Smart farming the key to China's food problems, study says

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High-yielding rice in demonstration plots. Credit: Fusuo Zhang

Clever farming techniques would provide China with more than enough grain to feed its escalating population in the coming decades while easing stress on its environment, scientists reported on Wednesday.

China faces a double crunch as its population of 1.35 billion rises to an

expected peak of 1.47 billion in 2030, which will require more than 650 million tonnes of rice, wheat and corn annually, they said.

The challenge coincides with accelerating climate change, soil degradation, growing competition for water and land from cities and global demand for food that is likely to double by 2050.

Writing in the journal *Nature*, a team led by Fusuo Zhang at the China Agricultural University in Beijing reported on a three-year experiment on how to improve yields on existing land.

They carried out dozens of field trials in the country's main grain-farming belts, where they grew plots of cereals using four different agricultural techniques.

One technique was to grow the cereals according to the practice of local farmers, and the second was a tweaked, or "improved," version of the same method.

The third was maximisation of yield without regard for the environment, which often entailed dousing fields with nitrogen fertiliser.

The fourth technique used modern crop and nutrient management, harnessing knowledge of the right strains of crops to match local soils and climate, more accurate dates for sowing and a smarter density of sowing, and using inputs efficiently.

The highest yield came from the third option.

It saw average local yields of rice jump from 7.2 tonnes to 8.8 tonnes per hectare (2.9 tonnes to 3.5 tonnes per acre), while the wheat harvest leapt from 7.2 tonnes to 9.2 tonnes, and corn (maize) from 10.5 tonnes to 14.4 tonnes.

This came close to record yields for those grains in intensive farms in the United States and Germany.

But the smart farming technique, called integrated soil-crop system management (ISSM), did extremely well, according to the investigators.

It typically came within 97-99 percent of the maximised yield but at far less cost to the environment.

Yields under ISSM rose to 8.5, 8.9 and 14.2 tonnes per hectare for rice, wheat and corn respectively, without any increase in nitrogen fertiliser.

Option No. 2—the "improved" local practice of farming—achieved 88-92 percent of the maximised yields.

Computer simulations suggest that by using ISSM, excessive use of nitrogen and emissions of greenhouse gases "are reduced substantially," the study said.

"If farmers in China could achieve average grain yields equivalent to 80 percent of this treatment by 2030, over the same planting area as in 2012, total production of rice, wheat and maize in China would be more than enough to meet the demand for direct human consumption and a substantially increased demand for animal feed, while decreasing the environmental costs of intensive agriculture," it said.

More information: Paper - dx.doi.org/10.1038/nature13609

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