Chapter 2
China's Reforestation and Rural Development Programs

Abstract This chapter describes the six largest programs introduced during the late 1990s and early 2000s. Together, these six Key Forestry Programs (KFPs) cover 97 % of China's counties and target over 100 million ha of land for forestation. The Grain for Green is the largest of these programs, in terms of area covered, people affected, and money invested. This book only reviews the Grain for Green, but in many villages more than one program was introduced concurrently. In this chapter, we argue that the government introduced the KFPs not only because environmental deterioration had reached a critical point, but also because China was producing a surplus of grain, which lowered farmers' incomes, and because inequality between the eastern and western provinces was reaching a critical point. The Grain for Green in particular addressed all these problems concurrently, through direct payments to poor farmers willing to set aside marginal land. Partly for this reason, the Grain for Green is considered by many as the best reforestation and rural development program ever undertaken in China.

Keywords Reforestation policies • Rural development policies • Key Forestry Programs • Slope Land Conversion Program • Natural Forest Protection Program • Shelterbelt Development Programs • Desertification Control Program • Wildlife Conservation and Nature Reserve Development Program • Fast-Growing and High-Yielding Timber Plantation Program

Introduction

Forest resources in China are characterised by inadequate supply, low quality and uneven geographic distribution. The period with the greatest deforestation occurred in the second half of the twentieth century, when forest coverage decreased from 30 to 40 % in 1949 to about 10 % in the late 1990s. The rapid increase in the nation's population, coupled with rapid economic development, resulted in enormous consumption of forest resources. At the turn of the millennia, the forest area of China was only taking up 4.1 % of land mass, and the stocking volume was merely 2.9 %, of the world's total (Lei 2002). This was not sufficient to meet the production and livelihood needs of a country accounting for 22 % of the world's population.

C.O. Delang, Z. Yuan, *China's Grain for Green Program*,
DOI 10.1007/978-3-319-11505-4_2

Since 1950, a total of 10 billion cubic metres of forest resources have been consumed nationwide. By 2050, the demand for forest resources is estimated to reach at least 18.5 billion cubic metres – 60 % more than the gross forest resources consumed in 2002 (370 million cubic metres).

An unfavourable physical landscape characterised by mountains and hills, uneven rainfalls, excessive commercial logging, and the cutting down of the forest on hillsides for cultivation in the upper and middle reaches of the Yangtze and Yellow river basins "caused an increase in the scope and intensity of water runoff and soil erosion and a decline in the ecosystem's capacity of regulating water and holding soil" (Yin et al. 2005: 19). The soil- and water-eroded areas reached 360 million ha, which accounted for 38.2 % of the country's total land area (more than three times the world average) and resulted in soil loss of 5 billion tonnes annually (Lei and Zhu 2002; Huang 2000). Increased soil erosion silted streams, reduced hydraulic capacity of the rivers and caused higher frequencies of flooding (Smil 1993; World Wildlife Fund and State Forest Administration 2003). Records show the annual soil loss in the two rivers to be as high as 4 billion tonnes (World Wildlife Fund and State Forest Administration 2003).

Using data from China's second soil census, Yang (1994) found that around 8 % of the country's cultivated land was affected by "intensive" water erosion, and another 26 % was affected by "light to medium" erosion. South-west China (containing the upper watershed of the Yangtze River) was estimated to contain 25 % of China's eroded land and 39 % of China's cultivated areas affected by "intensive" water erosion (Bennett 2008). According to official estimates, the soil erosion area in the Yangtze and Yellow river basins reached 75 million ha, with sediments of over 2 billion tonnes (Li 2001). On the other hand, the Loess Plateau (containing the upper watershed of the Yellow River) was estimated to contain 22 % of China's eroded land, and 19 % of China's cultivated area affected by "intensive" water erosion. Uncontrolled grazing and poor maintenance of rangelands caused extensive loss of grass cover, and contributed to soil erosion problems in the Loess Plateau. As a result of these dire conditions of forests and land, from the late 1990s the Chinese government undertook a number of forestry reforms. This chapter discusses these initiatives.

Drivers Behind the Chinese Government's Response to Deforestation

The United Nations Conference on Environment and Development (UNCED), held in Rio de Janeiro in 1992, launched "Agenda 21", a wide-ranging, non-binding and voluntary initiative that championed the importance of sustainable resource management. Section II of the document in particular focused on reducing the extent of deforestation and protecting biodiversity. In response, the Chinese government published its own "China's Agenda 21" in 1994, which for the first time recognised the importance of protecting forests alongside the need to produce timber for the

national economy, and acknowledged the need to use market approaches to address environmental problems (Lei and Zhu 2002; ACCA21 1994: 135). In the same vein, in May 1995, the forestry department published a blueprint paper, "The Forestry Executive Plan of the Agenda 21 in China" (DOF 1995). According to Lei (2002), the government also developed a "Blueprint for Ecosystem Development in China", with the objective of raising the forest cover to over 26 % by 2050, which required a net increase of 90.66 million ha in forest area. It would have taken 140 years to achieve that objective at the speed of the nationwide tree-planting campaign initiated in 1981 (Lei 2002).

In spite of these declarations and plans, little was done until the drought of the Yellow River in 1997, and the devastating floods in the middle reaches of the Yangtze River during the summer of 1998. During the drought in 1997, the Yellow River had no water discharged to the sea for 330 days, putting industrial, agricultural, and residential water uses in the northern plains in great jeopardy (Xu and Cao 2002). On the other hand, in 1998, massive floods along the Yangtze River and its tributaries claimed the lives of some 4,000 people, displaced some 18 million people and led to more than $12 billion in property damage and output losses (Lu et al. 2002). The Yellow River flows through nine provinces, and in 2000, some 110 million people lived in its basin, while another 55 million lived outside the river basin, but in areas irrigated by the Yellow River. The Yangtze River, the largest river in China, is even more important. The main channels of the Yangtze River flows through 11 provinces, and its basin accounts for some 18.75 % of China's land area, which produces 42 % of China's GDP. Both rivers basins are extremely important areas for the economic, cultural and social development of China.

