Impact evaluation differentials of adoption of nerica on area cultivated, yield and income of rice producers, and determinants in Nigeria

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ABSTRACT

Adoption of new agricultural technology has different impacts. This study analyzed the different impacts of NERICA adoption on rice producers in Nigeria using the treatment effect estimation approach. It was a cross-sectional survey of 621 rice farmers through a multistage sampling procedure. Although a high percentage of rice farmers were aware of two main NERICA lines: NERICA I (82 percent) and NERICA II (76 percent), the actual adoption rate of these varieties is still very low (57%) in Nigeria. To control for endogeneity, the study used the local average treatment effect estimation methodology and the results showed that NERICA adoption significantly increased the area planted of rice by farmers,yield, and total farm income. The positive impact of NERICA adoption on rice yields and total farm income of farmers respectively is a clear indication that NERICA has the potential to increase rice productivity, reduce poverty and food insecurity. NERICA cultivation should still be further encouraged to rice farmers through the extension agents so as to raise rice yield, reduce rice importation and ensure a sustainable production.

Keywords: Counterfactual framework, sustainable production, productivity, farmers" welfare.

PAPER

1. Introduction

Rice is an extremely important food and cash crop in Nigeria. This strategic commodity is the fourth largest cereal crop grown in the country behind sorghum, millet and maize. Rice is widely cultivated under diverse ecosystems and a wide variety of climatic and soil conditions (rainfed lowland, irrigated lowland, mangrove swamp, upland)with a total annual production of about 2 million metric tons (MT). This annual production is far less than the total national rice consumption which exceeds 5 million MT per year, or more than 30 kg per capita per annum leading to an annual importation of about 2.5-3 million MT (USAID, 2009).Adoption of new technologies is an important issue developing countries have to put into consideration in order increase farm productivity. This study presents the empirical findings from Nigeria on the impact of NERICA adoption.

The study is necessary because it approaches the problem of estimation of adoption rates and their determinants from the perspective of modern evaluation theory (Imbens and Wooldridge, 2009; Imbens, 2004; Wooldridge, 2002; Heckman and Vytlacil 1999; Angrist et al., 1996).

2. Research Methodology

This study draws its methodology from previous surveys conducted in other West African countries. These include among others:Wiredu et al., 2014 in Ghana; Ojehomon et al., 2012, Awotide et al. 2012, Dontsopet al., 2011 in Nigeria; Diagne et al., 2009a,b, Diagne, 2006 in Cote D„Ivoire; Spencer et al., 2006, Diagne et al., 2007 in Guinea.

This study was conducted in selected states in Nigeria, in 2012. The states were: Kaduna (located in the Northwestern Nigeria), Nasarawa (located in the Northcentral Nigeria), Ondo Osun, Ogun and Ekiti States (located in the Southwestern Nigeria). Data for the study were generated mainly from primary sources. The primary data were collected using a Focus Group Discussion across the rice growing communities to obtain prior information on their livelihoods and rice farming system. The semi-structured questionnaire was also administered to elicit information on the farmer"s socio-economic conditions, the farm"s characteristics, participation in the new rice variety selection, and experience with NERICA adoption, farm productivity, and income etc.

2.1 Sampling procedure

A multi-stage random sampling technique was used to select rice farmers from the six baseline states. The six states were selected purposively because no study as far as we know has evaluated the adoption

rate of this variety in all the baseline states in Nigeria since the official release in 2005. In the second stage (due to the difficulty of getting the list of rice-producing farmers in the selected states as a result of lack of rice farmers" census), the lists of all the rice growing Local Government Areas (LGAs) where rice is grown and NERICA seeds have been disseminated were collected from the respective Agricultural Development Programme (ADPs) officers. This was followed by a random selection of the villages where NERICA dissemination activities have taken place, known as PVS villages. For every two NERICA villages selected, one adjacent village (that is within 15 to 20km radius) where NERICA is yet to be disseminated was also randomly selected as control. The selections were based on the fact that the more the number of control villages in the research sample, the more the number of non-adopters that is expected to be selected. The distance was chosen because the closer the non NERICA village is to the NERICA village, the greater the possibility of farmers" knowledge of the variety through other means apart from official means of dissemination. In each state, six villages were selected (two PVS villages and one non-PVS village per LGA). The chance of selecting a non-PVS village was based on the selection of a NERICA village within that vicinity. The selection of the PVS villages within each state was based on the ADP zones. However, non- rice producing ADP zones were not selected.

