

Nitrogen-Use Efficient, Water-Use Efficient and Salt-Tolerant Rice Project



NEWEST  Nitrogen & Water Efficient
Salt Tolerant Rice





Background

Sub-Saharan Africa (SSA) has for the last two decades been experiencing a continuous increase in rice consumption driven mostly by a shift in consumer preferences, urbanisation and rapid population growth. Rice has therefore become a staple of considerable strategic importance, of which its growing demand poses an economic challenge for the continent. Annual rice consumption in SSA stands at 24.3 million tonnes while production is estimated at 12.5 million tonnes (MT) of milled rice, most of which is produced by smallholder farmers.

With the exception of a few countries which have attained self-sufficiency, rice demand exceeds production in most of SSA and large quantities of the grain continue to be imported to meet domestic demand. Overall, imported rice accounts

for about 40 percent of SSA local rice consumption. This translated to about 12.0 million metric tonnes in 2012 valued at over US\$ 5 billion. The United Nations Food and Agriculture Organization (FAO), forecasts that the world's largest increase in rice consumption over the next 10 years will occur in Africa.

The current insufficient rice production affects the well-being of over 20 million smallholder farmers who depend on rice as a staple. SSA countries are spending more than US\$ 5 billion annually on rice imports. The rice production deficit along with the subsequent large outflow of foreign exchange presents a great development challenge to governments and development agencies in SSA.

24.3 million tonnes...SSA annual rice consumption
12.5 million tonnes...Annual rice production in Sub-Saharan Africa

Improving rice productivity in Africa

Africa's annual rice production of 12.5 million tonnes and its consumption of 24.3 million tonnes creates a deficit of 12 million tonnes that affects over 20 million smallholder farmers who depend on it as a staple.

Low yields experienced by farmers are responsible for the rice imports in SSA where over 40 percent of the rice consumed today is imported. The average grain yield in Africa (2.2 t/ha) is below the world average (3.4 t/ha) by 49 percent and several factors account for this low yield.

Soil nitrogen deficiency has been cited as a major constraint to rice production. Nitrogen deficiency is mostly acute in the highly weathered upland areas where an average yield of only one tonne per hectare, which is about 25 percent of yield potential, has been recorded. Also, nitrogen is difficult to retain when applied in lowland areas due to floods and flowing water that characterise such areas. A major concern that constraints rice production in nitrogen deficient soils is the inability of farmers to buy fertilisers to address this constraint, and when they buy, they can hardly afford the required rate for optimal yield. Improving the nitrogen use efficiency (NUE) of rice is one means of overcoming these limitations.

Similarly, drought has been identified as a major limiting factor in rice production in SSA where about 80 percent of rice farms traditionally depend on rainfall. The farmers are often resource constrained, and cannot afford irrigation systems. With the utilisation and application of water use efficient (WUE) component, the rice will require less water and this will offer an appreciable coping mechanism against drought.

Also, high salinity is increasingly becoming a major problem in rice growing areas of the coastal lowlands and mangrove swamps of Africa.

Project goal

The goal of the Nitrogen-Use Efficient, Water-Use Efficient and Salt-Tolerant (NEWEST) Rice Project is to develop and disseminate farmer preferred and locally adapted rice varieties with enhanced nitrogen-use efficiency, water-use efficiency and salt tolerance.

A photograph showing three women in a muddy rice field. They are bent over, planting young rice seedlings into the soil. The woman on the left is wearing a blue shirt and a white headwrap. The woman in the middle is wearing a patterned top and a blue headwrap. The woman on the right is wearing a red top and a yellow headwrap. The field is filled with rows of young rice plants.

12.0 million tonnes... *Africa's annual rice importation*

USD\$ 5.7 billion... *value of rice imported annually in Africa*

Implementing the NEWEST Rice Project



The NEWEST rice project offers hope to rice farmers. As a breeder, I see it as a vehicle to bring transgenic rice varieties possessing combinations of nitrogen use efficiency, water use efficiency and salinity tolerance to Ghanaian rice farmers. I am also excited by the possibility of freely backcrossing these genes into other varieties.

Paul Kofi Dartey, Rice Breeder CRI, Ghana



Facts and figures on rice in SSA

- Annual rice production in SSA estimated at 12.5 million metric tonnes (MT)
- Africa has a deficit of about 12.0 million MT per year valued at over US\$ 5 billion that is imported annually.
- The insufficient rice production affects over 20 million smallholder farmers who depend on it as a staple.

The African Agricultural Technology Foundation (AATF) is working with partners to develop and disseminate farmer preferred and locally adapted rice varieties with enhanced nitrogen-use efficiency, water-use efficiency and salt tolerance (NEWEST).

AATF coordinates project activities throughout the entire product value chain (intellectual property management, business development, project management, regulatory affairs and communication and outreach), ensuring that activities are carried out as planned.

20 million... *number of smallholder farmers who depend on rice as a main food.*



Benefits of NEWEST Rice Project

- Abandoned croplands will be reclaimed reducing land shortages
- An additional 1.3 million tonnes of rice will be produced in Africa each year, reducing the current deficit by 10 percent.
- Available technologies for further use by scientists
- Availability of improved farmer-preferred rice varieties
- Improved crop yields, resulting in enhanced household food security and production of marketable crop surplus
- Food self-sufficiency in rice will redirect limited foreign exchange used to import rice



“ Our belief is that improved rice varieties developed with the nitrogen-use and salt-tolerance technologies that we have donated to the project will enable smallholder African rice farmers to sustainably increase their production and their profits – even in the face of variable and often challenging environmental conditions. Our goal is thus to increase smallholder productivity and food security, with a parallel reduction in negative environmental impacts. ”

*Eric Rey, president and CEO
Arcadia Biosciences Inc*

The Nitrogen-Use Efficient, Water-Use Efficient and Salt-Tolerant Rice Project Partnership



- AATF is contributing its leadership experience in public private partnership management, technology stewardship and project management expertise.
- Arcadia Biosciences is donating the NUE, WUE and ST trait technologies, producing transgenic plants and providing technical support.
- Public Intellectual Property Resource for Agriculture (PIPRA) is donating the enabling technologies for plant transformation.
- International Centre for Tropical Agriculture (CIAT) is carrying out seed increase, preliminary agronomic trials and field testing for trait gain.
- National agricultural research partners - National Agricultural Research Organisation, Uganda; Crop Research Institute, Ghana; and National Cereal Research Institute, Nigeria are involved in field testing for trait gain.

Investors

The United States Agency for International Development (USAID) funds project activities. Initial funding to support conceptualisation and implementation came from UK aid from the UK government and USAID.



What I really want is better rice seed varieties that can give me higher yields as I don't grow anything else on my farm apart from rice. Therefore, I would urge researchers to work on better rice seed varieties. I would also really want to grow upland rice that does not need a lot of water and is easier to grow.

Florence Apochi, rice farmer Osudoku-Asutsuare Greater Accra, Ghana



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