Many environmental experts blamed these floods on soil erosion and deforestation upstream (World Bank 2001). There are two factors that contribute to the environmental stability of the river basins. The first one is a rich vegetation cover. Intensely forested areas with good ground vegetation cover in the upper reaches reduce the direct impact of water moving on the ground. After decades of deforestation, by the late 1990s few trees were found in the upper reaches of the rivers, even in uninhabited regions. The deforestation processes in western China were held responsible "for the increasing magnitude and frequency of floods that destroyed large areas in the middle and lower reaches of China's major rivers, such as the Yangtze and Yellow River" (Zhou 2001b). The second factor was the large lake areas. Lakes with adequate storage capacity were able to temporarily store overland flows in the watersheds. However, in recent decades, many of these flood plains and embankments around lakes were built upon, dammed, or used for agriculture, and gradually disappeared.

Following these extensive droughts and floods, the Chinese government finally instigated programs of reforestation and ecological restoration through six Key Forestry Programs (KFP). Since the extent of the disasters was in part attributed to clear cutting for agriculture on mountainous slopes, the most important programs (in terms of people involved and money invested) of the Chinese government was a nationwide reforestation program among farmers, the Grain for Green (GfG) scheme, also known as Sloping Land Conversion Program (SLCP). This program

converts marginal croplands on steep hillsides and slopes into grassland and forests. The GfG is only one of the six programs, but the largest in terms of forest area, people involved, and expenditure. This book reviews the modes of operation, successes and failures of the program, but we find it useful to briefly introduce here the other five KFPs as well.

The Six Reforestation Programs

The six KFPs cover more than 97 % of China's counties and target 76 million ha of land for afforestation (Wang et al. 2007a). The six KFPs are expected to speed up the process of restoration of the forest ecosystems, which are expected to be restored by 2050. The forest cover is expected to reach and be maintained at over 26 % to improve ecological conditions and restore the landscape (Lei and Zhu 2002). Together, these six KFPs will cost almost Yuan 1 trillion by the time they come to an end. The six forestry programs, at the core of the Chinese government's reforestation and ecological restoration efforts, are:

1. The Grain for Green Program (GfG)
2. The Natural Forest Protection Program
3. The Key Shelterbelt Development Programs in Regions such as the Three North and the Middle and Lower Reaches of the Yangtze River
4. The Sandification Control Program for Areas in the Vicinity of Beijing and Tianjin
5. The Wildlife Conservation and Nature Reserve Development Program
6. The Fast-Growing and High-Yielding Timber Plantation Development Program in Key Regions.

Lei and Zhu (2002) reported of the early successes of the programs, stating in 2002 that the area of plantations nationwide reached 46.66 million ha, which consisted in 26 % of the world's total plantation areas during that year, and made China rank first in the world. Overall, the forest area had risen to 159 million ha, the stocking volume to 11.27 billion cubic metres, and the forest cover increased from 8.6 % in the early 1950s to 16.55 % in 2002.[1]

The Grain for Green Program (GfG)

Slope farming and overgrazing were the most important causes of soil erosion and desertification in western China. Xu et al. (2006a) estimated that of the 34.07 million ha of farmland in the Yangtze and Yellow river basins, 4.25 million ha were

[1] These official figures have to be taken with a pinch of salt. Until 1994 the canopy density had to be over 30 % for a vegetated area to be considered a forest, while from 1994 onwards a canopy density of 20 % was sufficient. Nevertheless, it is undeniable that the forest cover has considerably increased with the six KFPs.

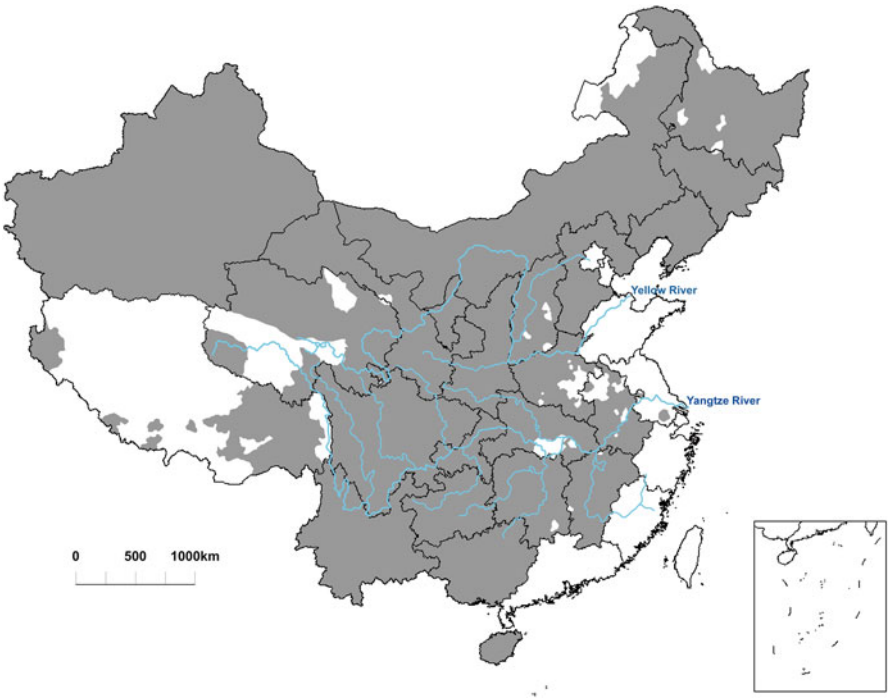

Fig. 2.1 Areas in which the Slope Land Conversion Program was implemented (Source: Delang and Wang 2013)

on slopes of 25° or greater. It was estimated that farming on such slopes could have caused the average erosion index to reach 4,000 tonnes per km^2 per year. However, with proper forest coverage, 80–90 % of the erosion could have been reduced (Yin et al. 2005). The GfG was put in place primarily to reconvert steep slopes that had been cleared for farming to their original vegetation (forest or grassland), thereby reducing siltation in the rivers and alleviating farmers' poverty.

