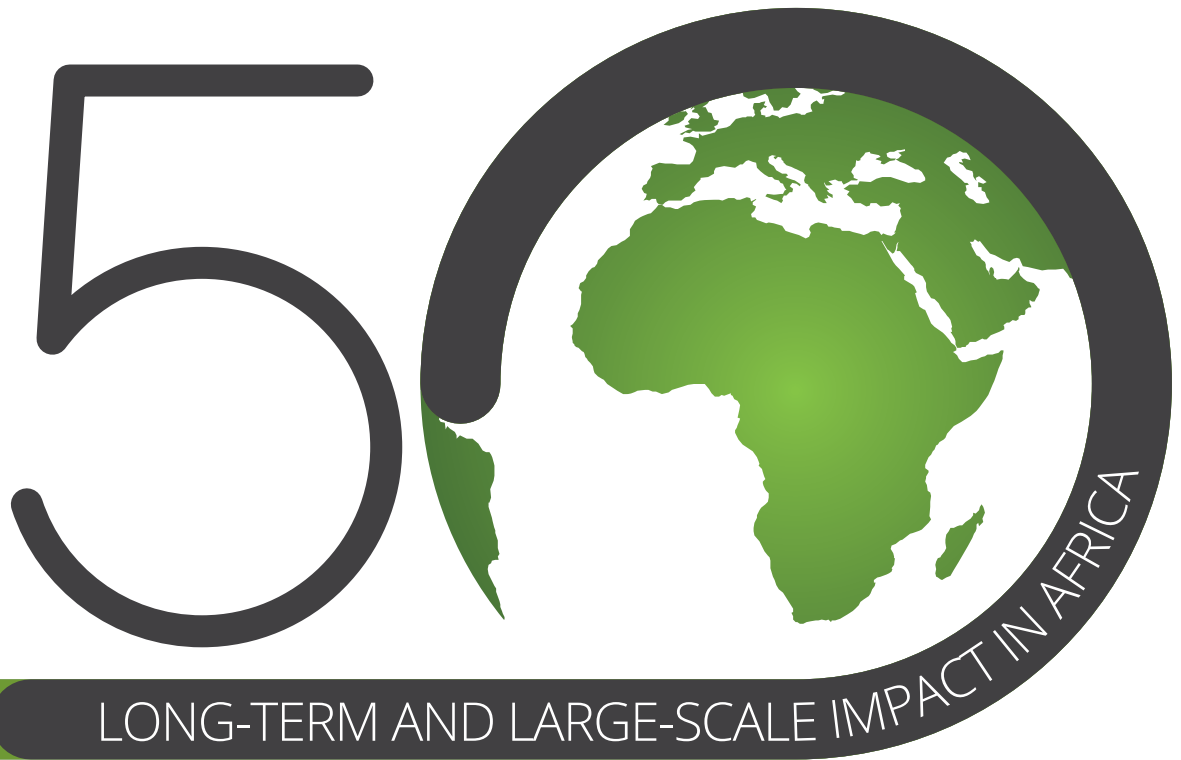


50 YEARS OF RICE RESEARCH FOR DEVELOPMENT



AfricaRice



Introduction

The Africa Rice Center (AfricaRice), established in 1971 as the West African Rice Development Association (WARDA), is celebrating 50 years of research for development (R4D). During the last five decades, AfricaRice and its partners (national agricultural research systems in sub-Saharan Africa and international research institutes) have made substantial contributions to achieving development goals and improving the livelihoods of the poor. Large gains have been realized through the development and dissemination of tangible technological, institutional and policy innovations. Meanwhile, numerous economic and social impacts have been documented through publications in reputable scientific journals. This brochure highlights the key long-term and large-scale impacts delivered by the R4D activities carried out by AfricaRice and its partners.

AfricaRice by numbers:

15 million: Number of people lifted out of poverty in sub-Saharan Africa in 2021

US\$ 37 billion: Cumulative gross research benefit

US\$ 3.49: Value generated for every dollar invested

AFRICARICE AND PARTNERS HAVE MADE SUBSTANTIAL CONTRIBUTIONS TO ACHIEVING DEVELOPMENT GOALS AND IMPROVING THE **LIVELIHOODS** OF THE **POOR**.

