

4 Concurrent green initiatives in China

China is the most populous country, with its territory area the third largest in the world. Its economic boom over the past four decades has led to its gross domestic product (GDP) reaching US\$17.7 trillion in 2021, making China's economy the second largest on the earth (China Briefing, 2022). On the other hand, China's environmental problems are among the most severe of any major countries and will likely worsen. The Chinese people, including the top leaders, are aware of these challenges and have spent a large amount of efforts and time handling such problems. The positive consequences are observable—for instance, the air quality in Beijing and other major cities—has become better. However, such efforts are not great enough to counter the forces that are driving environmental degradation and destruction in the country. The evidence comes from the deterioration of many essential indicators, which include—but are not limited to—biodiversity losses, depleted fisheries, grassland degradation, cropland losses, rapid desertification, disappearing wetlands, increasing frequency and magnitude of human-induced natural disasters, soil erosion, interrupted river flow, salinization, and water pollution and shortages (Liu & Diamond, 2005; Xu et al., 2019a, b).

China launched its Grain-to-Green Program (GTGP) in 1999–2001 and the Forest Ecological Benefit Compensation (FEBC) Fund in 2001. Since 2004, these two programs have been implemented simultaneously in 20 provinces, autonomous regions, and municipalities. GTGP-eligible land parcels are farmland on steep slopes, whereas FEBC parcels are natural forestlands, thus spatially disconnected from GTGP parcels. In many regions, parcels of both types of land are contracted to the same households (Yost et al., 2020), making them horizontally stacked payments.

4.1 Grain-to-Green Program (GTGP)

The Chinese central government proposed the Grain-to-Green Program (Phase I) in 1999 in some parts of China. In the upper reach of the Yangtze River Basin and the upper and middle reaches of the Yellow River Basin, the government paid farmers 2,250 and 1,500 kg of grain (around 3,150 and 2,100 yuan, respectively,

at a price of 1.4 yuan per kg of grain) per year for each hectare of converted cropland. Farmers may then receive additional funding, including 300 yuan/ha per year for miscellaneous expenses and a one-time payment of 750 yuan/ha for seeds or seedlings. Because the targeted croplands are primarily on steep slopes, GTGP is also known as the Sloping Land Conversion Program (SLCP) in literature. China's National Forestry and Grassland Administration refers to this program as the Conversion of Cropland to Forest Program, which covers all croplands enrolled in the program. The duration of subsidies varies depending on cropland conversion: two years if converted to grassland, five years if converted to economic forests by using fruit trees, or eight years if converted to ecological forests by using tree species such as Chinese pine (*Pinus tabulaeformis*) and black locust (*Robinia pseudoacacia*). Furthermore, no taxes on the converted cropland were collected.

With the eight-year extension of the GTGP in 2007 (Phase II), the compensation was reduced by nearly half: 2025 yuan/ha per year in south China and 1,425 yuan/ha per year in north China with no grain subsidy available. The actual amount of compensation varied from province to province. For example, Guizhou province's compensation was cash, and grain subsidies were replaced by money at equivalent market value. The total compensation was 3,585 yuan/ha for the first eight years (Phase I) and 2,010 yuan/ha for the eight-year extension (Phase II). The amount of compensation received by farmers at different places may vary because local village leaders might divert varying proportions of the money to other purposes.

GTGP has produced enormous ecological and socioeconomic benefits at local, regional, national, and global scales (Liu et al., 2008; Zhang et al., 2010). In rural areas, poor households need financial support, even small in amount, to afford the costs (e.g., transportation) associated with migration. This support explains the positive relationship between household income and migration propensity. However, when household income goes above a certain level, the link to migration may become weak and even reverse: the higher the income, the less likely the relevant household may migrate out. Observed in many parts of the world, the "inverted U-shape relationship" describes how income relates to the propensity for migration (Dao et al., 2018; Zhao, 2003).

4.2 Forest Ecological Benefit Compensation (FEBC)

The Chinese central government launched the experimental phase of its Forest Ecological Benefit Compensation (FEBC) program in 2001 in 11 provinces, autonomous regions, and municipalities, covering around 200 million ha (Deng et al., 2011; Ouyang et al., 2013). The FEBC program started formally in 2004, according to the Forestry Law of the People's Republic of China and the Decision to Promote Forestry Development by the Central Committee of the Chinese Communist Party and State Council. The program aims to establish, nurture, protect, and manage ecological welfare forests (EWF; Dai et al. 2009), i.e., forestland with vulnerable yet essential ecological benefits (Dai et al., 2009; Ministry

of Finance & State Administration of Forestry, 2007). The FEBC program, the Natural Forest Conservation Program (NFCP), Grain-to-Green Program (GTGP), and Ecological Transfer Payment (ETP) are significant components of China's forest eco-compensation mechanism (Ouyang et al., 2013).