The GfG is the largest reforestation program in the world, involving 124 million people, 32 million households in a total of 1,897 counties and 25 provinces, and the Xinjiang Production and Construction Corps (Fig. 2.1) (Mao et al. 2013). Lei (2002), Deputy Chief Administrator, reported that the program planned to convert 14.66 million ha of cropland to forest, and cover 17.33 million ha of barren land with trees during the period from 2001 to 2010. Between 1999 and 2012, China actually reforested a total of 24.86 million ha through the GfG, of which 9.06 million ha was former farmland and 15.8 million ha was barren hills and wasteland suitable for forests (SFA 2013b). Upon completion of the program, the forest and grass cover of the scheme's target area would be raised by 5 %; 86.66 million ha of soil- and water-eroded area would be brought under control, and 103 million ha of sand-fixation areas would be established.

By the end of 2008, the central government had invested a cumulative total of Yuan 191.8 billion in the GfG. The plans are for further investments of Yuan 240

billion, bringing the total investment to no less than Yuan 431.8 billion by 2016, when the program is set to end (National Development and Reform Commission 2008).[2] The GfG is the reforestation and ecological restoration program with the largest investment, greatest involvement, and broadest degree of public participation in history. The program improves the ecological conditions of much of China, and the socioeconomic circumstances of hundreds of million of people, and offers off-site benefits through positive externalities (e.g. biological diversity and economic diversification) and/or a reduction of negative externalities (e.g. soil erosion or labor shortages).

The Natural Forest Protection Program (NFPP)

The NFPP started in 12 provinces (autonomous regions or municipalities) in 1998, and targets forests under the management of State Linchang and State Forest Enterprises, as opposed to forests controlled by farmers, as the GfG does. According to the fifth national forest inventory (1994–1998), only 112 million ha of natural forests (which corresponds to about 70 % of all forested land) remained in China during these years, and most of these forests were degraded because of various human activities (SFA 2000c). The aims of the NFPP were to halt timber harvesting of natural forests, to protect and regenerate these forests, and to reforest, so as to meet the domestic demand for timber. To achieve the overall goal to protect and restore natural forests, the NFPP developed short, medium, and long-term goals as stepping stones (Liu et al. 2008).

The short-term goals (1998–2000) were to reduce or eliminate timber harvesting from natural forests, and to create alternative employment for those employed by forest enterprises. Commercial logging was to be completely banned in the upper reaches of the Yangtze and Yellow Rivers, as well as in Hainan Province by 2000, and substantially reduced elsewhere (Liu et al. 2008; Xu et al. 2006a). Significant steps were taken toward achieving the NFPP's short-term goals, such as generating alternative jobs for those previously employed by forest enterprises and eventually altering the employment and economic structure in forestry (Liu et al. 2008; Xu et al. 2006a). The dominant source of employment shifted from logging to forest management and plantation-farming (Liu et al. 2008).

The medium-term goals (2001–2010) were to construct and protect forests for ecological benefits and to increase the capacity for timber harvesting from plantation forests (Liu et al. 2008). Three major objectives were expected to be achieved during this period (Xi et al. 2012; Lei 2002):

1. The existing forest resources were to be protected. A logging ban was put in place on the commercial harvest of natural forests in the upper and middle reaches of the Yellow River and the upper reaches of the Yangtze River. The timber output

[2] The program is set to end 16 years after it initially started. It started at different times in different areas, but in most places it is expected to end in 2016–2019.

from natural forests in state-owned forest areas as the north-east and Inner Mongolia was reduced by 19.905 million m^3 (from 32 million m^3 in 1997 to 12 million m^3 by 2003), while 94.2 million ha of natural forest were brought under strict conservation (Lei 2002).

2. Afforest and reforest an additional 30.97 million ha by 2010 by means of mountain closure (prohibiting human activities, such as fuel wood collection and grazing, to allow regrowth), aerial seeding, and artificial planting, so as to facilitate sustainable logging in the future (Xiao et al. 2010; Liu et al. 2008).
3. A total of 741,000 redundant forest workers in the program area were to be redirected and relocated (Lei 2002).

The long-term goals (2011–2050) are to restore natural forests and meet domestic demand for timber in plantation forests.

Ultimately, the program was set to cover 734 counties and 167 forest industry bureaus in key state-owned forest areas in 17 provinces (autonomous regions or municipalities) in the upper reaches of the Yangtze River and the upper and middle reaches of the Yellow River, as well as the north-east and Inner Mongolia (Wu et al. 2007) (Fig. 2.2).