The third stage of the sampling involved the random selection of at least a hundred (100) rice farmers in each of the selected states. A total of 12 LGAs and 36 villages were selected for the study; and a total of 621 rice farmers were selected from the list of rice farmers in selected villages. The distribution of rice farmers interviewed per selected villages was based on the availability of rice farmers" guided by the NERICA field extension worker covering the selected villages. The sample size would have been based on the population size of rice farmers but this was not available.

2.2 Econometric procedures

This study used treatment effect estimation approach (counterfactual framework)to determine the impact of NERICA adoption on rice farmer"s income, yield, expenditure and per capita expenditure. The choice of this approach was based on the ability of the methods to produce consistent estimates (Imbens and Wooldridge, 2009). Also, we used the framework in order to overcome "non-exposure" bias and "selection" bias of the traditional procedures.This approach detects two important sources of bias in the estimation of treatment effects. These include the initial differences between on adopters and non-adopters in the absence of treatment, and the difference between the two groups. The parameters of interest are the average treatment effect (ATE) which is the expected effect of treatment on a randomly drawn person from the population, the average effect of the treatment on the treated (ATT) which represents the mean effect for those who actually participate in the treatment, and the average effect of treatment on the untreated (ATU) that measures the expected treatment effect for an individual drawn from the population of non-participants. By the counterfactual outcome framework a randomly selected rice producing household had two potential outcomes of adopting NERICA varieties .That is

$$Y = Y_1 \, if T = 1 \, and Y = Y_0 \, if T = 0 \text{ ----------1}$$

In equation 1, Y is the outcomes of interest such as total farm income. T is the adoption status. For the sample of randomly selected rice producing households the average effect of adoption, which is also known as ATE is generally given by:

$$ATE = E(Y_1 - Y_0) \text{ ----------2}$$

Differences in knowledge and access to information, physical accessibility as well as socioeconomic condition were expected to present unequal opportunities for adoption (Tambo and Abdoulaye, 2011). The impact parameter given adoption status, also known as the ATT is also given by:

$$ATT = E(Y_1 - Y_0) \,|T = 1) \text{----------3}$$

In this study access to the NERICA varieties was considered the most satisfactory condition for adoption. However, it was possible that some farmers had access to the seeds but did not plant the seeds. This implies that some farmers may have complied while others did not comply. In this case the impact on the farmers who received the seeds and subsequently planted, which is the local average treatment effect (LATE) is a more useful estimate of impact.

The non-parametric LATE framework was used to estimate the causal effect of the adoption of NERICA on total farm income, yield, expenditure, poverty status. The LATE parameter was expressed as;

$$LATE = E(Y_1 - Y_0)|P = 1, T = 1) \text{----------4}$$

In addition to NERICA adoption, the incomes of the rice producers were assumed to be also affected by some exogenous factors, X, such that the potential outcomes of adoption in terms of X and the unaccounted factor, μ, was given by

$$Y = Y_1 = X\beta_1 + \mu_1 if T = 1 \; and Y = Y_0 = X\beta_0 + \mu_0 \; if T = 0 \text{----------5}$$

The LATE was re-expressed as:

$$LATE = X\beta_1 - X\beta_0 + E(\mu_1 - \mu_0 | \, X, T = 1, P = 1) \text{----------6}$$

Subsequently, the observed income, $= Y_1 + Y_0$, was expressed following Wiredu *et al.,* (2014) in terms of the LATE as:

$$Y = X\beta_0 + T * LATE + \varepsilon_{LATE} \text{----------7}$$

The estimation of the LATE parameter in equation 7 followed a two stage instrumental variable regression procedure In the first stage a model of adoption was estimated with access to seeds of NERICA, P, as an instrument, W, as additional explanatory variables, and γ, as coefficient estimates. The model for adoption was specified as:

$$Prob(T = 1) = \emptyset(PW_\gamma) \text{----------8}$$

The second stage involved the estimation of the LATE model with the predicted probability of adoption. The model was also specified as;

$$Y = X\beta_0 + \hat{T} * LATE\ (X) + \varepsilon_{LATE} \text{----------9}$$

To analyze the various factors influencing the adoption of NERICA, we employed the ATE-Probit model.

