

Feature: NERICA – a family affair

When delighted farmers or even WARDA's own staff talk enthusiastically about NERICA it is easy to forget that NERICA stands not just for one or even 20 improved varieties of rice but an extended family of some 3000 siblings!

Of course, some of those siblings – as in any sprawling but ultimately ordered family – push their way to the fore more than others. That is why even the best-informed NERICA watchers still think of NERICA 1-18 – the first released upland varieties that took West and Central Africa by storm. Now some 60 siblings directed at lowland culture are jostling to be noticed in widespread evaluation trials throughout sub-Saharan Africa.

In addition to the upland NERICA varieties, WARDA and national programs of West African countries developed NERICA varieties suitable for rainfed and irrigated lowlands, one of the most complex rice ecologies in the world. Key to this success was the unique R&D partnership model forged between WARDA and the national programs of West African countries through the Rice Research and Development Network for West and Central Africa (ROCARIZ), which facilitated the shuttle-breeding approach to accelerate the selection process and achieve wide adaptability for the lowland NERICAs

Lowland NERICAs are being evaluated in about 20 African countries across West,

Central and East Africa for different water regimes, and in different integrated crop management scenarios. Plans are under way to characterize more *glaberrima* germplasm in lowland ecosystems to allow better-targeted crosses and molecular characterization of elite and promising characteristics. Work is continuing on improving the first generation of lowland NERICAs and a second generation with improved plant height has already been developed.

The potential in the lowlands is huge. In West Africa alone there are an estimated 20 million hectares of cultivable lowlands. If just 2 million hectares of lowlands is grown to rice producing an average yield of only 3 tonnes per hectare, the region could easily stop its costly rice imports. The lowlands, therefore, offer great potential for the sustainable expansion and intensification of rice and can help to feed the growing population in the region.

Given such high potential, the new lowland NERICAs are expected to make an even bigger impact than the upland NERICAs, which have previously unleashed the potential of the upland rice ecologies across Africa.

The lowland NERICAs were developed by a research team led by Dr Moussa Sié, WARDA's lowland rice breeder, and Dr Kouamé Miézan, then head of WARDA's Sahel Station in St-Louis, Senegal, and their national partners using the interspecific hybridization technology. The development, release and farmers' adoption of the lowland NERICAs were the direct outcome of the work done by WARDA and its NARS partners (especially INERA in Burkina Faso, ITRA in Togo and IER in Mali) during 2002-2004 through the ROCARIZ rice network.

Dr Sié highlights that the lowland varieties have a yield potential of 6-7 tonnes per ha, and are demonstrating good resistance to major lowland stresses. Use of the Participatory Varietal Selection (PVS) process is underwriting the acceptability of these new varieties to farmers, with the result that four lowland varieties were officially released in Burkina Faso and two in Mali in 2005.

In the case of Burkina Faso, rice is grown in three ecologies: upland, which accounts for 10% of the rice-cropped area and provides 5% of production, irrigated schemes (23% of cropped area and 53% of the production) and lowland rice, which covers 67% of rice-cropped area and provides 42% of the country's production.

Lowland rice is the most important traditional way of rice farming in Burkina Faso and also combines characteristics from upland and irrigated rice. However, traditional cultivars grown in most cropped lowlands are in the process of being lost because of their long cycle which is not adapted to decreasing rainfall. Farmers have been growing varieties of *Oryza glaberrima* because of their resistance to drought, their plant vigor, tolerance to weeds and good grain quality.

In order to meet the needs of both farmers and consumers, Dr Sié says it is

Table 1. Names and origins of new lowland varieties (NERICA type) released in Burkina Faso.

Name of Varieties	Genetic origins (parents)	Geographic Origins	Released names
WAS 161-B-9-3	TOG 5681 / 4*IR 64	WARDA (ADRAO) St-Louis, Senegal	FKR 56N
WAS 191-9-3	IR 64 / TOG 5681 // 4*IR 64	WARDA (ADRAO) St-Louis, Senegal	FKR 58N
WAS 122-IDSA-1-WAS-1-1-B	TOG 5681 / .3*IR 64	WARDA (ADRAO) St-Louis, Senegal	FKR 60N
WAS 122-IDSA-1-WAS-6-1	TOG 5681 / 3*IR 64	WARDA (ADRAO) St-Louis, Senegal	FKR 62N

FKR: Farako-Bâ Riz N: NERICA (New Rice for Africa)

The NERICA varieties have been shown to possess better grain quality than existing local varieties (particularly whiter color and, lower susceptibility to breakage during milling). In addition, some of the NERICAs have been identified to have the same or even better cooking and eating characteristics than most types of imported rice available in West Africa.

necessary to valorize the *Oryza glaberrima* resource through genetic and agronomic improvement of its cultivars as well as to explore the yield potential of the Asian rice species, *Oryza sativa*. A research program has been carried out in Burkina Faso since 1999 on introduced breeding lines, which include hybrids from interspecific crosses between *Oryza sativa* L. and *Oryza glaberrima* St.) and intraspecific crosses (*O. sativa* x *O. sativa*).

