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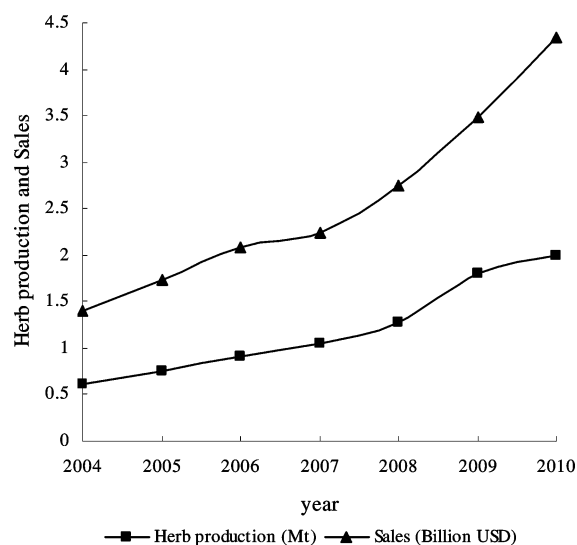
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Because the typical herbs that are used as a source of traditional Chinese medicines are an important substitute for more costly synthetic drugs, they are an important natural resource. Unfortunately, they are mainly distributed in fragile landscapes where it is difficult to harvest the herbs sustainably. Therefore, concealed by the prosperity of the Chinese medicinal herb industry is a huge social and ecological problem that has resulted from the industry's rapid expansion (Figure 1).



**Figure 1.** Increase in the production and sales of Chinese medicinal herbs from 2004 to 2010.<sup>1,4</sup>

For example, gathering of 1 kg of a certain cyanobacterium can lead to the deterioration of 6 ha, on average.<sup>1</sup> As a result, the direct and indirect environmental impacts caused by unsustainable exploitation of the wild herb resource continue to worsen, and the associated biodiversity loss continues to expand.

Many internal and external factors are responsible for this situation. It is certainly true that a huge and growing demand has driven the development of the Chinese medicinal herb

industry, and that a lack of sufficient supplies has raised the price of this rare resource, making its harvest an increasingly attractive option to impoverished Chinese citizens. For instance, the price of the mushroom *Cordyceps sinensis*, which has been shown to have anticancer properties, recently reached RMB 750 (about U.S. \$118) per gram in 2010, almost two times the price of gold at that time.<sup>2</sup> Unfortunately, a lack of defined property rights related to wild Chinese herbs has led to their treatment as a common resource, and with no one person or group responsible for its preservation, there has been no force to restrict its exploitation to sustainable levels. Although it is possible to foresee successful protection of these resources if China's government is willing to invest the necessary funds and staff, the cost of biodiversity protection is often borne by local peoples, with little or no compensation when the government eliminates their ability to benefit from a newly protected resource. This problem is exacerbated by the huge economic benefits provided by this resource, which gives local residents a stronger incentive to exploit the resource than protect it. This attitude is encouraged by the perceived importance of economic growth to local and national governments, which has led many regional governments to encourage exploitation rather than restraining it.<sup>3</sup>

To solve these problems, China's government attempted to develop the Chinese herb industry through the establishment of artificial plantations. By 2008, the government had invested 2.5 billion RMB (395 million U.S. \$) to establish 17 areas for the cultivation of Chinese herbs.<sup>4</sup> Unfortunately, the cultivated herbs cannot entirely replace the wild herbs because their variety is limited (the plantations are often monocultures) and there are large perceived differences in the quality between the wild and farmed herbs. Because of agricultural subsidies, more and more farmers have chosen to cultivate the government's preferred crops instead of Chinese medicinal herbs. The resulting decrease in cultivation of Chinese herbs has decreased their availability, leading to rapid increases in the price of herbs.

By failing to provide subsidies for the cultivation of these herbs, the government ensured that it was more expensive to cultivate the herbs than to obtain them from herbalists, which seriously undermined the incentives for growers (especially individual growers) to continue their cultivation. The resulting combination of scarcity and high prices has induced more people to gather wild Chinese herbs, even when doing so was illegal; the resulting depletion of this natural resource increased

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its price, leading to more intensive exploitation and greater depletion of the resource, thereby increasing the rarity of the herbs and creating a vicious circle. A similar problem has resulted in illegal hunting of wild animals that play an important part in Chinese traditional medicine, thereby directly and indirectly accelerating the extinction of animals such as the Chinese tiger.

Biodiversity loss due to excessive exploitation of herbs, and the associated environmental degradation, has seriously imperiled whole ecosystems, especially those in fragile ecological environments and especially against the current background of climate change and expanding urbanization. To truly begin solving these problems, the local residents of areas in need of protection must be given an incentive to become the “guardians of nature” instead of its destroyers; that is, they must be given an economic incentive that gives them more reason to protect nature than to manage it. At the same time, the government must define their responsibilities clearly to ensure that they understand the need for protection of the resource and must provide the technical support required to give them the skills and the knowledge they need to perform their new duties. This approach can also avoid the inefficiency of central government supervisory systems, while providing a solution to the conflicts between socioeconomic policies and the large investments in environmental programs that have been undermined by failing to consider the environmental consequences of the socioeconomic policies. These conflicts have led to inappropriate actions that have compromised the ability to achieve environmental restoration goals.<sup>3</sup> An example of this is farmers who received government subsidies (money and food) to convert farms in degraded and unsuitable land into grassland and forest under China’s Grain for Green program. Cao et al.<sup>5</sup> found that once the subsidies end, many (percentage) of the farmers will be forced to return to their former unsustainable actions by the need to grow food to survive. In addition, the guidelines for cultivation of Chinese herbs and the establishment of nature reserves would need to be properly adjusted in accordance with the current production status and market demand to provide guidance for appropriate management.

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