A total of Yuan 96.2 billion (US$11.63 billion) were assigned for NFPP-related activities from 2000 to 2010. The central government was to invest Yuan 78.4 billion (81.5 % of the total), with the remaining Yuan 17.8 billion (22.7 %) were set to come

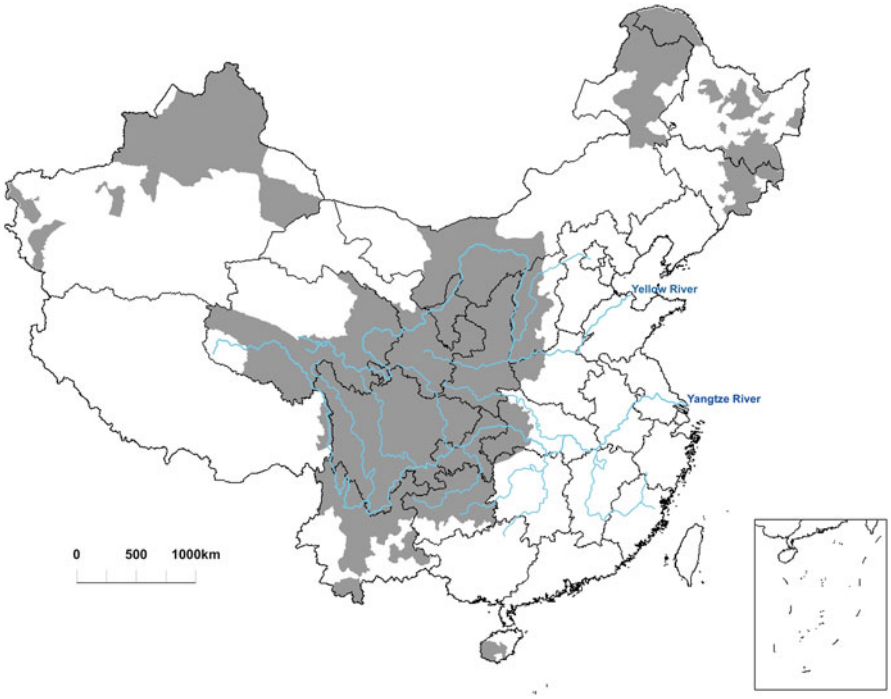

Fig. 2.2 Areas in which the Natural Forest Protection Program was implemented (Source: Delang and Wang 2013)

from the provinces participating in the program (Yin et al. 2005). This investment was mainly used to cover the economic losses of forest enterprises that were caused by the shift from timber harvesting to tree plantations and forest management (Liu et al. 2008), including forest protection, regeneration, management, relocation of forest workers, and other related tasks (SFA 2002). In 2011 was implemented the second phase of the NFPP, which led to additional investment, a greater emphasis on forestry management, and a sharp increase (by 30.04 %) of the social security income of the remaining NFPP workers (SFA 2012b, c). NFPP is the second largest reforestation and ecological restoration program in China, in terms of the total area of implementation, and capital invested. The total amount of land converted by the GfG has exceeded the total amount of land converted by the NFPP since 2002, with the difference increasing over time (Fig. 2.3).

By 2004, 92.66 million ha of forests (60 % of the total forest area in China) were effectively managed and protected; 6.33 million ha of forests were newly established, and net stock volumes increased by 186 million m^3. A complete logging ban was put in place for the commercial harvest of natural forests in 13 provinces and autonomous regions along the upper reaches of the Yangtze River and the upper and middle reaches of the Yellow River. The timber output in such state-owned forest areas as the north-east and Inner Mongolia was reduced by 7.63 million m^3. In addition, 530,000 forest workers were redirected and resettled (Lei 2002; Xi et al. 2012).

The Shelterbelt Development Programs (SDP)

The program targets desertification, mainly in the Three North region and the Yangtze River basin. The SDP is a repackaging of previous reforestation programs. Specifically, it includes the fourth phase of the "Three North" Shelterbelt Program, the second phases of the Yangtze River, Coastal and Zhuhai Shelterbelt Programs as well as the second phase of the Taihang Mountain Afforestation Program and the Plain Afforestation Program (Lei 2002; Lei and Zhu 2002). It is China's largest shelterbelt program in terms of geographic coverage, and includes "Three North" regions, coastal regions, the Pearl River, the Huai River, the Taihang Mountain, the Dongting Lake, the Poyang Lake, and the middle and lower reaches of the Yangzte River (Zhou 2001a).

The "Three North" Shelterbelt is the largest and most distinctive artificial ecological engineering project in China. The objective of the "Three North" Shelterbelt program is to "control sand and wind erosion, harness soil and water losses, improve ecological environments and produce multiple forest products" (Li et al. 2012: 71). The name "Three North" derives from the location the project is carried out. The region includes the semi-arid and arid lands in the north-east, the north and north-west of China, where desertification and erosion of soil and water constitute serious problems (Li et al. 2012; Zhu and Cheng 1994). The range of the program is enormous: 4,480 km from east to west and 560–1,460 km from south to north (Li et al. 2012). The region involves 551 counties in 13 provinces (autonomous regions or

