiary sectors and the development of the tertiary sector, especially the forest recreation industry. The development of forestry e-commerce will be further supported and measures will be employed to expand the sale of bamboo products online.

1. Stressing the development of the forest recreation industry: The action plan will tap into bamboo producing areas' rich resources and the multiple services provided by forests, make good use of local bamboo culture, repair ancient paths and encourage local people to run guesthouses in forests. Recreational services, such as camping, hiking and forest bathing, will be provided to meet urban residents' growing leisure and health demand. Developing this industry can help bring health to urban residents, economic benefits to rural people, protection to forest ecosystems and development to the bamboo industry.

2. Promoting the development of e-commerce: Actions will be taken to strengthen the exiting platforms on forest products promotion, including China Yiwu International Forest Products Fair and the specialized bamboo shoot markets in counties such as Anji, Yuhang, Deqing and Suichang. The action plan will also speed up the development of e-commerce and expand online sales by promoting online spot trading of forest-derived commodities. Developing forestry e-commerce will become an important part of forestry upgrade and receive more policy and financial support.

4. Priority projects

4.1 Demonstration areas of modern forestry economy

In this project, the demonstration area in Deqing will be rolled out to other counties. It is planned that altogether 10 demonstration areas will be built to showcase modern bamboo industry in Anji, Suichang,

Qingyuan, etc. These demo areas will take the lead in Zhejiang's forestry upgrade and whole value chain development through the integration of all three industrial sectors, pooling of production factors, innovation of industrial systems and mechanisms, and advancement of technology.

4.2 One million mu of bamboo forests for farmers' income generation

The project will take place across 1 million mu of suitable bamboo forests in bamboo producing districts and counties. Road construction in bamboo forests and efficient water-saving irrigation system building will be combined with the introduction of applicable machinery for logging and plowing. Standardized and safe manufacturing technologies will also be introduced. It is expected that profits by mu will increase by at least 30%. Among the 1 million mu of bamboo forests, 100,000 mu will be earmarked for the project "10,000 Yuan from 1 Mu of Mountain Land". It is advised that infrastructure development and technology dissemination should be prioritized for receiving financial support.

4.3 Cultivation of new business types

The model of joint-stock cooperatives (JSCs) in Gaojiatang Village in Anji, will be rolled out in this project. In 2011, Gaojiatang Village in Shanchuan, Anji started Zhinan JSC for Bamboo Shoots. Bamboo forests were taken as contributions at their monetary value and the registered capital reached 3.66 million yuan. Currently, 176 households are members of this cooperative and 4,205 mu of bamboo forests are involved, accounting for 95.9% of all the bamboo forests in the village. The village has realized the transformation from family businesses to cooperative operation, enlarged operation scale and promoted the integration of the primary, secondary and tertiary sectors. In 2014, despite the pressure of rising management costs and plummeting Moso bamboo prices, the production value of the JSC exceeded 2 million yuan and dividend per household reached 11,000 yuan, achieving an increase of 10.3% from the previous year. Over the years, funds from mortgaging the management rights of woodlands have amounted to more than 6 million yuan, 1.5 km of roads and 2 km of trails have been constructed in forests, and over 200 mu of bamboo forests have been covered by sprinkler irrigation. Gaojiatang Village is also in cooperation with travel agencies. Together, they developed tourist attractions Qixinggu and Xianlongxia. In 2014, the village received 360,000 tourists. The development of tourism gave rise to 22 family agritainment businesses, creating over 100 jobs.

Following the principle of fostering strong businesses, measures will be employed to encourage leading companies to go public. Commercialization projects with good prospects and advanced technologies will be supported or invested with funds or stocks through Zhejiang Provincial Fund for Modern Agriculture Development. It is advised that Zhejiang Provincial Fund for Modern Agriculture Development or other competitive projects should decide the allocation of supporting funds.

4.4 Commercialization of crucial generic technologies in the bamboo industry

The project will let companies be the main actors in technological innovation. Zhejiang Service Platform for Technological Innovation in the Bamboo Industry, consisting of education and research institutions and leading companies, will also be employed. There will be stronger support for the development of crucial and generic technologies for environment-friendly and lowcarbon manufacturing, development of new products and application of new materials. Key commercialization projects include wastewater treatment for bamboo shoot processing factories, bamboo winding composite pressure pipes, development of high value-added bamboo products, and application of machine automation to replace manual labour.

