• P R E S S   R E L E A S E •

Consultative Group on International Agricultural Research
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Dr. Klaus Lampe, Director General of the International Rice Research Institute, will be available for interviews on Thursday, October 20 and Friday, October 21 by calling 703-820-2244.

The CGIAR International Centers Week in Washington, D.C. will conclude with a press luncheon at 12:30 p.m. Friday, October 28th. Attendance by reservation only. Please call the CGIAR press office -202-473-8913 or 202-458-5829 during the conference.

New 'Super Rice' Will Help Feed Nearly Half-Billion More People

A new breed of "super rice" that can produce 25 percent more grain on the same amount of land and help feed an additional 450 million people a year has been developed by scientists at the International Rice Research Institute (IRRI), one of the 17 centers of the Consultative Group on International Agricultural Research (CGIAR).

"This new rice will go a long way toward feeding the world's people through the next century, especially in Asia where rice is the staple," says Ismail Serageldin, Chairman of CGIAR and Vice President of the World Bank's Office of Environmentally Sustainable Development.

On irrigated land, under the best conditions, the new rice variety will yield five tons per acre (12.5 tons per hectare), versus four tons per acre (10 tons per hectare) for present-day rice. The new rice, if widely planted, could produce 100 million more tons of rice per year than is currently grown. Since the average per capita consumption of rice in Asia is 440 pounds (200 kilograms) per year, the additional 100 million tons would feed more than 450 million people.

The "super rice" and other global agricultural research projects will be discussed at the CGIAR International Centers Week in Washington, D.C., which will be held from October 24-28. About 350 donor and center representatives from CGIAR will attend. IRRI, based in the Philippines, developed the rice over the past five years.

Rice is the most important food crop in developing countries. It is eaten by half the world's population. Currently, production just about keeps up with demand, but that will change with the population growth.

The world's present population of 5.5 billion is projected to reach 8.3 billion by 2025, with the population of rice-consuming countries growing at a faster rate than the rest of the world. Total demand for rice is expected to increase 70 percent over the next 30 years. Most of the increase will come from population growth. By 2025, 350 million more tons of rice will have to be produced each year.

"It's not possible to step up rice production dramatically by planting on new land," says Mr. Serageldin. "Some of the best rice land is being lost to population growth and rapidly expanding urban centers, while remaining virgin lands are not suited for rice. In fact, the area planted in rice worldwide has remained stable since 1980."

Exacerbating this land shortage, some 25 million acres of good rice lands in south Asia, or 10 percent of the global total devoted to irrigated rice, are showing signs of soil fatigue from intensive monoculture production, according to estimates by IRRI scientists.

The rice production equation will have to change dramatically so that the world produces more rice on less land, using less water, pesticides, fertilizer and labor, IRRI scientists conclude.

"We don't know yet how many people will live on Earth in the middle of the next century, but we know that we have to produce at least more than twice the food that we harvest today," says Dr. Klaus Lampe, IRRI's Director General. "We don't have the technology yet to make that happen. The new generation of rices, however, is a very important building block to achieve this goal."

More than 300 rice varieties have been developed by a team led by IRRI's principal plant breeder, Dr. Gurdev S. Khush, who joined IRRI in 1967. The varieties are now planted all over the world. One of them, IR36 -- which carries resistance to about 15 insects, diseases and environmental stresses -- is being grown under a dozen names on 27 million acres and is the most widely grown variety of any crop in the world. Another variety developed by Dr. Khush's team, IR64, is planted in many Asian countries -- for example, on 60 percent of the irrigated rice land in Indonesia.

To begin creating the new rice, IRRI scientists examined the institute's collection of some 80,000 rice samples for the desired characteristics. IRRI plant breeders crossed selections from the collection to produce the traits that they wanted in the new rice. They tried to improve the grain-to-straw ratio, from the present 50 percent each to 60 percent grain, by reducing the number of stems or tillers, which bear the grain, and increasing the number of grains carried by those tillers.

"There are only an average of 100 grains per panicle (a rice panicle serves the same function as an ear of corn) in the rice grown today," says Dr. Khush. "Each current rice plant today has some 25 stems or tillers, but not all of them produce rice. We sought to reduce the number of tillers to 8 to 10, but with all of them being productive. In addition, via selection, we could ensure that each tiller produces a panicle with 200 to 250 grains, or at least double the current production. By designing this type of plant, we can increase the yield potential by 20-25 percent." (See diagram on Page 6.)

Just this year, IRRI began to harvest prototypes of the new rice, which has thick and sturdy stems and thicker, darker green and erect leaves, achieving the goal of a 25 percent increase in yield.

"We can say today that IRRI has been successful, but Dr. Khush and his associates still must carry out more research and development before the new rice can go into commercial production," says Mr. Serageldin.