Cumulative investment of over US\$ 433 million

Annual investments around **US\$ 10 million**



Between 1991 and 2020, a cumulative value of more than **US\$ 433 million** was invested in R4D activities carried out by AfricaRice and its partners. Annual investments of around **US\$ 10 million** almost doubled in the aftermath of the 2008 food crisis to reach a peak of **US\$ 30 million** in 2013 (Figure 1). Over the past five decades, most of the investment (around 65%) has been used to develop and disseminate innovative technologies and knowledge to boost local production, improve rice quality and competitiveness, and address the gap between supply of and demand for domestic rice (Figure 2).

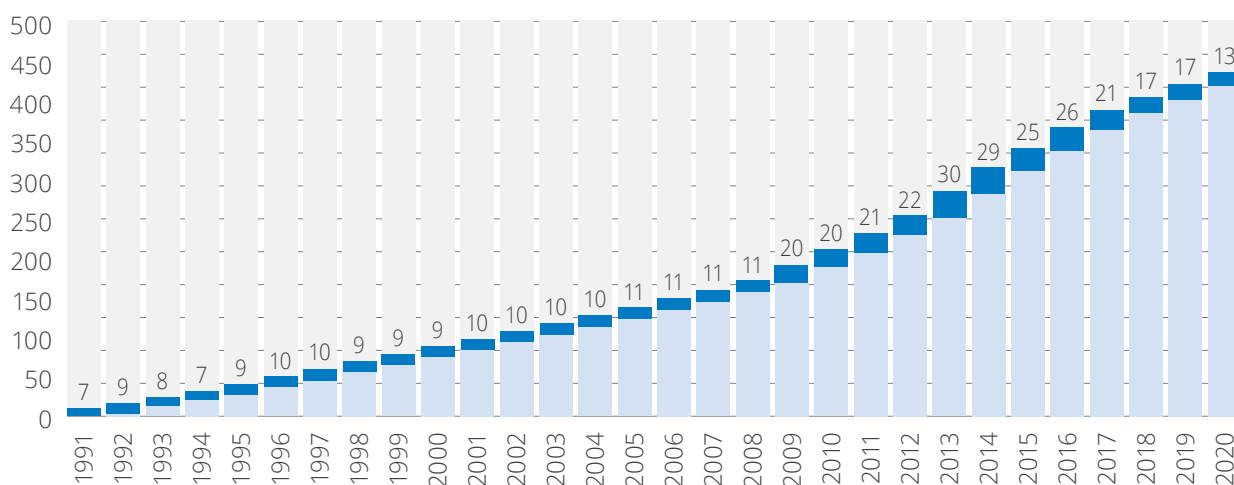


Figure 1. Cumulative AfricaRice annual research expenditure (US\$ million)

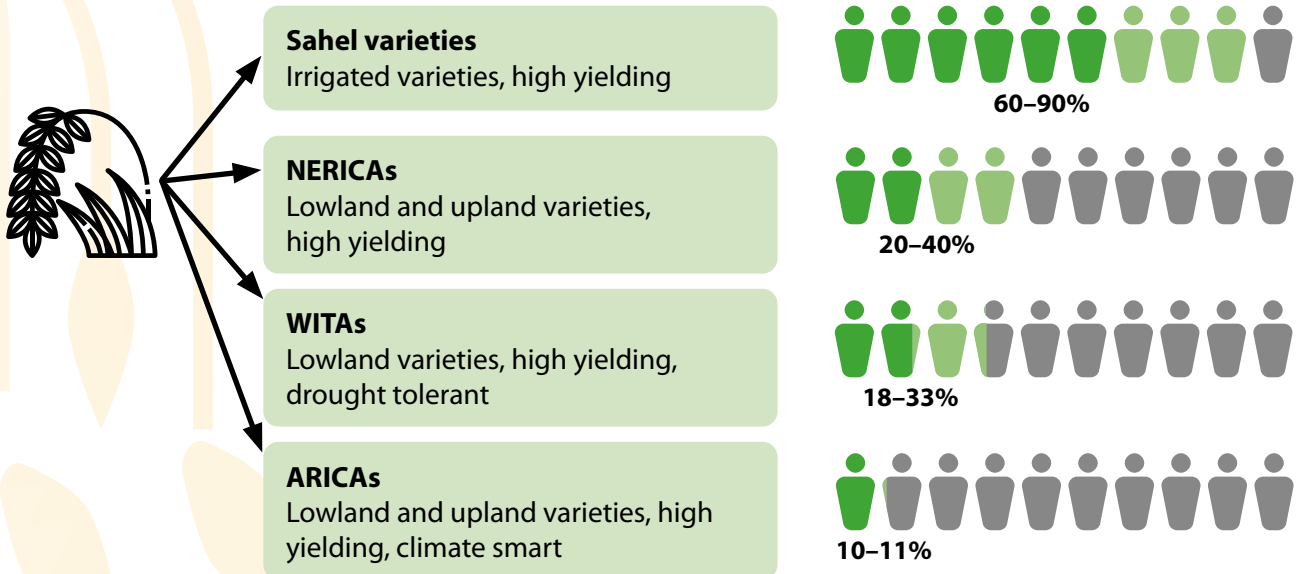
Source: AfricaRice Annual Reports (1991–2020).