4.5 Expansion of the forest recreation industry

In this project, the government will play a guiding role, the market will allocate resources and companies are active participants. Actions will be taken to attract investment to the development of the forest recreation industry and close relations will be built between investors, forest farms and farmers. There will be more financial support on the fronts of infrastructure and recreational facilities, in particular, on the restoration of forest landscape, the repair of ancient paths and the running of family guesthouses in forests. It is advised that the development of infrastructure and recreational facilities should be prioritized for receiving financial support.

4.6 Supporting forestry e-commerce

Recent years have seen the rapid development of bamboo product e-commerce in Zhejiang. Bamboo products made in Qingyuan and Anji, bamboo shoots made in Suichang and Deqing and bamboo charcoal made in Qujiang and Suichang have scored particularly fast growth. Companies such as Jiuchuan in Qingyuan are selling over 50% of their products online. It is advised that Qingyuan's e-commerce model should be rolled out. In this model, they strengthen the development of original products and expand into cross-border e-commerce. The online spot trading of agriculture and forestry commodities is supported with policy and funding. Multiple modes of e-commerce are explored in this model, including vertical e-commerce websites, companies + e-shops, farmers + associations (companies) + platform, and companies + authorized operators + platform. It is advised that the development of e-commerce platforms, trainings and technology dissemination should be prioritized for receiving financial support.

5. Supporting measures

Enhancing policy support to cultivate industries that bring to wealth to people: Zhejiang has a large bamboo industry in terms of production, processing and trade. The bamboo industry covers primary, secondary and tertiary sectors, creating a considerable number of jobs along its long value chain. At present, it is one of the most suitable industries for income generation for farmers in mountainous areas and has become a pillar in the rural economy of Zhejiang's mountainous areas and a predominant source of farmers' income. Stronger leadership is required in all localities and related government departments. They need to take current difficulties in bamboo industry development seriously, make the advancement of this industry a high priority, and provide better policies for farmers' welfare. Support should be provided on all areas, including government finance, financial services, science and technology and environment protection. Overall, practical actions should be taken to follow the philosophy that "lucid waters and lush mountains are invaluable assets".

Deepening reforms to support businesses: In efforts to boost large-scale operation, protect farmers' lawful rights and interests and raise economic benefits, more efforts will be made to separate the ownership, use rights and management rights in forestry and to foster the development of industry leaders and specialized farmers' cooperatives. The leading companies in the bamboo industry will be encouraged to take the lead in establishing specialized cooperatives, especially JSCs. Measures will be taken to ensure that under this new type of business, farmers will maintain their land, the combination of different production factors can be optimized with large-scale and intensive management, and

economic benefits can be reaped. With giving support to strong businesses in mind, the leading companies will also be encouraged to go public on stock exchanges. Commercialization projects with good prospects and advanced technologies will be supported or invested with funds or stocks through Zhejiang Provincial Fund for Modern Agriculture Development. Favourable tax policies will be provided for investors in leading companies in modern agriculture and forestry. Credits will be extended to the leading companies in financial troubles as a result of mutual guarantee.

Optimizing Investment mechanisms to reinforce infrastructure: While market forces will be critical in allocating resources, the role policy can play in guiding the allocation will be strengthened. Efforts will be made to attract investment in the bamboo industry, especially its secondary and tertiary sectors. Policies will be further improved to bring substantial benefits to farmers. With Zhejiang Provincial Fund for Modern Agriculture Development and Fund for Agriculture Commercialization, more financial support will be in place, employing market-economy models such as funding support, risk compensations, guarantee subsidies, loan interest deductions, stock investment and awarding instead of subsidizing. More actions will be taken to carry out favourable loan policies related to farmers, such as interest deductions and risk compensations for loans with forest assets rights as mortgages. There is a plan to set up a fund for farmers' loan guarantee to improve related risk compensation system. Policy-based insurance will cover more bamboo forest areas. Infrastructure development, such as road construction and water-saving irrigation system building in bamboo forests, will be enhanced. More efforts will be made on improving bamboo forests low in economic benefits. Equipment and machinery in forestry will continue to be improved. The diverse services and benefits of forests will be made full use of with enhanced construction of forest recreational facilities.

