

# Made for the TROPICS

by Kyung-Ho Kang

*Traditionally grown in cooler regions, japonica varieties, which are developed by IRRI, can now be cultivated under the warmer climate of the Philippines*

Rice is more than a staple food in Asia. It is ingrained in the culture—not to mention adapted to the topography and climate of particular countries—that sometimes respective ethnic groups can be distinguished from each other based on the type of rice they grow and eat. While South and Southeast Asians, for example, prefer long-grain rice such as basmati and jasmine, Northeast Asians prefer medium-grain rice, known as japonica. This latter type of rice thrives in temperate areas. Hence, in countries where it is not traditionally grown, consumers need to pay more to obtain it.

This may soon change, however, as the International Rice Research Institute (IRRI) has recently developed two temperate japonica rice varieties released in the Philippines. The Rice Technical Working Group of the National Seed Industry Council through the National Cooperative Tests Network, led by the Philippine Rice Research Institute, has approved two temperate japonica rice cultivars, NSIC Rc170 or IRRI 142 and

NSIC Rc220 or IRRI 152, for large-scale planting. This development is expected to provide local farmers with higher returns, and subsequently, allow consumers to enjoy this quality rice at a more affordable price.

## Adapting to the tropics

IRRI's japonica rice breeding program, which is now known as Germplasm Utilization Value Added (GUVA), started in 1991, in collaboration with the Republic of Korea, to develop high-quality, high-yielding temperate japonica rice cultivars that can adapt and grow in the tropical zone. Under warm conditions, most temperate japonica rice varieties show stunted growth and develop weak tillers, small panicles, and premature heading because these varieties are sensitive to short daylength and high temperature. So, during the initial stage of the breeding program, every year, scientists identified and selected, from the Korean Seed Multiplication Project's nursery, germplasm (plant genetic material)

that showed good performance in the Philippines. These selections served as base materials to develop breeding populations of temperate japonica rice that can adapt to tropical conditions. They were found to be less sensitive to longer exposure to sunlight and higher temperature, and also did not differ much in plant growth under the varying environments of Korea and the Philippines.

The first of the two cultivars in the Philippines, NSIC Rc170 or IRRI 142, now called MS11, was released in 2008. MS11 is a cross between two varieties from the Republic of Korea, namely, Jinmibyeo and Cheolweon 46. Jinmibyeo has high grain quality, while Cheolweon 46 has high resistance to pests and diseases in tropical conditions. The product, MS11, is a semidwarf (90 cm), early-maturing (112 days) variety, and has the typical characteristics of japonica grain—short rounded shape, low amylose content (15.5%), and low gelatinization temperature. In the three-season multilocation trials from the wet

seasons of 2001 to 2002, MS11 yielded an average of 4.5 tons per hectare, with a premium milling and head rice recovery of 70 and 61%, respectively.

The second temperate japonica rice, NSIC Rc220 or IRRI 152, was released in 2009. Locally known as Japonica 1, this cultivar is also a semidwarf (89 cm), early-maturing (109 days), and high-yielding variety. Again, in three-year multilocation trials conducted during the wet seasons of 2007 to 2008, it demonstrated a 25% greater yield advantage over MS11. And, strikingly, it was evaluated to have better eating quality—comparable with that of the highly regarded Koshihikari, a japonica rice widely grown in Japan.

## Contributions of japonica rice

Historically, japonica rice has had a profound impact on rice breeding in Asian countries. IRRI produced IR8 from a cross between a Chinese japonica

variety, Dee-geo-woo-gen, and an Indonesian variety, Peta (see *Breeding history* on pages 34-38 *Rice Today* Vol. 5 No. 4). As a result, this raised the yield potential of rice from a mere 2–3 tons per hectare of the traditional varieties to 8–10 tons per hectare—and later led to Asia's Green Revolution. Moreover, the development of the high-yielding Tongil-type rice cultivars by crossing japonica with indica has helped Korea achieve and sustain its rice self-sufficiency status since 1972.

Besides increasing rice productivity, japonica rice has been used for a wide range of gene sources to improve cold tolerance, grain quality such as grain shape, amylose content, gelatinization, resistance to diseases such as blast and bacterial leaf blight, plant stature, and leaf senescence, among other traits.

Now, many elite temperate japonica lines adaptable to tropical climate are being developed at IRRI through the GUVA program. These lines are expected to provide base materials for intersubspecies hybridization to develop intermediate varieties. These intermediate varieties will be another

breeding goal for the GUVA program to achieve genetic improvement for yield potential, canopy architecture, lodging tolerance, and resistance to major pests and environmental stresses that currently pose a threat to the temperate japonica varieties' growth in tropical conditions.

## Growing taste for japonica

With the release of the two japonica rice cultivars, a growing taste for japonica rice in the Philippines, especially among urban dwellers and the younger generation, will soon be satiated at more reasonable costs. Korean, Japanese, and Taiwanese restaurants and hotels would no longer need to look back to their origins to cater to their customers' preference. Most importantly, local farmers who grow this type of rice could soon take advantage of the expanding market, reap higher profits, and, we hope, lead better lives. 🍚

*Dr. Kang is a plant breeder in IRRI's Plant Breeding, Genetics, and Biotechnology Division.*



A PANICLE of a japonica rice cultivar, MS11.



IRRI PLANT breeder Dr. Kang and visiting research fellow Dr. Jeung-Hee Lee closely examine ripening japonica rice.