$$T = E\,(y \mid x, w) = \alpha w + \delta w\,(x\text{-}X) \text{ ----------11}$$

Where T = Status of adoption(1 = if adopted and 0 otherwise); y = outcome of exposure to treatment; w = a binary indicator variable for NERICA exposure (w =1 indicates exposure and w = 0 otherwise.); x = a vector of explanatory variablesX_1 = the gender of farmers (1 = male and 0 = female); X_2 = the age of farmers (years); X_3 = Education of farmers (1 = formal education and 0 Otherwise); X_4 = the Household size which is the number of people living under the same roof; X_5 = past participation in PVS trials (PVS participation = 1 and 0 otherwise); X_6 = contact with extension agent where (extension contact = 1 and 0 otherwise); X_7 = access to phone (where access to phone = 1 and 0 otherwise); X_8 = growing upland rice (growing upland=1, and 0 otherwise); X_9 = growing lowland rice (lowland rice = 1 and 0 otherwise); X_{10} = Distance to market (km); X_{11} = No of livestock; X_{12} = Kaduna State dummy (Kaduna state =1 and 0 otherwise); X_{13} = Ekiti State dummy(Ekiti State =1, otherwise 0); X_{14} = Nasarawa State dummy (Nasarawa = 1 and 0 otherwise); X_{15} = Ogun State dummy (Ogun =1 and 0 otherwise); X_{16} = Access to radio (access to radio =1 and 0 otherwise); X_{17} = access to television (access to television =1 and 0 otherwise); X_{18} = Ondo State dummy (Ondo=1 and 0 otherwise); X = vector of sample means of x; α and δ = are the parameters to be estimated

3. Results and Discussion

3.1 Adoption rates of NERICA varieties

The actual adoption rate of was 57 percent (Table 1). Across the individual states, the actual adoption rate was 77 percent, 67 percent, 62 percent, 62 percent, 47 percent and 8 percent in Ondo, Ekiti, Nasarawa, Ogun, Kadunaand Osun States respectively. The potential population adoption rate (ATE), which represent the true demand for NERICA varieties by the target population was estimated to be 80 percent for the study area, and 98 percent, 90 percent, 86 percent, 84 percent, 82 percent and 13 percent in Nasarawa, Ondo, Ekiti, Ogun, Kaduna, and Osun States respectively. This suggest that if the whole population was aware of, and have access to NERICA seed before the time of the survey, the NERICA adoption rate in the study area (Nigeria) could have been 80 percent instead of the actual 57 percent. Thus, for entire study area (six states), the estimate of the population adoption gap is accordingly 23 percent, and is statistically significant at 1 percent level. The corresponding estimates of the population

adoption gap (i.e., the non-awareness bias) for Nasarawa, Kaduna, Ogun, Ekiti, Ondo, and Osun States are 36 percent, 35 percent, 22 percent, 19 percent, 14 percent, and 5 percent respectively, and all are statistically significant at 1 percent level. At the time of this study, the adoption rates among the NERICA exposed subpopulation (ATE1) in the study area was 81 percent while in Nasarawa, Ondo, Ekiti, Ogun, Kaduna, and Osun States, the adoption rate were estimated to be 98 percent, 90 percent, 86 percent, 85 percent, , 83 percent and 12 percent respectively.It is also instructive to compare adoption rates estimated in this study with estimates from other studies conducted in Nigeria and elsewhere in Africa. Although the adoption rate of 57 percent was considerably higher than the 4 percent reported by Diagne (2006) for Cote d"Ivoire, greater than 18 percent reported by Adegbola et al., (2005) for Benin republic, 30 and 40 percent reported for Ekiti and Kaduna (Nigeria) States respectively by Spencer et al., (2006), and 20 percent reported by Dontsop et al.,(2011) for Osun State (Nigeria), the 23 percent adoption gap estimates imply that there is still a potential for significantly increasing NERICA adoption rates in Nigeria.