Promoting Innovation to drive industry upgrade: Scientific and technological innovation underpins the upgrade of the bamboo industry. Forestry companies, cooperatives, and research and higher education institutions should work together on generic and crucial issues hindering industrial development and jointly promote the commercialization of new technologies. Efforts should be made to roll out successful demonstrations such as the management model of "10,000 Yuan from 1 Mu of Mountain Land", the combined cultivation of bamboo of different species and economic benefits, the integrated development of forest-related industries and the application of new materials. In addition, in order to help companies achieve their upgrade, there should be more measures to help disseminate environment-friendly and low-carbon production technologies.

Development Plan for the Bamboo Industry in Yunnan Province 2014-2020

1. Current status

Yunnan Province, located on the southwest border of China, is reputed as the "home of bamboo" as a world-recognized place of origin of bamboo and a bamboo growing region in modern days. Natural bamboo forests in Yunnan rank the first across the country in terms of variety and size. It has rich resources of large sympodial bamboo and grows many bamboo species that are densely concentrated if not endemic to Yunnan. At present, in the province there are 250 species (including varieties and forma) in 29 genera of the subfamily Bambusoideae. 40% of the genera and 25% of the species across the world and 75% of the genera and 50% of the species in China can be found here; Yunnan is also home to over 100 endemic bamboo species and more than 10 endemic bamboo genera.

Recent years have seen the development of the bamboo industry in Yunnan. Major progress has been made in bamboo cultivation, as over 1 million mu¹ of bamboo has been planted in the past 5 years, providing the province with a relatively solid resources base for industry development. People's attention to the development and utilization of bamboo resources has given rise to its processing industry. Bamboo-themed eco-tourism has also been growing. However, compared to other bamboo producing regions in China, Yunnan is lagging in industry development. Its scattered resources make it difficult for large-scale utilization. Bamboo processing and development are less-developed and the companies in this business are insufficient in being industry leaders. The province also lacks original and branded products to compete in the market, scientific and technological innovation, and policy and systemic support.

2. Development goals and strategy

The development plan for the bamboo industry in Yunnan covers the period from 2014 to 2020.

2.1 Goals

The overall goals are to develop 7 million mu of bamboo forests across the province by 2020, bringing the total bamboo forest area to 12 million mu; to increase the total production value from 2.5 billion yuan to 15 billion yuan by 2020 and 100 billion yuan by 2030, finish the initial set-up of bamboo industrial clusters and build a strong bamboo industry based on rich resources in the province. Major development targets are listed as follows.

1. Develop 7 million mu of bamboo forests, including 5 million mu of newly planted bamboo and 2 million mu of yield-improved bamboo. Achieve a production value of 4.2 billion yuan from the utilization of bamboo materials and culms (for packaging and other uses), and the production of fresh bamboo shoots, bamboo rhizomes, branch tips and leaves.

2. Produce 600,000 m³ of bamboo-based panels (including bamboo-wood composite container flooring, bamboo-based OSB, bamboo flooring, laminated bamboo, bamboo scrimber, ply-bamboo)

¹ Mu, a Chinese area unit, equals approximately 666.67 m².

annually, reaching a production value of 1.5 billion yuan.

3. Produce 50,000 tons of fresh bamboo shoots, 200,000 tons of dried bamboo shoots, 100,000 tons of other newly-developed bamboo-based food, and 10,000 tons of bamboo juice annually, reaching a production value of 1.7 billion yuan in the processing of bamboo-based food products.

4. Produce 450,000 tons of bamboo pulp and 5,000 tons of bamboo fibre products annually, reaching a production value of 2.7 billion yuan.

5. Produce 25 million pieces of bamboo-made daily commodities, weaving and carving handicrafts and 100,000 pieces of bamboo furniture annually, reaching a production value of 1.9 billion yuan.

