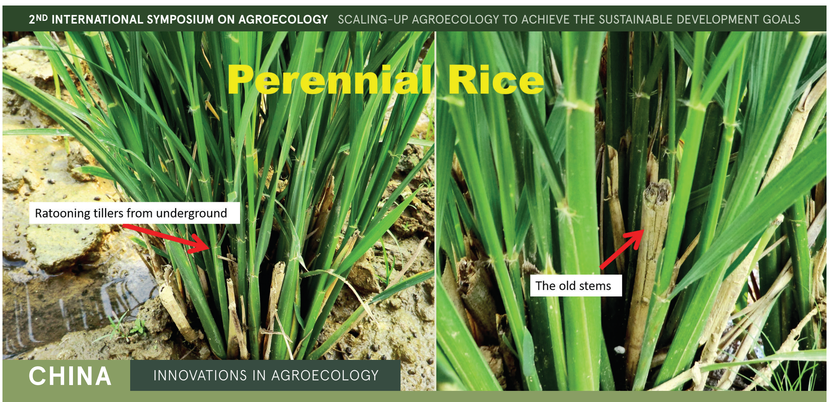


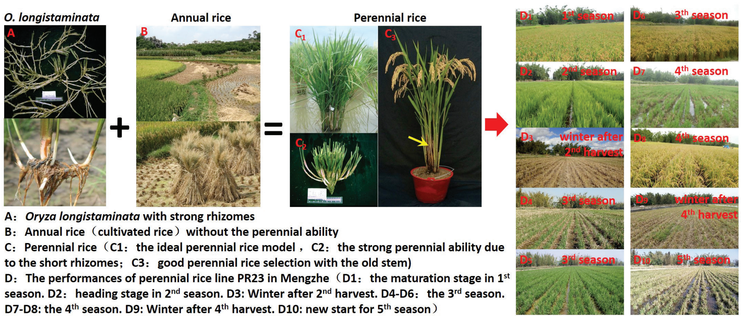
CHINA INNOVATIONS IN AGROECOLOGY

PERENNIAL RICE: SUSTAINABLE RICE PRODUCTION SYSTEM

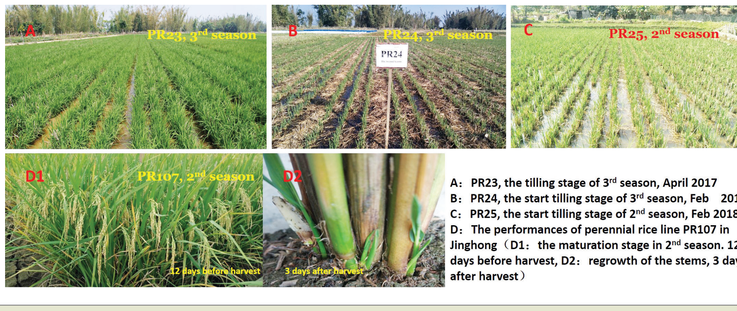
Two serious problems in rice production should be solved, not only in China, but also all over the world. First, environmental problems need to be addressed, such as soil erosion caused by annual rice production systems, especially upland rice production, although yields are high. Second, with economic development, labour shortages in rural regions are becoming increasingly severe. To solve these issues, the idea of developing and using a perennial rice production system was proposed in 1989.

DESCRIPTION OF THE INNOVATION

Perennial Rice, as its name implies, is rice that can be harvested many years without reseeding, due to the regeneration of rhizome. *Oryza longistaminata*, is a perennial wild rice species from the same genus as cultivated rice, such as *Oryza sativa*. It is considered to be the ideal perenniality donor for perennial rice, as it has strong rhizome (vegetative propagation), and the same AA genome as Oryza sativa. In 1997, RD23 and *Oryza longistaminata* were crossed, resulting in an F1 individual with strong rhizomes. Breeding and selection, including molecular, marker-assisted selection (MAS), were carried out for many years.



A: *Oryza longistaminata* with strong rhizomes
B: Annual rice（cultivated rice）without the perennial ability
C: Perennial rice（C1: the ideal perennial rice model，C2: the strong perennial ability due to the short rhizomes; C3: good perennial rice selection with the old stem)
D: The performances of perennial rice line PR23 in Mengzhe（D1: the maturation stage in 1st season. D2: heading stage in 2nd season. D3: Winter after 2nd harvest. D4-D6: the 3rd season. D7-D8: the 4th season. D9: Winter after 4th harvest. D10: new start for 5th season）



A: PR23, the tilling stage of 3rd season, April 2017
B: PR24, the start tilling stage of 3rd season, Feb 2018
C: PR25, the start tilling stage of 2nd season, Feb 2018
D: The performances of perennial rice line PR107 in Jinghong（D1: the maturation stage in 2nd season. 12 days before harvest, D2: regrowth of the stems, 3 days after harvest）

DESIGN AND SHARING OF THE INNOVATION

So far, four good selections have been bred: PR23, PR24, PR25 and PR107. Of these, PR23 has been used in nine provinces in southern China, and four countries in South and Southeast Asia, such as Laos, Myanmar, Cambodia, and Thailand. The applied area size was more than 100 hectares in Yunnan province, and it has been tested for more than three years for perennial ability and yield.

The results show that the regrowth rate was over 85 percent, at least after the sixth harvest, and the average yield was maintained at 15 tonnes/ha per year. PR23 is now ready to be released in Yunnan.

BENEFIT FOR FAMILY FARMERS AND FOOD AND NUTRITION SECURITY

Perennial rice technology is a green and sustainable agricultural technology, as it has many benefits for farmers and rice production. Compared with traditional rice production, the perennial rice production process saves production costs (50 percent from the second season), with less use of chemical fertilizer, irrigation water and crop management input; perennial rice production also requires less labour input and reduced labour intensity.

SOCIAL, ECONOMIC AND ENVIRONMENTAL IMPACTS

Perennial rice technology is a simplified, green and sustainable agricultural technology, which has significant social, economic and environmental impacts.

Perennial rice production reduces soil erosion for rice fields or upland, as it does not require tillage after the first transplant. At the same time, perennial rice yields are as high as traditional rice yields.

Perennial rice is a good solution for rice production nowadays.. It will change the way rice is produced, and achieve balance among environmental protection, economic development and food security.

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