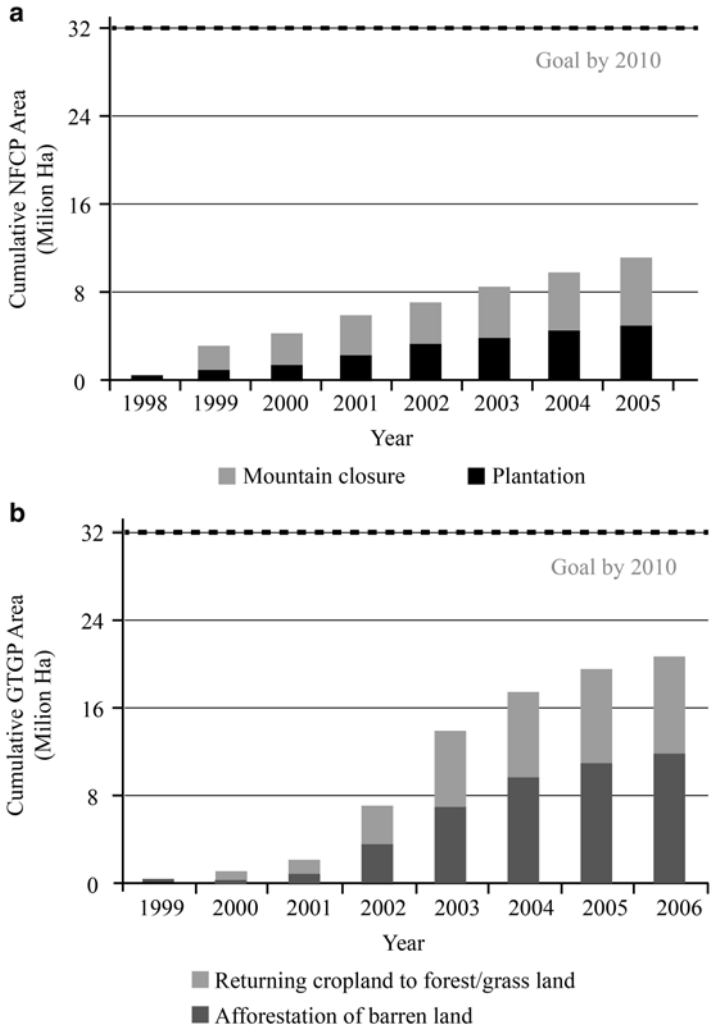

Fig. 2.3 Cumulative amount of land under the NFPP (**a**) and GFG (**b**). The *dashed line* shows targets that had been set for 2010 (Source: Liu et al. 2008)

municipalities): Heilongjiang, Jilin, Liaoning, Hebei, Shanxi, Shaanxi, Gansu and Qinghai, Tianjin City, Beijing City, the Inner Mongolia, Ningxia and Xinjiang autonomous regions. The area is about 4.06 million km^2 large, and makes up 42.39 % of the total territory of the country (Li et al. 2012).

The "Three North" Shelterbelt project started in 1978 and is expected to last until 2050 (Lei 2002). The Three North scheme is meant to control desertification through a variety of measures. First, by stopping the advance of the desert. As such, about 1,060 km^2 of desert per year are transformed from mobile dunes to semi-fixed or fixed dunes (Zha and Gao 1997, in Li et al. 2012). Second, through afforestation.

Table 2.1 Socio-economic transformation in the "Three North" regions in 1977 and 2007

Year	Forest volume (million m^3)	Area of economic forest (million ha)	Production of fresh and dry fruits (million tonnes)	Tourist number (million persons)	Number of employment positions
1977	720	1.8	7.2	2.3	110,000
2007	1,390	5.8	36	90	700,000

Source: Li et al. (2012)

Table 2.2 Agricultural transformation in the "Three North" regions in 1977 and 2007

Year	Area of protected cropland (ha)	Production of crop (kg/ha)	Total production of crop (million tonnes)	Area of pasture in sandy land (million ha)
1977	505.0	1,770	60	4.3
2007	2,248.6	4,665	153	19.64

Source: Li et al. (2012)

Lei and Zhu (2002) reported that 94,600 km^2 of land were planned to be afforested, and 13,000 km^2 of desertified land brought under control from 2001 to 2010. Indeed, the forest cover increased from 5.05 % in 1978 to 10.51 % in 2008 (Table 2.1) (Li et al. 2012). By 2050, 305,800 km^2 are planned to be afforested.[3] Third, through the protection of cropland, and increase in crop production and pasture areas. Between 1977 and 2007, the area of protected cropland has increased by 445 %, the productivity of the land has increased by 264 %, the total agricultural output has increased by 255 %, and the area suitable for pasture has increased by 457 % (Table 2.2).

Soil erosion modulus at present is significantly lower than that in 1977, at less than 1,000 tonnes per ha per year in some well-planted areas. Similarly, the amount of sand entering into the Yellow River has been reduced by about 300 million tonnes according to one estimate (Li et al. 2012). Amelioration of the environment has also had further economic benefits. For example, it has stimulated the development of tourism, which provides employment opportunities for the local population (Table 2.1) (Li et al. 2012).

The shelterbelt development project in the middle and lower reaches of the Yangtze River involves relevant areas in 31 provinces (autonomous regions and municipalities). It was expected that 180,000 km^2 of land would be afforested, 73,300 km^2 of low-efficiency shelterbelt improved, and 373,300 km^2 of existing forests properly managed and protected during the period from 2001 to 2010 (Lei and Zhu 2002). The coastal shelterbelt project involves 195 counties in 11 provinces. The planned afforestation area is 35,600 km^2. The regional forest cover was raised from 21.7 % in 1987 to 29.1 % after 15 years of implementation (Li 2004b;

[3] When considering these changes, one should bear in mind that until 1994, the canopy density had to be over 30 % for a vegetated area to be considered a forest, while from 1994 onwards a canopy density of 20 % was sufficient.

Wenhua 2004). Finally, the Taihang Mountains afforestation project involves 110 counties in Beijing, Hebei, Henan and Shanxi Provinces. Through this project, 35,600 km^2 of forests are planned to be planted by 2050 (Li 2004b).

The Desertification Control Program (DC)

The Desertification Control Program targets sandstorms in areas surrounding Beijing. The program covers 75 counties, with a total area of 460,000 km^2, in five provinces (autonomous regions or municipalities), including Beijing, Tianjin, Hebei, Shanxi and Inner Mongolia (Lei 2002). Lei and Zhu (2002) reported that during the period from 2001 to 2010, it was expected that 26,300 km^2 of cropland would be converted to forest, 49,400 km^2 of plantations would be established, 106,300 km^2 of grassland would be harnessed, 113,800 supporting water conservation facilities would be developed, 23,000 km^2 of catchment would be managed and 180,000 people would be relocated for ecological reasons. Zhou (2001a, b) reported that upon completion of the program the ecosystem in the areas in the vicinity of Beijing and Tianjin would be remarkably improved, with the forest cover expected to reach 21.4 % by 2010, an increase of 14.7 % (Lei 2002).