6. Produce 1,000 tons of bamboo leaf flavonoids and related products and 20,000 tons of bamboo charcoal annually, reaching a production value of 0.2 billion yuan in the bamboo chemical industry.

7.Develop bamboo forests-based eco-tourism and service industry to achieve a production value of over 2.8 billion yuan.

2.2 Strategy

The overall strategy is to develop one industry service centre, one key industry belt, four industry clusters, and twenty priority counties.

1. With Kunming at the centre, develop a bamboo industry service centre to facilitate trade, offer technological services, foster international cooperation, and provide integrated services.

2. Along the belt of Yuxi, Pu'er and Xishuangbanna, develop a key industry belt that is focused on bamboo-based daily commodity processing and panel production and integrated with food processing, pulp and paper making, chemical industry, and cultural tourism.

3. With Zhaotong at the centre, develop an industry cluster in northeastern Yunnan that is focused on bamboo-based food deep processing and integrated with daily commodity processing and chemical industry.

4. With Dehong at the centre, develop an industry cluster in western Yunnan that is focused on bamboo-based panel production and integrated with daily commodity processing, food processing, chemical industry and culm utilization.

5. With Lincang at the centre, develop an industry cluster in southwestern Yunnan that is focused on bamboo-based daily commodity processing and integrated with panel production, food processing, pulp and paper making, culm utilization and cultural tourism.

6. With Honghe at the centre, develop an industry cluster in southeastern Yunnan that is focused on bamboo pulp production and integrated with bamboo-based food processing, panel production, culm utilization and chemical industry.

7. Identify 20 priority counties for bamboo industry development.

3. Key tasks

3.1 Cultivation of bamboo forests

With directed breeding, bamboo forests can be developed for producing edible shoots, producing bamboo materials, pulp and paper making, chemical industry, and sightseeing. Based on the characteristics of bamboo species, there are dragon bamboo (Dendrocalamus giganteus), Dendrocalamus hamiltonii, *Schizostachyum chinense, Bambusa emeiensis*, bamboo species suitable for producing edible shoots, and monopodial bamboo species.

1. Bamboo forest bases: The building of bamboo forest bases will cover all the autonomous prefectures and cities except Diqing. Bamboo cultivation efforts will be focused on 20 priority counties in 8 prefectures and cities (Yuxi, Baoshan, Zhaotong, Pu'er, Lincang, Honghe, Xishuangbanna and Dehong). Altogether 7 million mu of bamboo forests will be developed.

2. Bamboo seedling nursery bases: It is planned that 29 new nurseries will be built, altogether covering an area of 4,350 mu. Meanwhile, there is also an improvement plan for 18 existing nurseries, covering 900 mu. Nursery development efforts will mainly cover 7 prefectures and cities (Yuxi, Zhaotong, Honghe, Xishuangbanna, Lincang, Pu'er and Dehong).

3. Road construction in bamboo forests: The plan will develop a total of 7,100 km of roads in bamboo forests, including 6,500 km of new roads and 600 km of reconstructed roads.

3.2 Bamboo product processing

On developing Yunnan's bamboo product processing industry:

1. Bamboo-based panels: The bamboo industrial clusters in western and southwestern Yunnan will concentrate their development efforts on bamboo-based panels, while the cluster in southeastern Yunnan will also make moderate efforts on this front. By 2020, 40 key manufacturers of high value-added bamboo-based panels will be developed and the production value of the area will reach 1.5 billion yuan.

2. Bamboo food product (edible shoots and bamboo beverage products) processing: The bamboo industrial cluster in northeastern Yunnan will be the focus of development in this area. It is planned that by 2020, the production of bamboo-based drinks and upmarket health beverage will reach 10,000 tons and the production value of bamboo food processing will reach 1.7 billion yuan.

3. Bamboo pulp and paper making and bamboo fibre manufacturing: The industrial clusters in southwestern and southeastern Yunnan will concentrate their development efforts on bamboo pulp and paper making, with a goal to produce 450,000 tons of pulp annually. The key industry belt and Kunming will concentrate their development on bamboo fibre manufacturing. By 2020, the industry will see 3 new manufacturers of bamboo fibre and Yunnan's production of this type of products will reach approximately 5,000 tons.