The objective was to identify high yielding varieties resistant to environment constraints such as diseases and insect pests as well as climatic and edaphic factors. The research team tapped into the African rice for traits of resistance to major lowland stresses, particularly rice yellow mottle virus (RYMV). The *sativa indica* varieties (traditional irrigated or lowland rice) were used in the crosses instead of the *japonica* (traditional upland rice). Some of the progeny combined the best features of both parents: the droopy leaves and vigorous early growth (associated with weed-competitiveness) typical of the African rice and the high number of spikelets (indicating productivity) of the Asian rice. The crosses successfully transferred resistance to RYMV into some of the progeny.

Both farmers and scientists through PVS made selections from the introduced breeding lines. Over four years of

experimentation, several advanced lines showed consistent performance resulting in the release of four named NERICAs (Table 1).

Selection criteria inevitably vary from one farmer to another but involvement of a large number of farmer-selectors ensures that the final choices made do indeed reflect just what is most acceptable to a wide range of rice growers. The farmers at the Sowe PVS trial site in Burkina Faso altered their selection criteria between visits. On their first visit (Fig. 1), they ranked tillering ability, size, color and plant recovery ability as their most important reasons for choosing particular lines. Next time they came, they selected panicle weight as the prime determinant of plant yield and vigor. Although plant growth stage was clearly a major influence on their choice, it was nevertheless possible to draw overall conclusions about the varieties when the results of the different selection times were combined.

Among the characteristics of the new released varieties, their height is shorter and cycles similar to that of the check (FKR 14). But there is an improvement in grain size and quality, particularly for FKR 60N and FKR 62N, which are larger and thinner. All four new varieties have higher 1000-grain weights compared to that of the check.

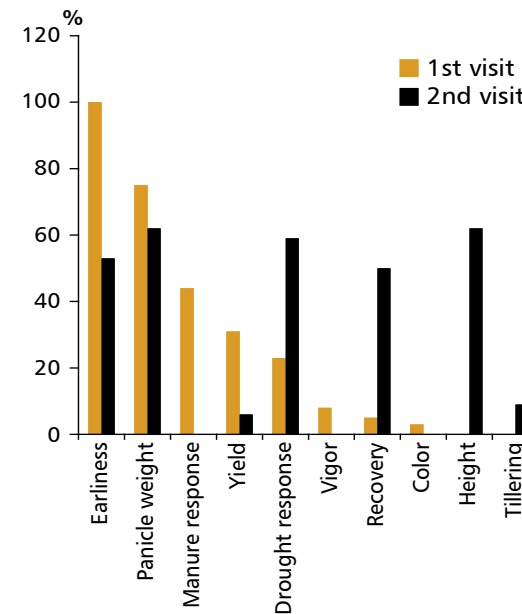


Figure 1. Most important reasons for farmers' variety choices.

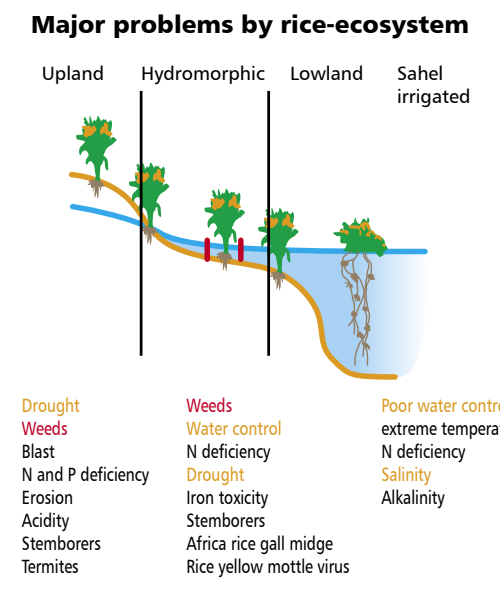


Figure 2. How constraints to rice production pan out across ecosystems.



The yield potential of some Lowland NERICAs can reach 6-7 tonnes/ha.



Well-filled panicles are what every grower wants to see in his or her field.