The Wildlife Conservation and Nature Reserve Development Program (WCNR)

The Wildlife Conservation and Nature Reserve Development Program targeted such issues as species, nature and wetland protection. Priorities, between 2001 and 2010, were given to the following (Xi et al. 2012):

1. Setting up 15 wild fauna and flora protection projects (including the Giant Panda, Golden Monkey, Tibetan Antelope and plants in the orchid family) (Stanturf et al. 2012)
2. Establishing 200 nature reserve projects in the types of forest, desertified land and wetland ecosystem, 32 wetland conservation and wise use demonstration projects and 50,000 nature reserve districts (Lei 2002);
3. Completing the germplasm pools for conservation of wild fauna and flora, the national research system of wild fauna and flora and relevant monitoring networks (Lei 2002; Sun and Liqiao 2006).

Between 2001 and 2006, 831 natural reserves were created, and 19.5 million ha of forestland and special sites were protected under this program. By 2010, the number of nature reserves was set to reach 1,800, which was to include 220 nature reserves at national level, with the total area of nature reserves taking up 16.14 % of the country's land area (Lei 2002).

The Fast-Growing and High-Yielding Timber Plantation Program (FHTP)

The Fast-Growing and High-Yielding Timber Plantation Program aims to resolve the supply of timber, while at the same time mitigating the pressure of timber demand on forest resources. The program covers 114 forestry bureaus (or farms) and 886 counties in 18 provinces and autonomous regions, located to the east of the isohyet of 400 mm in China (Lei 2002). Between 2001 and 2015, it plans to establish 13.33 million ha of fast-growing and high-yielding plantations. Upon completion, the program would provide 130 million m^3 of timber annually, accounting for 40 % of China's commercial timber consumption, thus helping to create a balance between timber supply and demand (Zhou 2001b).

Why the Key Forestry Programs?

While the six KFPs were spurred by the drought and flooding of 1997 and 1998, it is also important to recognize that other factors may have contributed to the Chinese government starting these programs at that time. The economic development experienced in previous years had increased the costs of flooding, justifying the investment of such large amounts of money in forest conservation and reforestation. However, at the same time, it also made it possible for the Chinese government to invest such large amounts of money. Thus, while the drought and flooding spurred the urgency of investing very large amounts of money in addressing the deforestation that had taken place during the past decades, other factors also prompted the government to carry out these reforms, and allowed it to start these programs at that particular time.

First, the Chinese government wanted to become more influential in the global arena, entrenching China's status as a superpower, not only economically but also socially and environmentally, to improve its image, increase its influence, and prove that it was a good, responsible member of the world community. For example, China subscribed to the nuclear Non-Proliferation Treaty (1992) and a number of international environmental treaties, such as the Convention on Biological Diversity (1992), the Ramsar Convention (1992), the United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (1997), the Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES 1981), the International Tropical Timber Agreement (1986), and The Convention on the Protection of New Plant Varieties (1999), all implemented by the Forestry Department (Lu 2011; Chen and Shou 2001; Zhang 1998).

Second, the need for reforms in rural western China had become more urgent. By the late 1990s, inequality between urban and rural households, in particular between the more industrialised east and the more agricultural west, had increased,

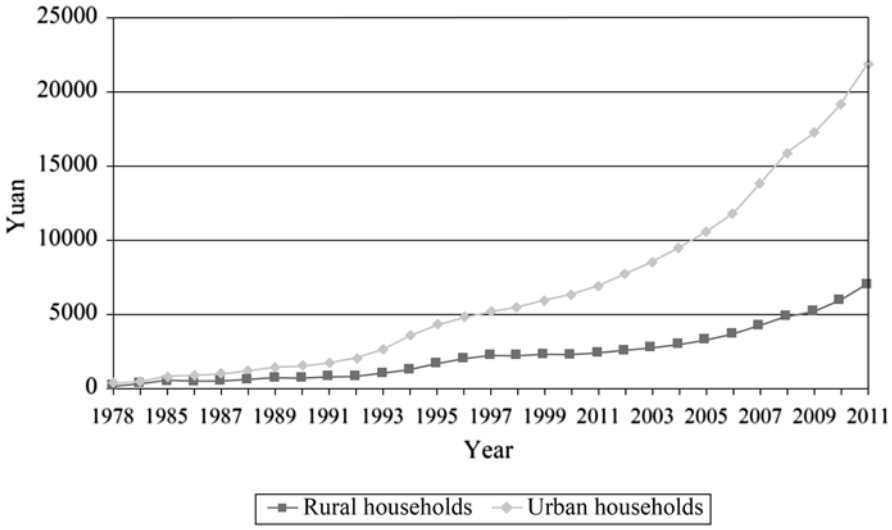

Fig. 2.4 Annual per capita income of urban and rural household, 1978–2011 (Source: National Bureau of Statistics of China 1996–2012)

generating growing anger among the rural population that had not been able to benefit from the economic growth (Fig. 2.4). Since the majority (63.91 % in 2001, NBS 2004: 174) of the Chinese population were rural dwellers, the increasing inequality was of concern to the leaders, as those rural dwellers could generate political instability, which would imperil economic growth. In 2001, the government identified and set out to address "Three rural issues concerning agriculture, countryside, and farmers"[4]: farmers' incomes were very low while their burden was high; production was low and shrinking; rural areas lacked public services (Chen 2010; Wang 2008). These problems were to be addressed by the GfG (Zhao 2010; Zhang 2010), but also to a lesser extent by the NFPP. For example, by limiting the amount of timber logged in nationally-owned forests, the NFPP also benefited timber-producing households (Delang and Wang 2013).

