

## Soil Security Is Alarming in China's Main Grain Producing Areas

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Food production and security is an important thing for China. However, the extensive agriculture practices with high input of chemical materials in the past also brought serious threats to the ecosystem and public health. Since Guangzhou Food and Drug Administration reported on May 16, 2013 that the content of cadmium (Cd) in 44.44% of sampled rice and rice production was above national standards, this event of “Cd toxicity in rice” has caused widespread public concern and anxiety, and China’s food security derived from contaminated soils has been highlighted.<sup>1</sup>

In fact, prior to this, more serious problems in today’s China soils were probably overlooked. 76% of Chinese grain was from its main producing areas, such as Henan, which produced 9.7% of national grain in only 6.5% of the country’s arable land. Thus, the soil health of main grain producing areas is a key to food supply to China, even to the international market. Especially, the toxic rice reported was mainly from Hunan and Jiangxi, two of China’s main grain producing areas. In this sense, the safety assessment of China’s food production arising from unhealthy soil environment of main grain producing areas is urgent.

High production in China’s main grain producing areas was obtained at a great cost of resources such as fertilizers, pesticides, and agriculture-used films. Figure 1 showed the consumption of fertilizers, pesticides, and agriculture-used films from 1978 to 2008 in Henan. Obviously, this consumption was extremely large, and was increasing markedly with time.<sup>2</sup> Overuse of chemical fertilizers, especially N fertilizers,

contributed substantially to the soil acidification of those main grain producing areas.<sup>3</sup> Further, intensive chemical fertilizers combination with agriculture-used films resulted in the accumulation of salinity in facility culturing soils, among which the secondary salinization of soils became the predominant problem.<sup>4</sup> Additionally, the mass remains of used agriculture films especially conventional polyethylene mulches in surface soils would cause serious “white pollution” due to their nondegradability.<sup>5</sup> These changes strongly affected soil quality and its productivity. Above all, soils of the main grain producing areas were probably contaminated by long-term excessive use of fertilizers, pesticides, and agriculture-used films, which could threaten national food security.<sup>1</sup> Therefore, it is time for us to pay utmost attention to checking the soil health of China’s main grain producing areas.

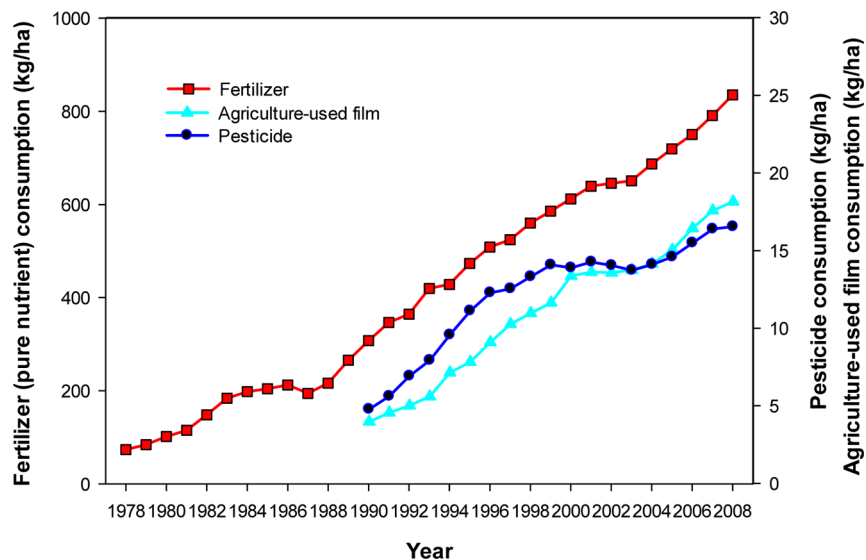
Ensuring the soil security of China’s main grain producing areas is of crucial importance for a safe food supply. After the alarming overdevelopment for more than 30 years, it is time for us to improve soil quality and maintain soil health in those areas. First, a comprehensive soil environment survey should be conducted to develop a detailed background information of the national soil environment. The good news is Central People’s Government has authorized this survey in early 2013. Second, decreasing input of chemicals and improving resource use efficiency will ensure soil quality. For example, the consumption of fertilizers (pure nutrients) in Henan in 2008 reached 835.4 kg/ha (Figure 1), far above average of the world (116.6 kg/ha). These inputs of chemical materials could be greatly reduced without a decrease in crop productivity. Third, regulating agriculture systems maybe be necessary in those degraded arable lands such as long-term vegetable and fruit planting bases (for example, Shouguang and Yantai, respectively), where serious salinization and acidification occurred, respectively. A simple and feasible strategy is using intercrop and/or rotation among vegetable, fruit, and grain. Fourth, contaminated arable lands must be remediated. After remediation by application of existing technologies, and assessment of the security of the whole soil–plant system, food crops could be allowed to be planted in these arable lands.

In order to produce more and safer food, establishing a sustainable agriculture system in China’s main grain producing areas is necessary and urgent. Under increasing population pressure and environmental strain, Chinese soil scientists are facing many unprecedented challenges such as how to maintain and improve soil productivity, thereby avoiding soil contamination or degradation.

Received: May 28, 2013

Accepted: June 14, 2013

Published: June 26, 2013



**Figure 1.** The consumption of fertilizers, pesticides, and agriculture-used films in Henan province, China (data from Henan Statistical Yearbook-2012<sup>2</sup>).

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### Notes

The authors declare no competing financial interest.

## ACKNOWLEDGMENTS

This work was financially supported by National Natural Science Foundation of China (No. 41271254).

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