4. Bamboo-based daily commodity (handicrafts and furniture) processing: The industrial cluster in southwestern Yunnan and the key industry belt are the focus of development on this front. The goal is that by 2020, under a total production value of 1.9 billion yuan, production of bamboo-based daily commodities will amount to 25 million pieces and processing of bamboo furniture will reach 100,000

pieces.

5. Bamboo chemical industry (extraction of bamboo leaf flavonoids and processing of bamboo charcoal): The bamboo industrial clusters in western and southeastern Yunnan and the key industry belt will concentrate their development efforts on the bamboo chemical industry. By 2020, the extraction and processing of bamboo leaf flavonoids is expected to reach 1,000 tons and the processing of bamboo charcoal 20,000 tons, bringing the production value of the bamboo-based chemical industry in Yunnan to 200 million yuan.

6. Bamboo culm utilization (packaging materials and others): The clusters in southeastern, southwestern and western Yunnan will concentrate their efforts on fostering small and medium-sized manufacturers of bamboo-based packaging materials and bamboo culm utilization and on encouraging the building of traditional bamboo architecture of the Dai, Wa and Jingpo people. It is planned that by 2020, there will be over 200 key manufacturers of bamboo packaging materials and over 300 SMEs of other culm applications, with a production value of above 1.5 billion yuan.

On fostering industry leaders and carrying out branding strategy:

1. Fostering industry leaders: The goal is that by 2020, there will be at least 12 province-level leading manufacturers of bamboo-based panels, and 40 companies, including 10 province-level leading companies, in bamboo shoot processing; 3 new or reconstructed environment-friendly manufacturers of bamboo pulp; 12 new businesses in bamboo daily commodity (or handicraft) processing and 20 new or reconstructed manufacturers of bamboo furniture.

2. Carrying out branding strategy: The goal is that by 2020, there will be 3 provincially and 1 nationally well-known trademarks in bamboo-wood composite container flooring, 2 provincially and 1 nationally well-known trademarks in bamboo-bases OSB, 3 provincially and 1 nationally well-known trademarks in laminated bamboo and bamboo scrimber, 2 provincially and 1 nationally well-known trademarks in ply-bamboo, and 10 industry leaders, 5 provincially and 2 nationally well-known trademarks in bamboo scrimber, so provincially and 2 nationally well-known trademarks in bamboo scrimber, branding strategy will also be in place for bamboo pulp and paper making, bamboo fibre production and bamboo daily commodity processing.

3.3 Development of bamboo culture and eco-tourism

On developing bamboo culture:

1. Traditional bamboo art forms in Yunnan: With the help of bamboo engineering technology research centre and architecture design research institutes, bamboo residential buildings and ethnic culture-themed landscape will be restored and renovated.

2. Bamboo culture innovations: Efforts will be made to protect local bamboo cultures through the application for world cultural heritages, the compiling of bamboo culture-themed books, audios and videos and the application for geographical indications for Yunnan's bamboo products. There is a plan to build a provincial bamboo culture museum based on China-South Asia and Southeast Asia Bamboo Product Trade Centre.

3. Bamboo exhibitions and festivals: Bamboo culture festivals, bamboo shoot festivals and feasts, bamboo carving exhibitions and bamboo shoot exhibitions will be held to showcase Yunnan's unique bamboo culture.

On developing bamboo-themed eco-tourism:

1. Bamboo forests for sightseeing: There is a plan to develop 100,000 mu of bamboo forests for sightseeing in Kunming, Yuxi, Zhaotong, Lijiang, Pu'er, Lincang, Honghe, Xishuangbanna, Dali and Dehong.

2. Bamboo culture gardens: Yunnan has in planning a 500-mu subtropical bamboo garden in Kunming, a 500-mu world alp bamboo garden in Shangri-La, a 500-mu garden for medium and large-sized monopodial bamboo in Zhaotong, a 500-mu ornamental bamboo garden in Xishuangbanna, a 30,000-mu Asian bamboo and rattan garden in Pu'er, a 1,500-mu world bamboo museum in Cangyuan and a 1500-mu Southeast Asian bamboo museum in Dehong.

