

NERICA IMPACT AND ADOPTION IN SUB-SAHARAN AFRICA

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Background information

Since 1996 rice farmers in many countries in West, Central, East and Southern Africa have been exposed to NERICA varieties. Have they made any difference in the lives of these farmers?

The Africa Rice Center (WARDA), in collaboration with its NARS partners, initiated studies on the impact of NERICA rice adoption in nine countries of West Africa, comprising Benin, Côte d'Ivoire, The Gambia, Ghana, Guinea, Mali, Nigeria, Sierra Leone and Togo. By 2006 the studies were completed in Benin, Côte d'Ivoire and Guinea.

Below are summarized the major findings from the aforementioned studies are summarized below.

Unit 1 – NERICA diffusion and adoption

In Côte d'Ivoire, a low diffusion rate (9%) limited the adoption of the NERICA varieties to only 4% in the year 2000. But the adoption rate in the population could have been up to 27% had the whole population been exposed to the NERICA technology (Diagne, 2006a).

The rate of NERICA diffusion was 39% in Guinea, a diffusion rate much higher than that in Côte d'Ivoire. The NERICA population potential adoption rate (were all the farmers in Guinea exposed to the NERICA) is 58%, double the actual adoption rate of 23% observed in the sample (Diagne *et al.*, 2006a). Up to 53% of farmers who were exposed to NERICA lines had adopted them in 2001. The total area under NERICA varieties in Guinea has been estimated to be 28,000

hectares in 2002 and 51,000 hectares in 2003 (Diagne *et al.*, 2006b). The total area planted to NERICA varieties is growing fast and has quickly surpassed that covered by the modern varieties of the Institut de Recherches Agricoles de Guinée – IRAG. The total estimated area in 2006 was, however, but a third of the potential area had all farmers known about NERICA varieties and had access to seed.

In Benin, the NERICA diffusion rate in 2004 was 26%. NERICA varieties were adopted by 18% of the sample of 304 rice farmers surveyed in 24 villages in 2004; this adoption rate was three times lower than estimated potential adoption rate of 57%. Up to 68% of farmers who were exposed to NERICA varieties in Benin in 2004 adopted them. About 2000 hectares were estimated to be under NERICA lines in Benin in 2003. The potential area under NERICA varieties in 2003 (had all farmers known about the NERICA breakthrough) was estimated to be 5500 hectares (Adegbola *et al.*, 2006).

Unit 2 – Determinants of NERICA adoption

The results of the econometric analysis of the socioeconomic determinants of NERICA adoption in Côte d'Ivoire show that the main factors which affected the adoption of NERICA varieties (i.e. with estimated effects statistically significant at the 5% level) were growing rice partially for sale (positive impact), household size (positive), age (negative impact), having a secondary occupation (negative impact), growing upland rice (positive impact), and past participation in PVS trials (positive impact) and living in a PVS-hosting village (positive impact) (Diagne, 2006b). In Guinea, the main socioeconomic determinants of NERICA adoption with positive effects were participation in a training program and living in a village where the NGO SG2000 has previously had activities (Diagne *et al.*, 2006b). In Benin, the main socio-economic determinants with positive effects were land availability and living in a PVS-hosting village. In addition to the analysis of the socioeconomic determinants

of NERICA adoption, it was also found in Benin that varietal attributes such as swelling capacity and short growing cycle were important determinants of NERICA adoption (Adegbola *et al.*, 2006).

The policy implication of the empirical findings regarding the important role played by PVS both in the diffusion and adoption of the NERICAs and both within and outside the populations involved in the trials goes beyond the endorsement and promotion of PVS as an effective tool for technology development and dissemination. Indeed, the finding that the mere conduct of PVS trials in a community promotes the adoption of NERICA varieties beyond the subpopulation participating in the trials points to a possible strategy for scaling up PVS: focus on covering more villages with relatively few PVS participants per village (i.e. inter-village scaling up) and let the naturally-occurring phenomenon of “social learning” about the characteristics of a technology do its work within the village community (i.e. the intra-village scaling up).

Unit 3 – Impact of NERICA adoption

In Côte d’Ivoire, the NERICA impact assessment results show the impact of NERICA adoption on the average yield of rice to be heterogeneous, with a sizable and statistically significant impact found for female farmers (+741 kg/ha) and no statistically significant impact found for male farmers (Diagne 2006b). The results also suggest that a large number of farmers, especially those in the forest ecology, adopt the NERICA not because of its yield potential but because of its non-yield varietal attributes such as its short growth cycle, height, and consumption and grain qualities.

In Guinea, the results of the analysis of the impact of the introduction of NERICA technology on rice biodiversity shows that the relatively high level of NERICA adoption has not led to a concomitant reduction in the number of pre-existing cultivated rice varieties (Barry *et al.*, 2006). It appears that because of their short duration, the NERICA

varieties are used by farmers as a complement to traditional varieties and thus enhance the varietal diversity of rice.