Two components comprise the FEBC program: the national ecological welfare forest (EWF) fund from the central government and the local ecological welfare forest fund from the local governments (Deng et al., 2011). By definition, the national EWF fund covers important nationwide forestlands approved by the former State Forestry Administration, while the local EWF fund covers regionally important forestlands identified and approved by provincial or same-level governments. By the end of 2006, 25 provinces, autonomous regions, or municipalities had set up various local EWF funds (Deng et al., 2011). However, this article only considers national EWF land as “few provincial governments have committed subsidies to protect local EWF lands” (Dai et al., 2009). By the end of 2006, FEBC had protected a total of 104 million ha (1,560 million mu) of the national EWF forestland. However, according to Ouyang et al. (2013), the above area was 70 million ha, accounting for an accumulative investment of over 20 billion yuan by 2013.

The initial compensation was 5 yuan/mu (75 yuan/ha) for national EWF forestland, 4.75 yuan/mu used for protection and management by the corresponding forestry entrepreneur, community, or individuals, and 0.25 yuan/mu for governmental expenses, fire protection and road maintenance. Starting from 2010, the Chinese central government increased the compensation standard with a differential compensation policy: For national EWF forestland owned (note: partial ownership; essentially all land is owned by the central government) by collective organizations or individuals, the compensation was 9.75 yuan/mu and 0.25 yuan/mu for governmental expenses, fire protection, and road maintenance (Ministry of Finance & State Administration of Forestry, 2010).

4.3 Comparison between GTGP and FEBC programs

Below we compare China's Grain-to-Green Program (GTGP) and Forest Ecological Benefit Compensation (FEBC) programs (Table 4.1). Aside from the differences identified in the table, FEBC participation is more heavily prescribed than GTGP participation (Yost et al., 2020). Given that both GTGP and FEBC consider the protection of soil erosion as a paramount goal and share similar land eligibility standards (Dai et al., 2009), they occur concurrently in most places in China, which is evidenced by our Fanjingshan (Chapter 5) and Tianma cases (Chapter 6).

4.4 Area-based conservation experiment

If there is no spillover effect, Figure 4.1A shows the green initiatives in three types of areas: GTGP-eligible only areas, GTGP and FEBC simultaneously

Table 4.1 Comparison of China's GTGP and FEBC programs

<i>Program</i>	<i>GTGP</i>	<i>FEBC (for national ecological welfare forest or EWF)</i>
Program goal	Restore vegetation and reduce ground runoff and soil erosion	Protect existing forests and seek ecological security by reducing water runoff and erosion
Qualification	Cropland with slope $\geq 15^\circ$ in northwestern China and $\geq 25^\circ$ elsewhere	Slope $\geq 16^\circ$ in Northeast China and $\geq 26^\circ$ in South-central and other areas of China; also consider vegetation and precipitation (Dai et al., 2009)
Start year	1999 (variable by location)	2001 (variable by location)
Compensation (yuan/mu/year)	239 ^a	14.75 ^b
Obligations	Convert cropland to forestland or grassland	Prohibit forest fire, illegal logging, and poaching
Average cropland enrolled per household ^c (mu)	3.89	57.25

Notes: The table is modified from table 1 of Yost et al. (2020).

^a This payment rate dropped to 134 yuan/mu for Phase II of the program from 2007 to 2015. It is also subject to change depending on year and place.

^b This rate applies to forestland contracted to individual households. A different rate (5 yuan/mu) applies to state-owned forestland. It is also subject to change depending on year and place.

^c These numbers are from 200 households (out of our sample of 605) that enrolled land in both GTGP and FEBC at Fanjingshan National Nature Reserve based on a survey conducted in 2014 (Yost et al., 2020).

eligible areas, and FEBC eligible only areas. Due to the spillover effects, an extra amount of GTGP enrollment in GTGP and FEBC simultaneously eligible areas may come out, as discussed earlier, the oval in Figure 4.1B.

These findings may be good news: if other conditions are met, we should invest more green efforts in the middle area. Our data show that some local households may be free riders: they enroll more land in GTGP for more money but fail to fulfill their obligations. So we suggest policymakers change the enrollment rules such that the FEBC efforts can be reallocated to FEBC-only areas, i.e., the dotted FEBC effort in Figure 4.1C. As a result, the extra GTGP enrollment is gone, avoiding payments with zero or little ecological benefits. The other benefit is through a reshuffle of green efforts, we can allow a 3% budget cut for the whole country but still keep the total area of GTGP and FEBC unchanged. These considerations may be vital during times of crisis, such as COVID-19.