3. Bamboo-themed manors: There is a plan to build at least 100 such manors in Kunming, Qujing, Chuxiong, Honghe, Wenshan, Xishuangbanna, Dali, Dehong and Diqing.

4. Eco-tourism will be developed based on the infrastructure above.

3.4 Conservation of natural bamboo forests and preservation of germplasm resources

Based mainly on natural reserves and supplementarily on small-scale conservation areas for precious bamboo species and public forests, in situ conservation will be conducted to protect natural bamboo resources. Based on bamboo gardens and museums built for tourism, germplasm resources in and outside Yunnan will be preserved. Rescue and conservation research efforts will be targeted on 5 species (*Cephalostachyum scandens, Fargesia gongshanensis, Schizostachyum chinense, Teinostachyum yunnanensis,* and *Dendrocalamus sinicus*) that are endangered as a result of flowering. There is also a plan to set up a provincial information system to carry out dynamic monitoring on natural bamboo forests.

3.5 Development of a bamboo product distribution network

1. Distribution infrastructure: The construction of China-South Asia and Southeast Asia Bamboo Product Trade Centre will be accelerated. 6 large regional bamboo trading markets will be set up in Zhaotong, Pu'er, Lincang, Honghe, Xishuangbanna and Dehong. There is also a plan to build county-level wholesale markets, township-level trading markets and village-level retail branches.

2. Actors in the distribution network: The leading companies and rural cooperatives in the industry will be the main actors. Other actors in the network will include bamboo industry associations, middlemen, specialized distributors, distribution agencies, professional retailors in the urban area, and seasonal or temporary distribution teams formed by farmers.

3. Innovation of distribution methods: Business formats that will be the focus of development include chain business, franchise business, modern logistic services, distribution centres, e-commerce and contracts. Active efforts should be made to develop preservation technologies and cold-chain logistics for fresh bamboo shoots. Bamboo industry associations should assist companies and cooperatives in hosting product promotion events and trade fairs and in making innovations in modern product distribution.

3.6 Development of an integrated service system

An integrated service system will be built covering information, product distribution, technology, finance, insurance, legal services and various agencies (for assessment, consulting, certification, etc.). The priority is put on enhancing the development of cooperatives, information service networks, and the system for product standardization and quality inspection.

3.7 Building of a scientific and technological support system

On building a technology innovation system for the bamboo industry:

1. China-South Asia and Southeast Asia Bamboo Industry Development Research Centre: The establishment of the research centre in Kunming will be headed by Yunnan Bamboo and Rattan Industry Association, technologically underpinned by Yunnan Plateau Agriculture Institute, and planned together with China-South Asia and Southeast Asia Bamboo Product Trade Centre.

2. Bamboo industry scientific and technological innovation platform: With Yunnan Bamboo and Rattan Engineering Technology Research Centre and Bamboo and Rattan Institute of Southwest Forestry University at its core, the platform will be built with 8 branches to be built in Yuxi, Baoshan, Zhaotong, Pu'er, Lincang, Honghe, Xishuangbanna, and Dehong.

3. Company-based allance of bamboo industry technological innovation: The priorities of the alliance will be given to bamboo-based panels, bamboo container flooring, bamboo pulp and paper making, farming of organic bamboo shoots, and bamboo shoot preservation methods.

On building a technology support system for the bamboo industry:

1. R&D system: The research and development will mainly focus on the breeding of quality bamboo species, directed breeding of high-yield bamboo, bamboo germplasm resources, bamboo product processing, bamboo-based biomass energy and machinery suitable for processing large sympodial bamboo in Yunnan.

2. Technology dissemination system: Practical technologies in bamboo production and processing will be better disseminated and applied across the industry. Demonstrations will be provided on efficient material producing bamboo forests and efficient edible shoot producing bamboo forests. Companies will be encouraged to establish training and research centres and forest food production bases and apply for the certification of the Forest Stewardship Council (FSC).

3. Talent development: Efforts will be made to support the development of leading figures of R&D in the bamboo industry. Talents in high-end R&D, engineering technology and corporate management will also be developed.