3.2 Comparative farm-level economic benefits from NERICA adoption

The difference statistical test shows a productivity difference in NERICA yields and also a difference in variable production costs between adopters and non-adopters (Table 2). NERICA adopters were about 14 per cent more productive compared to the non-adopters. Variable costs for adopters were 61.6 percent lower than non-adopters on average, suggesting greater benefits from this source. The simple comparisons between adopters and non-adopters demonstrate that the adopters are distinguishable in terms of considerably higher NERICA net income. This result agrees with the finding of Ojehomon et al., (2012) who reported that investment in NERICA rice production in Ekiti State, Nigeria is more profitable than the other non-NERICA varieties grown in the area. This suggests that NERICA can really be considered as a poverty alleviating crop (Table 3).

Table 2 - Comparative physical and economic benefits in NERICA Adopters production in Nigeria

Variables	Adopters (n =292)	Non-adopters (n=329)	Difference (percent)
Area cultivated (ha)	2.6	1.5	1.1 (42.3)***
Yield (Kg /ha)	1412.0	1220.9	191.1(13.5)
Gross value of production ('000 ₦/ ha)	358.4	221.9	136.5 (38.1)***
Variable costs ('000 ₦/ ha)	8667.7	3330.1	5337.6(61.6)***
NERICA net-income ('000 ₦/ ha)	663.9	274.8	389.1(58.6)***

Note: The figures in parenthesis are in percentage

Table 1: Estimation of Population Adoption Incidence Rates

Variables	Ekiti	Kaduna	Nassarawa	Ogun	Ondo	Osun	Pooled sample
ATE	0.859***	0.815***	0.980***	0.839***	0.904***	0.132***	0.799***
	(0.038)	(0.041)	(0.017)	(0.043)	(0.031)	(0.034)	(0.017)
ATE1	0.859***	0.834***	0.983***	0.852***	0.904***	0.120***	0.810***
	(0.038)	(0.041)	(0.015)	(0.039)	(0.031)	(0.031)	(0.015)
ATE0	0.860***	0.790***	0.976***	0.806***	0.908***	0.157***	0.775***
	(0.042)	(0.063)	(0.021)	(0.058)	(0.034)	(0.051)	(0.025)
JAA	0.667***	0.467***	0.624***	0.622***	0.766***	0.084***	0.569***
	(0.029)	(0.023)	(0.010)	(0.029)	(0.026)	(0.022)	(0.011)
GAP	-0.192***	-0.348***	-0.356***	-0.218***	-0.138***	-0.048***	-0.230***
	(0.009)	(0.028)	(0.008)	(0.016)	(0.005)	(0.015)	(0.007)
PSB	-0.000 (0.004)	0.019 (0.018)	0.003 (0.004)	0.012 (0.009)	-0.001	-0.012	0.010* (0.005)
					(0.002)	(0.011)	
Observed							
NE/N	0.777***	0.560***	0.635***	0.730***	0.848***	0.700***	0.703***
	(0.412)	(0.048)	(0.047)	(0.045)	(0.035)	(0.046)	(0.020)
NA/N	0.631***	0.468***	0.644***	0.620***	0.762***	0.060***	0.569***
	(0.048)	(0.048)	(0.048)	(0.0488)	(0.042)	(0.024)	(0.021)
NA/NE	0.813***	0.836***	0.985***	0.849***	0.899***	0.086***	0.809***
	(0.062)	(0.086)	(0.076)	(0.067)	(0.049)	(0.034)	(0.030)
N	103	109	101	100	105	100	552
NE	80	61	66	73	89	70	388
NA	65	51	65	62	80	6	314

Note: Figures in parentheses are standard errors.
ATE = Population potential adoption rate; ATE 1 = Adoption rate among exposed and access to seed; ATE0 = Adoption rate among non-exposed; JAA = Actual adoption rate; GAP = JAA – ATE ; PBS = Population selection bias ; N = number observed
NE = number of exposed; NA = number of adopters
*** = $p < 0.01$ ** = $p < 0.05$ * = $p < 0.10$

Table 3 - Comparative economic benefit of NERICA production (disaggregated by sampled States)