BETWEEN **1991** AND **2020**, A CUMULATIVE VALUE OF MORE THAN **US\$ 433 MILLION** WAS INVESTED IN R4D ACTIVITIES CARRIED OUT BY AFRICARICE AND ITS PARTNERS.

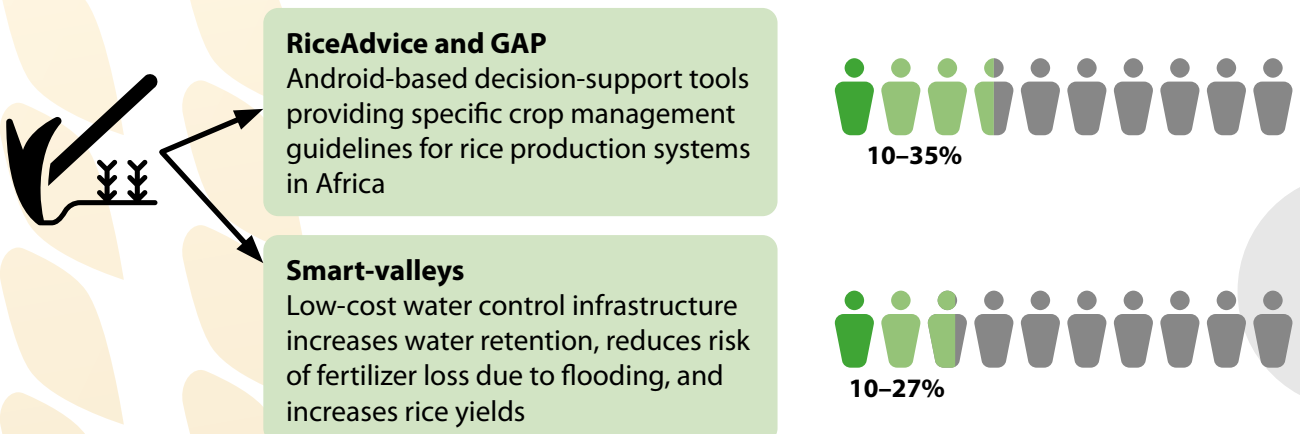


AVERAGE ADOPTION RATES

GENETIC IMPROVEMENT



AGRONOMY



POST-HARVEST

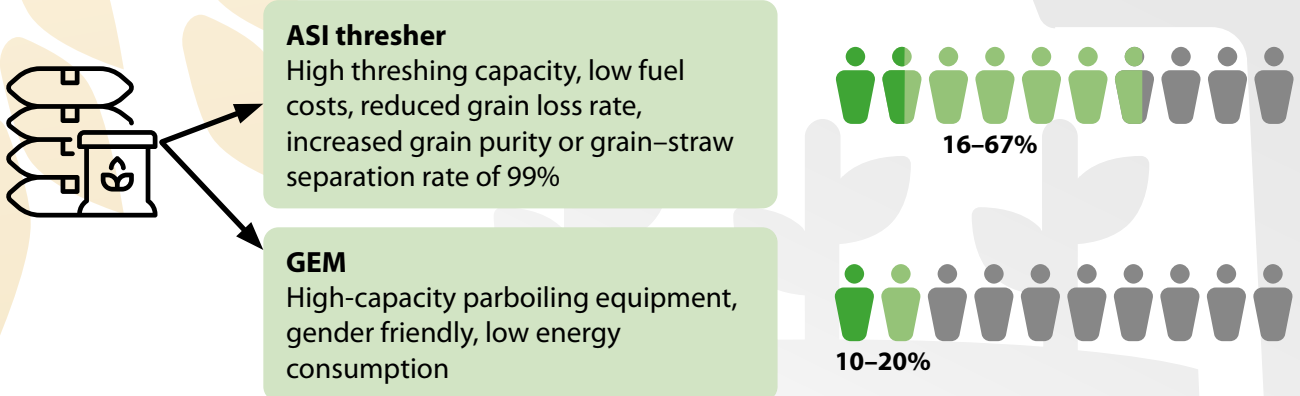


Figure 2. Key AfricaRice technologies disseminated over the last 50 years

Source: AfricaRice e-registration and monitoring data (2013–2021).

Note: NERICA = New Rice for Africa; ARICAs = Advanced Rice Varieties for Africa; WITAs = varieties for the rainfed lowland and irrigated ecosystems; GAP = good agricultural practices; ASI thresher = improved rice thresher; GEM = grain quality-enhancer, energy-efficient and durable material.

Over **2 million** hectares under NERICA varieties in **more than 16** sub-Saharan African countries in 2021

In terms of genetic improvement, AfricaRice and partners have developed and released about 570 high-yielding and stress-tolerant varieties (Futakuchi *et al.*, 2021). Since the first release in the early 2000s, New Rice for Africa (NERICA) varieties have revolutionized rice production. NERICAs are early maturing (75–100 days), well adapted to harsh environments, compete strongly against weeds, have good resistance to local diseases and pests, and are capable of withstanding droughts, floods, infertile soils and iron toxicity. NERICA varieties developed for upland agro-ecosystems have enabled thousands of small-scale producers to produce rice in upland areas. Women especially have gained, since they often lack access to traditional lowland planting areas.

NERICAs are now the most widely adopted upland rice varieties in sub-Saharan Africa, and are grown

