

Golden Wheat “Greens”

Kenya’s Drylands

Rodolfo Quevenco

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Through IAEA partnerships, scientists and farmers pioneer hardier, healthier wheat.

Hot and barren, Kenya’s dry lands have long been unfit for agriculture, at best merely a grazing area for wild animals and livestock.

Today, the landscape is more picturesque and productive, lined with golden stalks of wheat yielding precious grain for Kenya’s farms and families. The wheat is a new variety, one that is high yielding and resistant to drought. As a result, small farming families are realizing harvests on farmlands once considered too poor to cultivate, to the country’s social and economic benefit.

The progress is life-saving at a time when wheat crops in Kenya and other African countries are

plagued by a virulent new strain of fungus called “wheat rust” that threatens the region’s farmlands.

“The progress is crucial. This wheat is literally Kenya’s bread of life,” says Martin Dyre, whose family owns one of Kenya’s largest wheat plantations. “The diet of this country is changing more and more towards wheat-based products, so the demand for wheat is growing.”

Scientists and crop researchers at Kenya’s Agricultural Research Institute (KARI) developed the new wheat seeds over the past decade. Through a process called “mutation plant breeding”, they applied radiation-based techniques to modify crop characteristics and traits. Kenya worked

closely with the IAEA, through its technical cooperation arm and a regional programme called AFRA (African Co-operative Agreement for Research, Development and Training related to Nuclear Science and Technology). In August 2008, through its Joint Division with the UN Food and Agriculture Organization, the IAEA hosted an International Conference on Plant Breeding to take stock of the latest developments in Kenya and other countries.

KARI is the country’s premier institution for agricultural research and technology transfer. Its plant breeders successfully released their first mutant wheat variety in 2001. Called Njoro-BW1, it was bred to be tolerant to drought and use limited rainfall efficiently. Key side benefits include a moderate susceptibility to wheat rust; high yields, with grains valued for flour production of good baking quality.

Njoro-BW1 today is cultivated on more than 10,000 hectares in Narok, Nalvasha, Katumani and Mogotio. Its popularity among Kenyan wheat farmers is increasing steadily, so much so that KARI’s seed unit can barely keep up with farmer’s demand.

Professor Miriam Kinyua, now an Associate Professor at Moi University and KARI’s former Chief Plant Breeder and Center Director, is largely credited for developing Kenya’s mutant wheat varieties.

“Njoro-BW1 came out as a hit variety”, she recalls. “The farmers liked it from the start. In dry areas, they can expect to harvest up to 20 bags an acre. It is now our most popular wheat variety for the drylands”.

Peter Njau, KARI’s chief plant breeder, says Njoro-BW1’s value goes beyond drylands.

“Although we developed the Njoro-BW1 variety for dry lowlands, it is being widely adapted in other areas”, he says. Farmers have reported successfully growing the wheat in the highlands and even in the acidic soils of the northern rift, where it is outperforming other wheat varieties developed for those conditions.

Kenya’s plant breeders soon will release a second mutant wheat variety, code-named DH4, which shares most of the same good qualities of Njoro-BW1.

“DH4 is high-yielding, and has a high grain quality. It is also hard and red, qualities that farmers ask for because of its high market value,” Professor Kinyua explains. Hard red grains distinguish as some of the world’s best wheat, high in protein and valued for making flour used for baking high-quality breads.

All Bread Does Not Bake Equal

One of KARI’s objectives is to develop good quality wheat bread for the country’s consumers, says Mr. Njau. The institute has conducted a comparison study of the different wheat varieties available in Kenya for their quality of bread, including Njoro-BW1 and the new DH4 variety.

Among varieties tested, Njoro-BW1 came out on top in flour extraction. DH4 also scored high in bread quality overall.

“You can tell the quality of bread just by pressing it”, Mr. Njau illustrates. “If you press good bread, it just swells back. If it’s bad, it just sinks.”

The tests showed that mutant wheat varieties produce better bread, outperforming even the parent strain in quality and yield.

Multiplying the Seed

With every new crop variety comes the challenge of stocking up on seed to meet expected demand. For KARI, the biggest issue most often is availability of land. KARI has its own fields but they are not large enough to meet farming needs, especially for a high-demand variety like Njoro-BW1.

Fortunately, for Kenya’s plant breeders, the country’s Cereal Growers Association (CGA), has provided needed land and support particularly in the area of seed multiplication. In the highlands of Timau, by the northern slopes of Mount Kenya, several hectares of prime wheat land are being dedicated for field trials for future plantings of DH4.

In November 2007, DH4 was being grown on a small scale in trials on some 40 hectares of farmland.

“These are the straw qualities wheat farmers are looking for”, says Martin Dyre as he cuts a length of leaf from one of the plants. His family owns the vast Kisima Farm in Timau, Kenya; and he occupies a seat on the CGA Board. Kisima Farms has provided land and logistical support to Professor Kinyua and her team at KARI, particularly in times when resources were scarce to help ensure continuity of research and trials.

“We are happy to continue to support plant breeding activities of this kind,” he says. “Good wheat is, in the end, good for all of us.”

Lower down the valley at the Wangu Embori Farm, Crop Supervisor Steven Irungu points to 70



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hectares being planted with the Njoro-BW1 seeds. He is impressed about the variety’s high yield and plans to increase the acreage. The Wangu Embori Farm is another farm contracted by KARI for seed multiplication.

Wheat for Food Security

Wheat is the second most important cereal crop in Kenya, after maize. But the country produces just a third and has to import two-thirds of its annual wheat demand, now at vastly higher prices. The United Nations Food and Agriculture Organization (FAO) reported that as of January 2008, the global prices of wheat were 83% higher than they were a year ago.

Alongside market forces stands the wheat rust plague that threatens Kenya and other countries. New crop varieties, such as wheat that is more resistant to drought conditions or to the rust fungus, are vital for Kenya’s food security.


Professor Miriam Kinyua believes mutation techniques are among the best options for Kenya to develop better wheat varieties and other vegetatively propagated crops.

“The fact that we can link up with the IAEA is a plus both for Kenya and for African scientific research,” she says.

Worldwide, issues of food supply and availability are intensifying in their urgency, says IAEA Director General Mohamed ElBaradei.

“Food security is among the most challenging problems facing poor countries,” he says. “Boosting agricultural production requires enhanced crop varieties, effective pest control measures, increased soil fertility and better soil and water management.”

Under national and regional projects, the IAEA helps local scientists and farmers with nuclear techniques that support each of these goals, working through channels of technical cooperation as well as scientific research of the Vienna-based Joint FAO/IAEA Division. In the past five years, in Africa alone, six new varieties of crops have been officially released — plants with higher yield, improved nutrition, and more hardy characteristics for harsh environments. This includes new varieties of sesame in Egypt, cassava in Ghana, wheat in Kenya, banana in Sudan and finger millet and cotton in Zambia.

The idea is not only to boost food production, Dr. ElBaradei says, but also to sustain it through greener, more productive fields. 

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