Variables	Kaduna State		
	Adopters (n =51)	Non-adopters (n=58)	Difference (percent)
Area cultivated (ha)	1.3	1.1	0.2(15.4)
Yield (Kg per ha)	2324.1	2272.4	51.7 (2.2)
Gross value of production ('000 ₦/ ha)	261.8	271.1	-9.3(3.6)
Variable costs ('000 ₦/ ha)	4.8	3.7	1.1 (22.9)***
NERICA net-income ('000 ₦/ ha)	252.2	229.7	22.5(8.9)
	Nasarawa State		
	Adopters (n =65)	Non-adopters (n=36)	Difference (percent)
Area cultivated (ha)	3.1	2.1	1.0(32.3)***
Yield (Kg per ha)	1061.0	1330.3	269.3(25.4)
Gross value of production ('000 ₦/ ha)	310.3	212.2	98.1(31.6)***
Variable costs ('000 ₦/ ha)	31.0	21.2	10.2(31.6)
NERICA net-income ('000 ₦/ ha)	324.9	201.7	123.2(37.9)
	Ogun State		
	Adopters (n = 62)	Non-adopters (n=38)	Difference (percent)
Area cultivated (ha)	1.9	1.5	0.4(21.1)
Yield (Kg per ha)	1811.9	1433.8	378.1(20.9)***
Gross value of production ('000 ₦/ ha)	474.4	413.7	60.7(12.8)
Variable costs ('000 ₦/ ha)	285.2	237.7	47.5 (16.7)
NERICA net-income ('000 ₦/ ha)	192.5	160.6	31.9(16.6)
	Ekiti State		
	Adopters (n =65)	Non-adopters (n= 38)	Difference (percent)
Area cultivated (ha)	4.3	3.6	0.7(16.3)
Yield (Kg per ha)	1379.9	1315.7	64.2 (4.7)
Gross value of production ('000 ₦/ ha)	379.9	357.9	22.0 (5.8)
Variable costs ('000 ₦/ ha)	449.9	274.3	175.6(39.0)**
NERICA net-income ('000 ₦/ ha)	126.7	38.1	88.6(69.9)
	Ondo State		
	Adopters (n =80)	Non-adopters (n= 25)	Difference (percent)
Area cultivated (ha)	2.3	2.1	0.2(8.7)
Yield (Kg per ha)	754.6	990.4	-235.8 (31.2)
Gross value of production ('000 ₦/ ha)	375.2	296.4	78.8(21.0)
Variable costs ('000 naira per ha)	6139.6	3484.8	2654.8 (43.2)
NERICA net-income ('000 ₦/ ha)	532.7	329.1	203.6(38.2)

Table 3 segue **- Comparative economic benefit of NERICA production (disaggregated by sampled States)**

	Osun State		
	Adopters (n =6)	Non-adopters (n=94)	Difference (percent)
Area cultivated (ha)	0.6	0.5	0.1(16.7)
Yield (Kg per ha)	425.0	505.1	-80.1 (18.8)
Gross value of production ('000 ₦/ ha)	48.5	45.3	3.2(6.6)
Variable costs ('000 ₦/ ha)	114.0	547.8	-433.8 (380.5)
NERICA net-income ('000 ₦/ ha)	642.9	447.7	195.2(30.4)

Note: The figures in parenthesis are in percentage

3.3 Determinants of NERICA adoption in Nigeria

In Table 4, the results of the log-likelihood of -122.3, the Pseudo R2 of 0.353 and the LR (chi2) of 0.0000 (significant at 1 percent level), imply that the overall model fitted and the explanatory variables used in the model collectively explain the adoption of NERICA decision among the rice farming households in Nigeria. The analysis showed that only gender and farmers access to radio were statistically significant. Men were more aware of NERICA than the women probably due to the large difference between men and women in rice farming in Nigeria (84 percent to 16 percent as indicated). This is in line with Dontsop et al.,(2011) findings who observed that though women were more likely to be aware of NERICA existence in Osun, Niger and Kaduna States of Nigeria, their men counterpart were most likely to adopt NERICA. The findings of the study also revealed that farmers that did not have access to radio were more likely aware of NERICA than those that have radio. This result however differs from other countries in Africa such as Côte d'Ivoire where factors like the household size, growing upland rice, past participation in PVS trials, age of the farmers have significant effects on adoption of NERICA (Diagne 2006).