in more than **16 countries**. The area under NERICA cultivation increased from 200,000 hectares (ha) in 2008 to 1.4 million ha in 2013, and **2.1 million ha** in 2021 (Arouna *et al.*, 2017; updated using rice area average annual growth rate). The estimated yield gain is 0.32 tonnes/ha. As of 2014, the NERICA varieties have brought food security to **7.2 million people** in Africa (Arouna *et al.*, 2017).

The development of NERICAs has been recognized by several international awards. The World Food Prize was awarded to Dr Monty Jones, the AfricaRice scientist who led the development of NERICA, in 2004. In 2019, AfricaRice received the AI-Sumait Prize for its contribution to food security in Africa.

<https://www.africarice.org/nerica>



'Smart-valleys' technology increases yields by **0.9 tonnes/ha** and incomes by **US\$ 267/ha**

'Smart-valleys' is a low-cost, participatory and sustainable approach to develop the bottoms of inland valleys for rice-based systems. Major advantages mentioned by farmers are increased water retention in their fields, less risk of fertilizer loss due to flooding, and increased rice yields.

This innovation has been implemented in Benin, Burkina Faso, Liberia, Sierra Leone and Togo, and has significantly reduced the constraints associated with

lowland rice production. It increases the humidity of plots by 12% throughout the growing cycle, and enables farmers to increase their rice yield by 0.9 tonnes/ha (21%). This translates to a net income gain of **US\$ 267 per ha** (Arouna and Akpa, 2019). The importance of this innovation was recognized when Dr Elliott Dossou-Yovo received the Norman Borlaug Award for Field Research and Application in 2021.