Resistance

Resistance to pests and disease must be bred into the new rice before it is released to farmers. IRRI is also trying to find ways to overcome the heavy use of chemical pesticides with the use of integrated pest management (IPM).

One of the most important components of IPM is the rice plant's built-in genetic resistance to the major diseases and insects. IRRI has a collection of resistant genes that can be built into the new varieties. For example, for bacterial blight, a major disease of the irrigated rices, IRRI has about 20 genes; for blast, the major disease of rice farmed in upland areas, 15 genes; for resistance to brown planthopper, an insect that has caused vast grain losses, 9 genes. IRRI has also systematically screened wild rice species, some of which have a very good built-in resistance to these diseases and insects, because they have grown without man-made protection.

Taste

More work also needs to be done to build in other traits to cater to the diverse needs of farmers and consumers across Asia.

The new varieties will incorporate different tastes and cooking qualities, because many countries have their own taste preferences. Some like long, slender grains, others like rounder, shorter grains.

The Future

Scientists stress that this new "architecture" of the rice plant also has to be matched with agronomic practices, such as planting, weed control, and proper levels of fertilizer application, if the new rice plant is to achieve its full yield potential.

The super rice, then, will not be commercially produced for at least five more years. The next step is for scientists of the national research systems to begin to adapt the new rices to a variety of local conditions and requirements before distributing them to farmers.

But IRRI will not stop there. Research is already under way to develop hybrids by crossing these new plants with modern high-yielding varieties. The resultant hybrids are expected to increase yields by a further 20-25 percent, to bring production up to six tons per acre (15 tons per hectare) in irrigated areas.

Producing rice from hybrid seeds will not be popular with smallholder farmers, because the seeds must be bought each year, while farmers like to keep seed from one crop for the next.

IRRI plans to get around this by transferring apomictic genes into the new rice plants, which will allow farmers to use seeds from a harvested crop for the next year's planting. Apomixis is asexual reproduction; it occurs naturally in more than 300 plant species. IRRI is also looking into wild species of rice to see if it can find apomixis there.

"Those genes are available and efforts are being made to clone them, and we will then introduce those into rice by genetic engineering," says Dr. Khush. "Then the hybrids will breed true and farmers will not have to buy the seeds every season."

Water

IRRI is also committed to creating rice that can grow with much less water. At the moment, a staggering 2000 liters of water -- more than 500 gallons -- are required to produce just one kilogram of rice, more than any other food crop.

"This cannot continue as people and industries compete for this finite resource," says Mr. Serageldin.

Dr. Sadiqul Bhuiyan, an IRRI agricultural engineer, is convinced that nearly half the water used at the moment could be saved.

"Instead of transplanting seedlings, farmers could directly sow the rice seeds into the puddled soil," says Dr. Bhuiyan. "Farmers could thus finish land preparation in a very short time, within a week or so, as compared to 4, 5 or 6 weeks in transplanted rice systems. During that 4-6 week period, farmers continue to use water."

Rice grown in the rain-fed ecosystems -- which currently make up some 40 percent of global production -- can also produce higher yields and IRRI is working to achieve this.

"Protecting the environment without protecting the welfare of people living in these ecosystems is an illusion," says Dr. Lampe. "Producing food by disregarding the needs of coming generations is a crime. That's why we at IRRI strongly believe that the latest achievements in breaking the yield barrier will have a dramatic effect on alleviating hunger, feeding another billion rice eaters and simultaneously helping to conserve the resource base."

The CGIAR

The CGIAR is an informal association of 43 governments, international organizations, and private foundations supporting an international research system for agriculture, forestry, fisheries and management of natural resources in developing countries.

The World Bank, the United Nations Development Programme (UNDP) and the Food and Agriculture Organization (FAO) jointly sponsor the CGIAR, which maintains 17 international research centers with a consolidated budget of $300 million, some 1,000 scientists and a total staff of 10,000. IRRI, the first of such centers, was set up in 1960.

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	Tall Conventional Plant	Improved High Yielding (Modern Rice)	Low Tillering Ideotype (Super Rice)
Year:	Before 1968	1970s and 80s*	21st Century
Height:	110-180 cm	90-110 cm	90-110 cm
Leaves:	Thin, long, small, drooping	Thin, short, small, erect	Thick, short, erect
Tillers:	High tillering unproduction ones	High tillering (up to 25 each plant)	Up to 15, but no
Panicles:	Less than 10	Up to 15	Up to 8
Growth Duration:	140-180 days	110-140 days	100-130 days
Grain yield Potential:	1.5-3.5 (4.0) T/HA**	6-10 T/HA**	13T/HA**

* - Of development and introduction to farmers' fields
** - T/HA =Tons per hectare (2.47 acres per hectare)

6- Super Rice