Next, we performed a green initiatives-reallocation experiment as we did for EQIP and CRP in Chapter 3: in a standard year (i.e., with relative stable GTGP

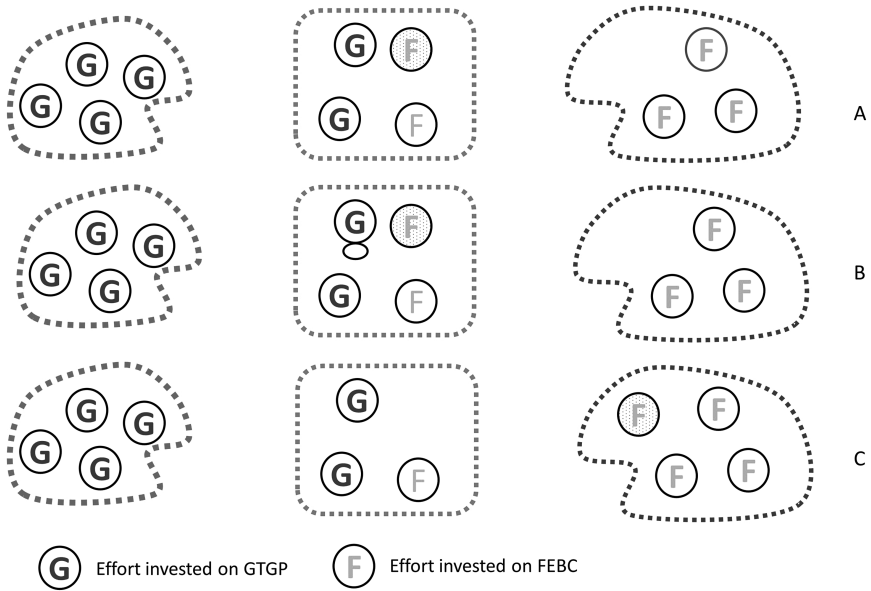


Figure 4.1 Initiative efforts invested in GTGP and FEBC under three conditions: (A) there are no spillover effects, (B) there is a spillover effect, and (C) the spillover generating FEBC effort is relocated to FEBC-only areas. The left, middle, and right dotted areas represent GTGP-eligible only areas, GTGP and FEBC simultaneously eligible areas, and FEBC eligible only areas.

enrollment), there is 5.51 million ha of GTGP land, which can decompose to 0.47 (due to FEBC) and 5.04 (original GTGP by its own) million ha (Section 5.4). For this 0.47 million ha GTGP land that comes as a consequence of nearby FEBC land, we can “reallocate” its 25%, 50%, 75%, and 100% back to FEBC. As a result, the total area of GTGP and FEBC does not change (i.e., it keeps at 5.51 million ha), but the total payment decreases with an increasing amount in FEBC. The much lower pay rate of FEBC may account for this decline in total combined payments of GTGP and FEBC. The results show that we can allow a budget cut of 0.79–3.17% without affecting the total amount of land devoted to GTGP and FEBC (Table 4.2).

Table 4.2 Payments saved due to policy redesign between GTGP and FEBC

	Pre-pandemic		During or post-pandemic				75% relocation		100% relocation	
	Baseline ^a		25% relocation ^b		50% relocation		75% relocation		100% relocation	
	Area	Pay	Area	Pay	Area	Pay	Area	Pay	Area	Pay
GTGP ^c	5.51	1,683.14	5.39	1,647.25	5.28	1,611.35	5.16	1,575.46	5.04	1,539.57
FEBC ^c	70	2,353.72	70.12	2,357.67	70.24	2,361.62	70.35	2,365.57	70.47	2,369.53
Total	75.51	4,036.86	75.51	4,004.92	75.51	3,972.98	75.51	3,941.04	75.51	3,909.09
Change	0	/	0	-31.94	0.00	-63.88	0.00	-95.83	0.00	-127.77
Change %	0	/	0	-0.79	0.00	-1.58	0.00	-2.37	0.00	-3.17

Notes:

^a We use the FEBC data in 2013 and GTGP data in 2006 (area: million ha; pay: million \$) due to data availability.

^b FEBC has generated 0.47 million ha of GTGP land.

^c The average pay rate for GTGP and FEBC is 134 Yuan/mu (305.47 \$/ha) and 14.75 Yuan/Mu (33.6246 \$/ha), respectively.

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