<https://www.africarice.org/smart-valleys>



MAJOR ADVANTAGES MENTIONED BY FARMERS ARE **INCREASED WATER RETENTION** IN THEIR FIELDS, LESS RISK OF FERTILIZER LOSS DUE TO FLOODING, AND **INCREASED RICE YIELDS**.

RiceAdvice generates gains of about **US\$ 3.7 million** in 2016

RiceAdvice is an Android-based application providing customized, field-level recommendations for fertilizer management, including which fertilizers to use, when and at what application rates. It also provides information on the expected date of maturity and suggests additional good agricultural practices to boost yields. Farmers applying RiceAdvice recommendations were able to increase their yields by an average of 20%

(730 kg/ha) over the control, achieving a 23% increase in profit, i.e. **US\$ 275/ha** (Arouna *et al.*, 2021a). In 2016, some 8,115 farmers benefited from RiceAdvice, generating an additional production of 7,625 tonnes of rice worth **US\$ 3.7 million** (calculations based on data in Arouna *et al.*, 2021a).

<https://www.africanrice.org/riceadvice>



IN 2016, **8,115 FARMERS** BENEFITED FROM RICEADVICE, GENERATING AN ADDITIONAL PRODUCTION OF **7,625 TONNES** OF RICE.

ASI thresher reduces postharvest losses and confers an average gain of **US\$ 53 per hectare**

Manual rice threshing is labor intensive and traditionally performed by women. It is inefficient, leading to postharvest losses of up to 35%. AfricaRice and partners developed an improved rice thresher in response to these challenges. It mechanically separates rice grains from panicles without damaging the grains. Farmers using the technology can achieve a high threshing capacity of **6-7 tonnes** of paddy rice per day. They can also reduce fuel costs and achieve a grain-straw separation rate of 99% (Ogwuiké *et al.*, 2020). The ASI thresher can be manufactured locally, which makes it one of the most important improved postharvest technologies in Africa. It is now being used in 19 African countries.

More than 50% of the total paddy produced in Senegal is threshed with ASI threshers. By replacing

traditional threshing technologies with the ASI, producers can attain an average gain of **US\$ 53/ha**. Since its first introduction in Senegal in 1997, the number of machines manufactured locally has increased steadily, reaching almost **3,000** in 2021. This represents an investment of about **US\$ 12 million**. The area coverage (where farmers have access to the technology) was estimated at 31% of the total in 2008, rising to 77% in 2021, with the ASI machine threshing paddy from an estimated area of **1.8 million ha**. In 2003, AfricaRice and partners received the Senegal Presidential Prize for Science in recognition of this technology development.

<https://www.africarice.org/asi-thresher>



Increased incomes and more efficient working for women rice parboilers

Rice parboiling involves partial boiling of rice in the husk before milling. It protects the rice from breaking during milling, preserves nutrition and enhances quality. AfricaRice researchers have found that when properly conducted, rice parboiling significantly improves the physical and nutritional quality of milled rice. However, the traditional parboiling process (conducted mostly by women) is laborious, time consuming and unsafe, producing rice with impurities, broken and burnt grains, and an undesirable smell. It also requires large quantities of firewood and water.

AfricaRice and its partners have developed an improved rice parboiling technology called GEM, which stands for grain quality-enhancer, energy-efficient and durable material. This produces better-quality, more marketable rice and improves work safety for women parboilers. GEM features energy-efficient and durable soaking tanks, with steamers

fired by means of a clean cooking stove and a labor-saving component for easy lifting of heavy loads. The technology has been adopted in Benin, Côte d'Ivoire, Ethiopia, Niger, Nigeria, Senegal and Togo.

Women using GEM for parboiling were able to earn more than those using traditional systems, gaining an extra **US\$ 200/tonne** of parboiled rice. The economic return for GEM is **70%** compared with 14% for traditional parboiling methods. GEM also significantly reduces or completely eliminates the need for firewood fuel, thereby saving **US\$ 30/tonne** in the cost of firewood in the parboiling process and providing a more sustainable, less labor-intensive option. In Nigeria in 2019, women generated over **US\$ 182,000** by selling 218 tonnes of quality rice parboiled domestically using GEM.