Third, these reforms were made possible by the increasing wealth of the Chinese government. The Chinese economy developed enormously during previous decades, and all expectations were for the economy to continue growing (which it did, especially after China joined the WTO in 2001). The Chinese government had large revenues, which it could invest in the development of the country. Before the 1990s, the government extracted money from rural areas to help the industrial sector develop, first by taxing agricultural and forestry products and diverting the funds to the industrial sector (Wang and Delang 2011), and second by lowering the price of agricultural and forestry products, which allowed industrial workers to subsist on lower salaries and provided cheap inputs for industries (Wang and Delang 2011).

[4] 三农"问题

By the end of the 1990s, the industrial sector had grown sufficiently and no longer needed funds extracted from the agricultural and forestry sectors. Also, in some cases, the industrial sector moved upmarket and no longer needed cheap agricultural and forest products, while the salaries of the workers were increasing and they could afford to pay more for their food. Whereas in the 1950s 39 % of government revenue had come from the agricultural tax, by 2004 only 1 % did (Li 2009a). The government could afford to lower the taxation level of the farmers and allocate more funds to the farming sector (Chen 2010: 4).[5] Thus, whereas prior to the 1990s the government had taxed rural areas to help industrialise the country, towards the end of the twentieth century the country had sufficiently industrialised for the government to use some of the taxes levied in industrial areas to develop rural areas. As O'Connor (2000) concluded, the great shift toward sustainable development in China has been from taking money from the agricultural sector to giving money to the agricultural sector.

Fourth, in the late 1990s, a crisis of grain supply exceeding demand developed in China. In 1995 and 1996, grain production increased substantially, and beginning in autumn 1996, there was a fall in market prices. Abundant harvests continued in 1997 and 1998 (Tan and Chen 1999). Peasants suffered because of low prices, and China suffered because it had to provide peasants with price subsidies. Through the GfG, less productive – and prone to erosion – marginal farmland was set aside, thereby also reducing the surplus of rice produced (Delang and Wang 2013). This will be further discussed in Chap. 3.

Fifth, the considerable economic development of the country also made it possible – and more profitable – for China to shift from producing timber to importing it. Until the 1970s, China imported little timber because of political constraints (the Cultural Revolution and the Great Leap Forward) (Wang and Delang 2011). From the 1970s to 1997, it imported little timber because timber produced in China was cheaper – mainly because the price was depressed by the government (Delang and Wang 2012). In the late 1990s, it became obvious that logging generated externalities which sharply increased the cost of timber, and it made economic sense to protect the national forests and import timber from other countries. China shifted from logging its own forests to import raw wood logged abroad (Fig. 2.5).

New Forestry Paradigms in China

The execution of these Key Forestry Programs has been a landmark in China, helping the sector to enter into a new era of renewal. Over this period, emphasis has been given to ecological, social, and economical benefits. This development is expected to propel five historic transformations.

[5] In 2000, the government started the financial reforms for agricultural products (which covered the whole national territory only in 2006). Through this reform, taxes on agricultural products, including trees and timber, were abolished. Since 2007, farmers in China no longer have to pay taxes or fees for agricultural or non-timber forest products, though they still pay limited fees for timber.

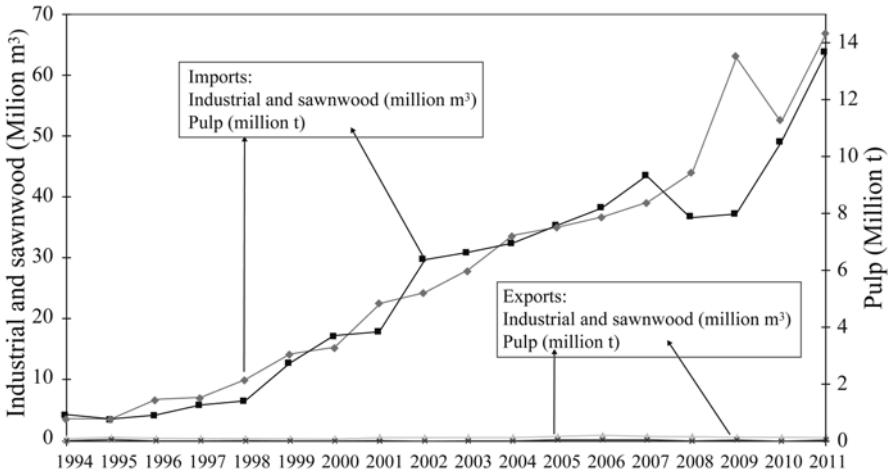

Fig. 2.5 Imports and exports of industrial and sawn wood (1994–2011) (Source: Delang and Wang 2013)

First, the transition from considering forestry a sector of the economy that contributes to the nation's GDP, to paying more attention to the environmental benefits it provides, and its role in the sustainable development of the country.

Second, a shift from ignoring the contribution that the ecological functions of forests make to the national economy, to fully accounting for these functions. In 2001, the MOF and the Ministry of Finance agreed to establish pilot projects in 660 counties within 11 provinces and 24 nature reserves, which represented a total area of more than 13.33 million ha. The implementation of this pilot scheme helped setting in motion a new stage in which the economic value of the ecological functions of forests would be properly incorporate into economic planning.

Third, a transition from transforming forests into farmland to transforming farmland into forests.

