African farmers develop their own rice cultivars

Nerica – New Rice for Africa is the name of the great biotechnological success in rice breeding. What scientists created in the lab using modern methods, namely hybrids of African rice and Asian rice, had already come into being decades ago by chance in West African fields.

When scientists of the Africa Rice Center (AfricaRice, formerly WARDA) in Cotonou, Benin created the rice cultivar Nerica (New Rice for Africa) in the mid 1990s by hybridising African rice (*Oryza glaberrima*) and Asian rice (*Oryza sativa*), it was considered a biotechnological sensation. Scientists of Wageningen University (the Netherlands) have since discovered hybrids of African rice and Asian rice in West Africa that are genetically different from Nerica and came into being totally independently of the scientific development that led to Nerica. These hybrids are the product of a spontaneous crossing of the two species. The farmer hybrids presumably arose from the parent species *Oryza glaberrima* and *Oryza sativa* ssp. *indica*, whereas Nerica arose from *Oryza glaberrima* and *Oryza sativa* ssp. *japonica*.

Farmers grow both African and Asian rice together in expansive areas of West Africa. As a general rule, the two rice species are not capable of crossbreeding. Part of the mystery as to how the hybrids came into being anyway no doubt lies in the enormous tracts of West African rice cropland. Somewhere within this immense crop production area, the supposedly impossible crossing of the two species took place. A group of new genotypes thus came into being in West Africa through in-field hybridisation. These genotypes are relatively well suited for production on nutrient-poor soils, and are early and drought tolerant, which is why they were preferentially grown and dispersed by the farmers.

Background

Hybrids are individuals that arise from a crossing of parents of the same species, different species or subspecies. In plant breeding, inbred lines are generally crossed to produce F1-hybrids, and the broader genetic source material of the parents results in yield increases (an effect known as heterosis). The hybrids referred to in this article are not F1-hybrids, but the stabilised progeny of crosses between African and Asian rice.

The advantages of Nerica in comparison with African and Asian rice: higher yield, shorter growth duration, resistance to local stresses and higher protein content than traditional rice varieties.

Wars promoted selection

The first hybrids presumably came into being in Guinea-Bissau and/or Sierra Leone, long before the wars in these countries started. Sierra Leone was battered by civil war from 1991 to 2002, whereas the Portuguese Colonial War raged in Guinea-Bissau from 1963 through 1974.

Many farmers went into hiding during the war in Sierra Leone, which made it impossible to clear new cropland in the forests. Trees would have had to have been felled, leaves and small branches would have been burned, and the rising

Photo: Iaif

Man harvesting a field of Nerica rice. Other than theses cultivars, the hybrids discovered by Dutch scientists in Africa are the product of a spontaneous crossing of two rice species.

smoke would have led the rebels directly to the villages. Instead of developing new land, the farmers thus planted their rice in the same fields year after year. Every year more nutrients were removed from the soil, and production became more and more difficult. Because the farmer hybrids grow relatively well on nutrient-poor soils, they were cultivated with increasingly greater frequency during the war years.

The Portuguese Colonial War promoted the dispersal of the hybrid cultivars. Many farmers fled from Guinea-Bissau to southern Senegal and to Gambia, carrying the hybrids in their baggage. With the severe decline in rainfall in Gambia and southern Senegal in the early 1970s, the local farmers began planting the hybrids of the refugees from Guinea-Bissau. In general the farmer hybrids grown in South Senegal, Gambia and Guinea Bissau are drought tolerant (although there is one exception) and they inherited from the African rice the ability to grow on poor soils. But unlike African rice they have a white or brown seed colour, which is important in these countries, since farmers prefer white seed colour. The seeds of African rice are red.

New relationship between farmers and scientists

The scientists from Wageningen are now advocating a new orientation of the relationship between the scientific community and local farmers. The new findings show that African farmers are playing an active role in the improvement of seed. The hybrids bred by them could be used as the foundation for new scientific developments. A wide range of rice varieties with different characteristics is needed to meet the agro-ecological and socio-economic needs of farmers in Africa and around the world. The genetic potential of rice can only be fully exploited through new forms of cooperation between scientists and farmers! *(ib)*

More information:

Study: *Evidence for the Emergence of New Rice Types of Interspecific Hybrid Origin in West African Farmers' Fields:*
www.plosone.org/article/info:doi%2F10.1371%2Fjournal.pone.0007335

In brief

Insect nets impregnated more effectively

Researchers at Bayer CropScience have found a way to incorporate deltamethrin, the company's WHO-recommended active ingredient for mosquito net impregnation, into polypropylene fibre. Announced by Bayer CropScience in November 2009, the result is a new textile fibre which can be used to make impregnated mosquito nets that are softer, stronger and remain effective for longer than conventional nets. The new product, which will be sold under the brand name LifeNet, is expected to be launched on the market within the next few years. *(Bayer CropScience AG)*

Maize genome decoded

A team of 150 scientists led by Washington University in St. Louis, Missouri (USA), has deciphered the genetic code of the maize plant. "Over 32,000 genes were predicted, of which 99.8 percent were placed on reference chromosomes", write the scientists in the November 2009 issue of *Science*. "These analyses inform and set the stage for further investigations to improve our understanding of the domestication and agricultural improvements of maize." *(AFP/Science)*

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