<https://www.africarice.org/gem-rice-parboiler>



15 million people lifted out of poverty through AfricaRice R4D activities in 2021

In 2014, the impact on incomes generated by growing improved rice varieties was estimated at **US\$ 58/capita** for NERICAs and **US\$ 72/capita** for other improved varieties. In terms of poverty reduction, about 1 million rice-producing households were raised out of poverty. This represented about 8 million people (Arouna *et al.*, 2017).

In 2021, some **15 million people** in 1.8 million households were lifted out of poverty as a result of AfricaRice R4D products (Arouna *et al.*, 2017; updated figures). This represented 17% men, 34% women and 49% children. Nigeria benefited the most, with **4.3 million people** from 554,000 households lifted out of poverty (Figure 3).

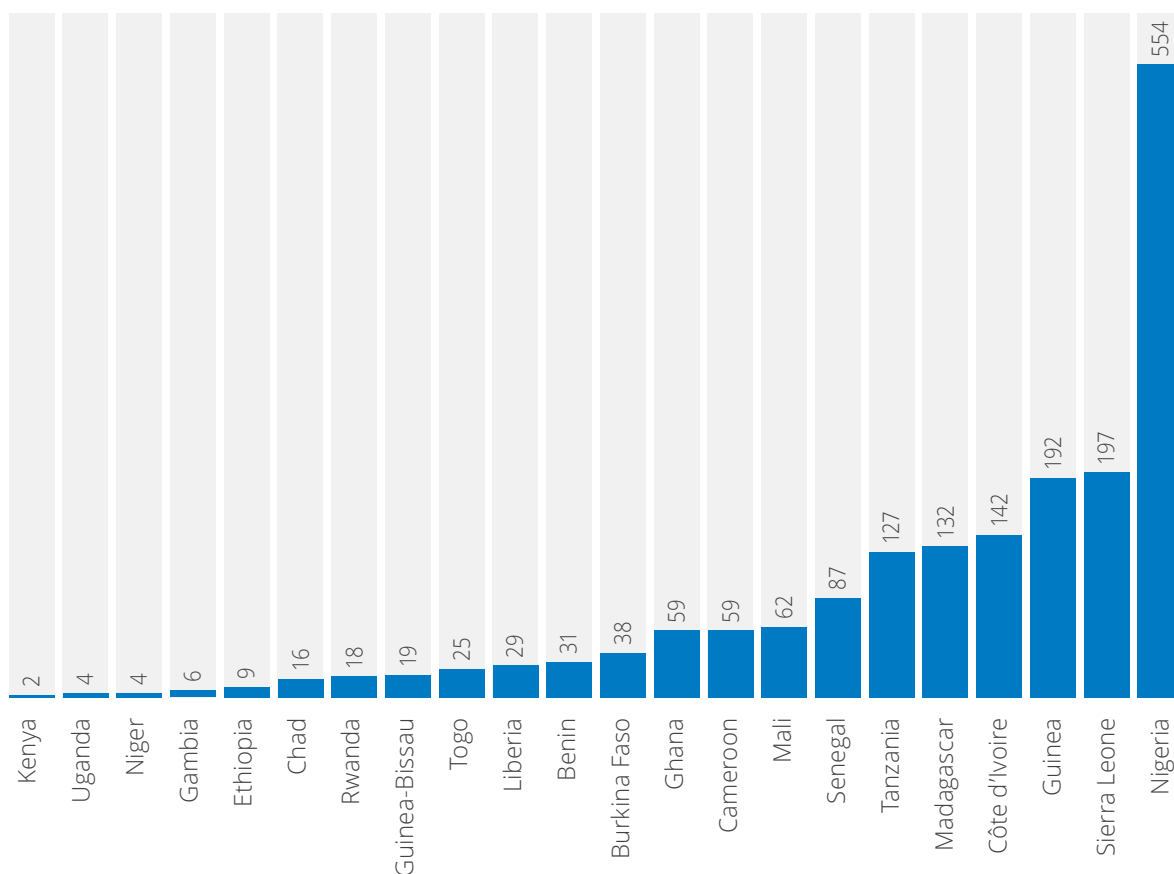


Figure 3. Number of households lifted out of poverty through AfricaRice initiatives (thousands)

Source: Arouna *et al.* (2017; updated figures).