The marginal effect shows that a unit decrease in number of those that have access to radio leads to 0.13 decreased in the likelihood of being aware of the NERICA varieties (Table 4). The significance of the dummy variables (Ekiti, Nasarawa, Ogun, Kaduna and Ondo) at 1 percent level in positive direction in Table 4 is an indication that there are differences in the determinants of NERICA adoption across the states in the study area. This result corroborate with the information obtained from the Focus Group Discussions (FGDs) in Sabon-Girke (Pako) in Igbebi Local Government Area (one of the PVS villages) of Kaduna State that farmers preferred, and adopt NERICA due to its high productivity and market value Similarly, in Ondo State, the outcome of the FGD at Eleyowo village showed that farmers adopt and preferred NERICA to other rice varieties due to its early maturity and its high yield, short stature, stability, and inability of the paddy to get dislodged before harvest and even after maturity. In Nasarawa State, the FGD revealed that farmers adopt NERICA because of the low fertilizer requirements; high tolerant to most diseases, better tastes, better than other cultivars and early maturity given room to farmers to harvest two to three times a year

Table 4 - Determinants of adoption of NERICA

Variables	Coefficient	Marginal effect
Constant	-1.5116** (0.7516)	
Gender	0.5509** (0.2306)	0.1437** (0.0681)
Age	0.0031 (0.0088)	0.0007 (0.0019)
Educational level	0.1236 (0.1812)	0.0262 (0.0374)
Household size	-0.0333 (0.0231)	-0.0072 (0.0049)
Access to credit	-0.2268 (0.2296)	-0.0508 (0.0544)
Contact to NGO extension services	0.1171 (0.2557)	0.0245 (0.0521)
Source of credit	-0.1739 (0.2062)	-0.0385 (0.0464)
Past participation in. PVS trials	0.2905 (0.2345)	0.0597 (0.0464)
Distance to market	0.0185 (0.0138)	0.0040 (0.0030)
Mobile phone	0.1180 (0.2121)	0.0263 (0.0484)

Table 4 segue **- Determinants of adoption of NERICA**

Access to radio	-0.9744 ** (0.4422)	-0.1256*** (0.0320)
Access to television	0.1972 (0.2343)	0.0447 (0.0560)
No of livestock	-0.0733 (0.2137)	-0.0157 (0.0450)
Growing upland rice	0.4327 (0.3007)	0.1038 (0.0797)
Growing lowland rice	0.3838 (0.2652)	0.0810 (0.0558)
Ekiti dummy	2.5902*** (0.3966)	0.2483*** (0.0393)
Kaduna dummy	2.2023*** (0.4325)	0.2407*** (0.0413)
Nasarawa dummy	3.4473*** (0.5765)	0.3109*** (0.0390)
Ogun dummy	2.2628*** (0.4152)	0.2419*** (0.0421)
Ondo dummy	2.7148*** (0.3962)	0.2726*** (0.0418)
Sample size = 388		
LRchi^2 = 0.0000		
Pseudo R^2 = 0.3533		
Log Likelihood = -122.2629		
Wald Chi^2 = 92.74		

NB: Figures in parentheses are robust standard errors. *** = $p < 0.01$ ** = $p < 0.05$

4. Conclusion and Recommendations

This study explored the impact of new agricultural technology (NERICA) on farm yield, total farm income/expenditure in Nigeria. The study uses the average treatment framework for its estimations. The key findings reveal that the Nigerian government is promoting the adoption of the new rice varieties to help boost rice production through her rice transformation agenda. Average farm size for NERICA farmers is 2.6ha. This shows that in spite of evident of the adoption of NERICA varieties; rice production in Nigeria is still at the small scale level. The adoption of NERICA varieties was observed as being relatively high in the study area compared to the reported values for other countries such as Côte d"Ivoire (9% by Diagne, 2006). Adoption of NERICA significantly increase (at 1percent level) the area of land cultivated, farm output, yield, household expenditure, per capita expenditure and total farm income. The positive impact of NERICA adoption on rice yields is a clear indication that NERICA has the potential to increase rice productivity significantly among NERICA farmers. The positive impact on income signifies that NERICA has potential to reduce poverty while the significant effects on food expenditure reveals that NERICA can help solve food insecurity. NERICA adoption has great potential for poverty reduction and improved livelihood of rice farmers in Nigeria. The estimates for the sub-population of exposed farmers (ATE1) and that of the non-exposed farmers (ATE0) suggest that there is still a potential for significantly increasing NERICA adoption rates in Nigeria. The federal, state and local governments in collaboration with agricultural research institutes and other NGOs should upgrade rice farmers" knowledge base, improve knowledge sharing, and close the gap between science, technology and innovation and development practice in order to make the best use of NERICA technology.

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