In Benin, the results of the analysis of data for the 2003 season show that the impact of adoption of NERICA varieties is significant and positive for the yield, production and incomes of producers. Indeed, an additional rice yield gain of 1587 kg per hectare was achieved by NERICA-adopting farmers, giving them a *per capita* rice production gain of 109 kg and additional income of 14 100 FCFA (\approx USD 28) respectively. However, the impact at the national level was very limited because of the present limited diffusion of the NERICA varieties in Benin (Adegbola *et al.*, 2006). Results from another analysis based on data from the 2004 season show that the impacts of NERICA adoption are higher for women than for men. Women potential adopters have a surplus of production of 850 kg of paddy per hectare compared to 517 kg per paddy for men, and an additional gain of 171 978 FCFA (\approx USD 337) per hectare compared to 141 568 FCFA (\approx USD 277) for men (Agboh-Noameshie *et al.*, 2006). Yet another study on the impact of NERICA technology on child schooling in Benin found NERICA adoption to result in a 6% increase in school attendance rate, a 14% increase in the gender parity index and a 11 400 FCFA (\approx USD 20) increase in school expenditure per child (Adekambi *et al.*, 2006).

The impact of adoption of NERICA rice on consumption spending, calorie intake and poverty was also assessed by Adekambi *et al.*, (2006). This study found that NERICA adoption had a positive impact on household spending per equivalent adult (+147.51 FCFA/day \approx USD 0.30). The highest impact was observed in female-headed households (161.75 FCFA/day \approx USD 0.32 compared to 128.34 FCFA/day \approx USD 0.26 for male-headed households). However, the difference between the two groups is not statistically significant.

In addition, the spending deficit ratio of the poor has been reduced by 19%, proving that NERICA adoption has led to an improvement in

the living conditions of poor households, reducing the gap between their expenditure and the poverty line by 19%. The NERICA varieties also led to an improvement in daily calorie intake of 35.82 kcal per equivalent adult (significant at the 10% level).

In the East African country of Uganda, rice was little grown until recently. The country became an early adopter of NERICA technology, and today rice is a cash crop for Ugandan growers. A NERICA-promoting program has been undertaken as one of the major poverty eradication measures. An empirical analysis of NERICA impact on the income of rural households in the country attempted to compare actual crop income with the hypothetical income without NERICA varieties. This study revealed that on average a shift from maize to NERICA varieties with proper crop rotation increased income by between USD 273 and USD 481 per hectare. The introduction of NERICA rice varieties in Uganda tends to improve the incomes of rural households in the country and is seen as a significant entry point for poverty reduction (Lodin, 2005; Kijima *et al.*, 2006).

Table 21. Summary results of the adoption and impact studies in Benin, Côte d'Ivoire, and Guinea.

Category	Benin	Côte d'Ivoire	Guinea
Average adoption rate of NERICA by farmers in sample (year)	18% (2004)	4% (2000)	23% (2001)
Average adoption rate, had all farmers been exposed to NERICA (year)	50% (2004)	27% (2000)	58%
Percentage of farmers adopting after being exposed to NERICA varieties (year)	68% (2004)	38% (2000)	53% (2001)
NERICA diffusion rate – % exposed to NERICA rice (year)	26% (2004)	9% (2000)	39% (2001)

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Estimated area under NERICA rice (year)	1995 ha (2003)	-	51,000 ha (2003)
Average NERICA impact on rice yield (year)	1,587 kg/ha (2003)	276* kg/ha (2000)	.085* kg/ha (2003)
Average NERICA impact on <i>per capita</i> rice production per year	109 kg/capita (2003)		
Average NERICA impact on <i>per capita</i> rice income per year	14,100 CFA (≈\$28) (2003)		
Average NERICA impact on yield for female farmers (year)	850 kg/ha (2004)	741 kg/ha (2000)	
Average NERICA impact on yield for male farmers (year)	517 kg/ha (2004)	-134* g/ha (2000)	
Average NERICA impact on income for female farmers (year)	171,978CFA/ha (≈\$337/ha)	-	-
Average NERICA impact on income for male farmers (year)	141,568CFA/ha (≈\$277/ha)		
Average NERICA impact on child school attendance rate	6% (2004)		
Average NERICA impact on the child school gender parity index	14% (2004)		
Average NERICA impact on school expenditure per child	11,400 CFA (≈ \$20) (2004)		
Average NERICA impact on total daily consumption expenditure per adult equivalent	148 CFA (≈ \$0.30) (2004)		
Impact on daily calories intake per adult equivalent	36 kilocalories (2004)		
Impact on the consumption expenditure deficit ratio (compared to the poverty line)	-19% (2004)		

* Not statistically different from zero at the 5% level