4. Supporting measures

4.1 Organisational support

Developing the bamboo industry will be made a priority in the efforts to adjust rural economic structure, increase farmers' income and address issues related to farmers, agriculture and rural areas. It will be reflected in local economic and social development plans and actions will be taken

accordingly to realize development goals. Decision-making mechanisms will be improved, with coordination agencies for bamboo industry development at province, prefecture/city, and county levels. The development of the bamboo industry will become an important indicator in the assessment of government performance at all levels.

4.2 Policy support

Actions will be taken to implement national and provincial favourable policies on forestation, agricultural industry leaders, plateau agricultural product processing, tax exemptions and deductions, and loan interest deduction. In addition, local governments will also provide favourable policies to support the building of bamboo industry bases and the development leading companies in bamboo product processing. Working on the successful reform of the collective forest right system, the government will speed up the proper transfer of the use right and management right of forests and woodlands, give full play to all factors of production in forestry and all kinds of forest resources and assets, and encourage farmers and companies to take an active part in the development of the bamboo industry. Working with national, provincial and local forestry projects, bamboo forests planted by individuals and companies will be subsidized. Bamboo product processing companies that have shown good prospects and strong leading capacities will be supported or encouraged to operate in Yunnan. Policy support will mainly focus on the right transfer of forests and woodlands, land acquisition, product development, infrastructure building and product acquisition.

4.3 Financial support

A fiscal subsidy system for the bamboo industry will be established to coordinate all levels of government fiscal resources and infrastructure investment. Apart from providing subsidies for farmers and companies for developing bamboo forests, the government will also subsidize the breeding of quality bamboo species, disaster monitoring and control in bamboo forests, infrastructure development in forest areas and development of machinery and equipment used in the bamboo industry. The financing and investment mechanism will be improved to provide farmers and SMEs with small loans and loan interest deductions, encourage and support strong bamboo businesses to go public, and attract more private capitals into the industry. More efforts will be made to develop forests-related policy-based insurances. The coverage will be expanded and risk diversification will be improved to better protect the bamboo industry from possible risks and decrease the risks involved in investment for companies and other capital sources.

4.4 Technological support

National and provincial science and technology programmes will be oriented toward the bamboo industry, providing financial, technological and policy support for technological platforms and professional teams, in order to gradually establish a well-rounded scientific and technological innovation system for the bamboo industry. Researchers will be encouraged to invest in bamboo product processing and technical services with their technology or capital. They will be allowed to provide paid consulting services or guidance for bamboo farmers and bamboo processing companies. To motivate research professionals, support will be provided for those of them who intend to start technology companies, business entities and demonstration bases. Companies are encouraged to hold activities on R&D, innovative practices, FSC-certification and brand building. More efforts will be made on building information service networks and developing bamboo product cooperatives and

associations.

4.5 Market development

More publicity will be given to bamboo industry development and measures will be taken to raise the recognition for bamboo products in our domestic market. Green consumption will be advocated, making bamboo culture an integrated part of modern life. Bamboo culture-themed seminars, exchanges and exhibitions will be held to increase people's awareness. There will be more policies to encourage consumption of bamboo products and create demands in the market. Efforts will be made to include bamboo flooring and ply-bamboo into the list of construction materials promoted in rural areas, list bamboo products in the national purchase catalogue of green construction materials and include bamboo-based office furniture in the scope of government procurement.

4.6 International cooperation

Cooperation and communication with INBAR and its member states, such as Vietnam, Myanmar, Nepal and India, will be increased. Domestic and foreign capital, resources, technology and management best practices are welcome. Active efforts will be made to promote Yunnan's bamboo products in Southeast and South Asia for more market shares.



This is a translation of *China's National Plan* for Bamboo Industry 2011 to 2020, and abridged translations of bamboo industry plans for three provinces: Sichuan, Zhejiang and Yunnan. The plans constitute some of the most comprehensive national and regional policies regarding the bamboo sector, and should be of relevance to policy makers and governments wanting to provide more support to their own bamboo industries.

The Plan was translated by the International Bamboo and Rattan Organisation, an intergovernmental organisation of 43 Member states which encourages sustainable development using bamboo and rattan.