



# Intensive Planting Is an Important Way to Improve Soybean Yield in China

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**Opinion**

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## Dense Planting is an Important Cultivation Measure for High Soybean Yield

Soybean, an important raw material in vegetable oil and protein-rich human food and animal feed, plays an important role in world food security. With the economic growth and changing diet, the global future food demand will continue to increase, especially the soybean. In the case of China, Chinese soybean consumption has exceeded 100 million tons in 2017, while the self-sufficiency rate is only approximately 15%. Therefore, China's soybean supply gap is huge. Many researchers have investigated that planting soybeans densely can remarkably increase in total aboveground biomass and seed yield. In addition, the plots with typical or high yield records often have higher planting density. In Arkansas, United States, a record soybean yield of 7,501.0 kg ha<sup>-1</sup> was recorded with a planting density of 371,000 plants ha<sup>-1</sup> in 2014. In Xinjiang Province, China, the highest soybean was 6,088.4 kg ha<sup>-1</sup> with a planting density of 299,000 plants ha<sup>-1</sup> in 2010. Soybean plants can intercept and use solar radiation more efficiently under dense planting, which is an important cultivation measure for high soybean yield.

## Comparison of Soybean Planting Density between China and America

Soybean planting density is lower in China than in the United States. American soybean varieties are oil-producing with unlimited or subfinite pod-setting habits. At the same time, American soybean plants have small leaves, good light transmittance and strong lodging resistance, which are suitable for high fertilizer and dense planting. Currently,

the average U.S. soybean harvest density is about 375000 plants per ha. However, the soybean plant in China had larger leaves, and the transmittance and lodging resistance of soybean plants were weaker than those of American soybean plants. Soybeans in northeast China are generally about 277500 plants per ha, about 210000 plants per ha in Huang-Huai-Hai region, and about 187500 plants per ha in southern China. According to the area weighted average, China's soybean planting (harvest) density per ha in general 240000. Therefore, there is much room for improvement in dense planting and cultivation of soybean in China.

## The Seed Cost is Low in Soybean Production in China

Conventional soybean varieties are planted in China, while gm varieties are basically planted in the United States, and the second-generation high-yield GM soybean varieties and polyvalent GM soybean varieties are basically popular, including Bt insect-resistant GM soybeans and transgenic soybeans that are simultaneously resistant to three herbicides (glyphosate, glyphosate and 2, 4-D). A boost in royalties has raised the price of Soybean seeds in the United States. However, Chinese farmers mostly use home-grown soybean seeds. The availability of cheap seeds has reduced resistance to increased soybean planting.

## Based on China's National Conditions, How to Improve Soybean Yield?

On the basis of intensive planting and tapping potential, the following technical measures can be adopted to improve

soybean production in China. Firstly, cultivate new soybean varieties with high density and stable yield, and improve the coverage rate of high quality varieties. Secondly, integrate

and perfect high-yield and high-efficiency comprehensive technology mode to improve the technology availability rate. Thirdly, suitable farming systems should be promoted.