Fourth, shifting from the previous emphasis on felling natural forests to gradually harvesting plantations. In the past, natural forests were the most important timber production areas in China. With the implementation of six KFPs, natural forests have become strictly protected. At the same time, the timber output of natural forests has been greatly reduced and the proportion of timber output of plantations been increased (Lei 2002). However, for the time being, the drop in logged forests is compensated with increased imports, which means that China has replaced logging its own forests with logging other countries' forests. Figure 2.5 shows how the imports of industrial timber and pulp have expanded more than 15 fold, while exports have remained marginal. Nevertheless, timber production will gradually shift from natural forests to plantations, and eventually all timber is expected to come from plantations.

Sixth, moving from land managed by the forestry industry for the production of timber, to forestry managed by different sectors, with input by several industries, for the benefit of the whole of China.

Table 2.3 Comparison of six key forestry programs

Program	Planned investment (billion Yuan)	Forestation area (10,000 ha)	Provinces covered (1,000 km^2)	Duration (years)
GfG	361.8	3,328	9,560	20
WCNR	135.7	4,980	9,570	50
NFPP	101.8	10,768	7,700	13
FHTP	71.8	1,333	4,210	17
SDP	94.6	6,870	9,570	73
DC	58.4	2,104	1,530	11

Sources: Li and Zhai (2002)
Note: The data reflect the actual completion for completed projects and planned target for uncompleted projects.

Together, the six KFPs cover over 97 % of all counties in China, with 76 million ha of plantations planned to be established. This makes the programs unprecedented in history due to their wide range, large scale and great investments (Table 2.3).

Between 1998 and 2003, five of the six programs were financed mainly by the state, which covered 83.5 % of the total investment. The only exception was the market-oriented FHTP, which was financed primarily by farmers, forest enterprises and foreign capital. The state covered only 6.6 % of the total investment in that program over this 5-year period. On the other hand, the NFPP is financed by the state, and directly implemented by either state-owned forest enterprises or local forest authorities, in a rather top-down fashion. Finally, while the GfG is financed predominantly by the state, it uses a public payment scheme that directly engages millions of rural households as core agents of project implementation (Bennett 2008). Thus, in terms of decentralization and grassroots participation, the GfG is a novel program, representing an important departure from the way China has been managing its forest resources (Bennett 2008). We can also conclude that although the six KFPs have been introduced during the same period, they adopted different organisation and financial arrangement, suited to the conditions and recipients among which they were implemented.

Liu et al. (2010) address the impact of six KFPs on-farmers' income and poverty status, using a fixed-effects model and a panel dataset of 1,968 households across four provinces for ten consecutive years, between 1995 and 2004. The findings suggested that the impact of the six KFPs were mixed. The GfG, the KSD, and the NFPP had a positive impact, with the GfG having by far the greatest impact. However, the WCNR and the DC had not yet had a pronounced overall effect owing to the short time span they had been implemented, even though they may have exerted certain influence at the margin. Notably, the impact of the WCNR, if any, was negative. On the other hand, from an environmental point of view, the implementation of the NFPP has effectively protected the state natural forest resource, while the large-scale GfG has become the major driving force of the recent growth in forest resources.

The scale of GfG makes the program one of the world's largest conservation projects. Statistics of the MOF suggest that forest cover within the GfG region increased by 2 % over 8 years (Liu et al. 2008). However, the GfG is much more

than a forest conservation project. It also has important socio-economic implications, and it has generated more positive socio-economic impacts than the NFPP, or any of the other forestry programs. Unlike the NFPP for example, which has cut off income from timber harvesting for many forest workers, the GfG has helped alleviate poverty through the direct subsidies it gives to farmers willing to set aside their land (see Part III). The GfG has directly benefited 120 million-farmers in more than 30 million households nationwide, whereas the NFPP has directly affected only hundreds of state-owned forest enterprises and only indirectly impacted a larger number of households (Liu et al. 2008).

The NFPP and GfG also have important global implications, although they were initially developed to address pressing environmental problems in China. As Liu and Diamond (2005) write, "China's achievements of developed-world consumption standards would approximately double the world's human resource use and environmental impact. But it is doubtful whether even the current human resource use and impact on the world could be sustained. […] China's environmental problems are therefore the world's" (Liu and Diamond 2005: 1181). Further, Liu et al. (2008) pointed out that "if implemented adequately and sustainably, these two programs could generate many benefits to China and the rest of the world by addressing a wide array of environmental issues (e.g. biodiversity loss, climate change, desertification, droughts, floods, soil erosion, and water runoff) as well as socioeconomic challenges (e.g. poverty alleviation, social conflicts, and economic development)".

Conclusions

The successive occurrences of ecological disasters in the late 1990s indicated that while there had been scattered, local-level successes in protecting forest ecosystems, they were overwhelmed by the worsening of the overall situation. This means that more decisive and forceful measures were needed to halt the environmental problems (Yin et al. 2005). This chapter has given an introduction to the key forest policies introduced in China in the late 1990s. Through the forestry reforms of 1998 and the six KFPs, China put in place the framework to transform the ways in which forests are managed, expoited, and protected. The aims of these programs have been lofty and well-intentioned, with some of the programs overshadowing all other reforestation and ecological restoration programs worldwide. To a large extent, the programs have been successful at reversing the deforestation, soil erosion, and desertification that had occurred during the previous decades, even though some programs have been more successful than others. In particular among farmers, the GfG is often considered to be the best reforestation program that the government has ever undertaken, largely because its objectives are not only to reforest and restore the ecological integrity of the areas, but also to alleviate poverty, and since payments are made directly to farmers who set aside their land, this latter objective is usually fulfilled.

http://www.springer.com/978-3-319-11504-7

China's Grain for Green Program
A Review of the Largest Ecological Restoration and Rural Development Program in the World
Delang, C.O.; Yuan, Z.
2015, XX, 230 p. 40 illus., 7 illus. in color., Hardcover
ISBN: 978-3-319-11504-7