Cumulative gross research benefit of **US\$ 37 billion** since 1991

Before 1998, AfricaRice R4D had a relatively limited impact because it focused mainly on the development of human capacity in West Africa. In 1998, rice R4D contributed **US\$ 360 million** to the rice economy of seven West African countries (Dalton and Guei, 2003). This represented a gain of US\$ 97/ha, ranging from US\$ 33/ha in rainfed upland areas to **US\$ 213/ha** in irrigated lowland areas.

Much progress has been made since then, with an increasing trend in the gross annual research benefit (in PPP constant 2015). The estimated cumulative gross annual research benefit over the past 30 years is **US\$ 37 billion** (Figure 4), representing a gain of **US\$ 3.49** for every US\$ 1 invested. In the most conservative case, at a minimal rate of technology adoption across sub-Saharan Africa and a minimal increase in rice area, AfricaRice R4D will have contributed about US\$ 15.13 billion to the economy of the region. Under the most optimistic and realistic assumption, AfricaRice and partners will have contributed up to US\$ 69.15 billion (estimation based on Dalton and Guei, 2003).

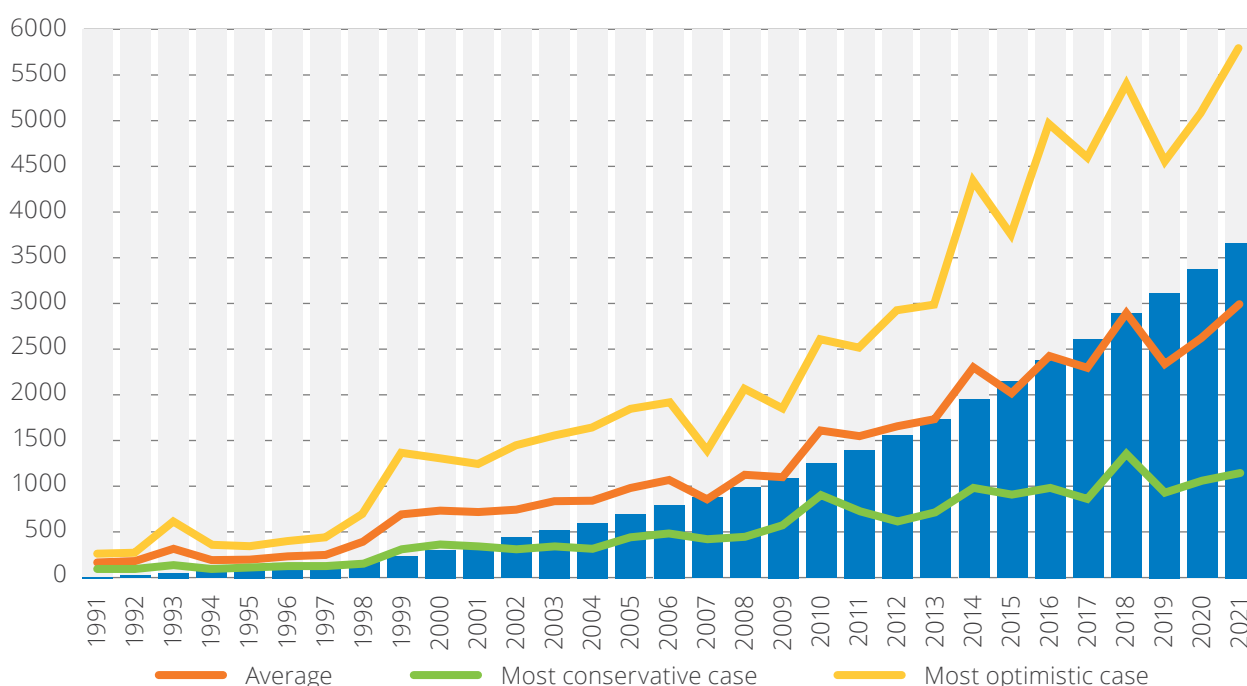
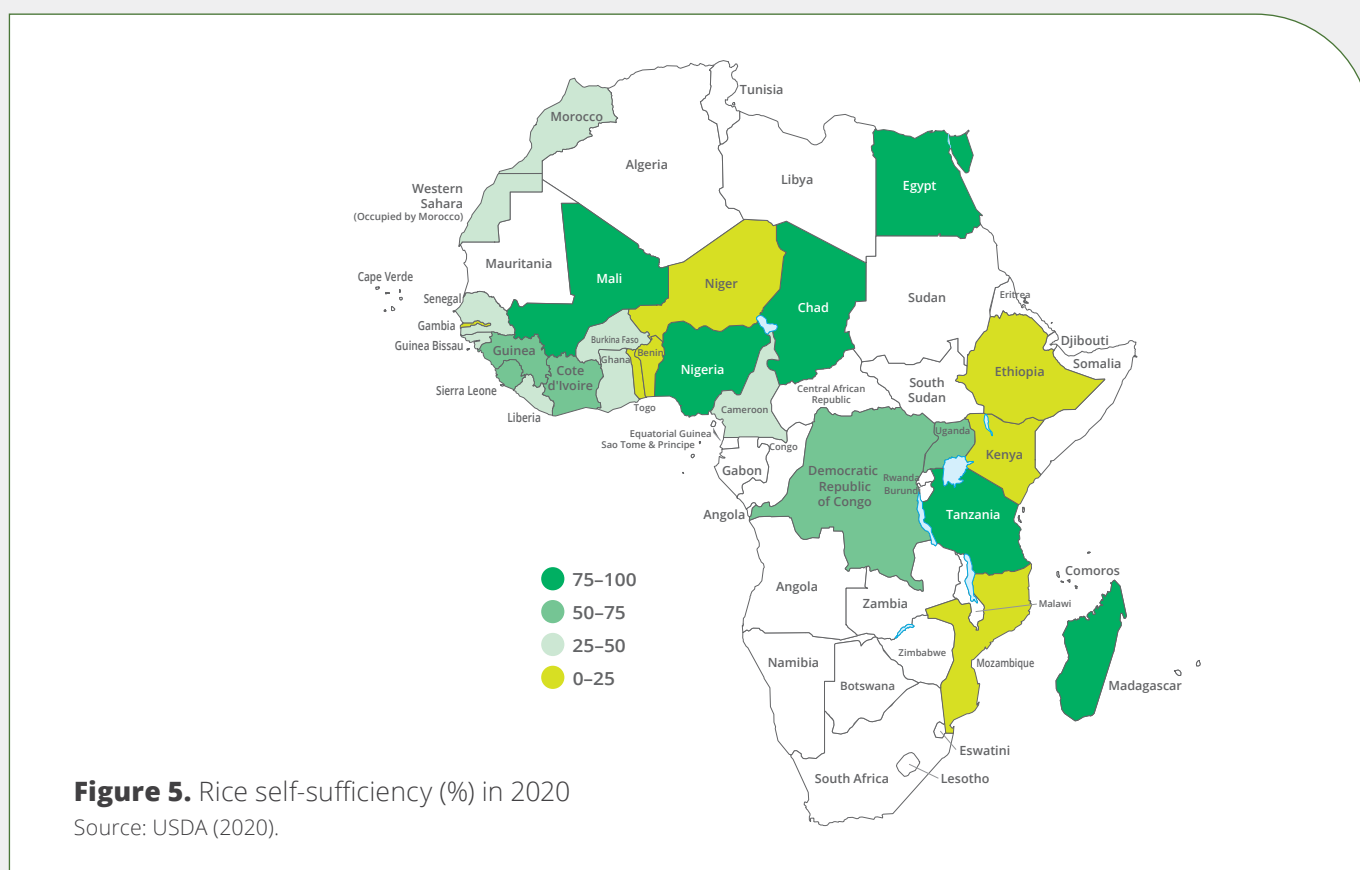


Figure 4. Gross annual research benefit (lines) and cumulative gross annual research benefit (bars) in US\$ million (PPP constant 2015)

Source: AfricaRice estimation based on Dalton and Guei (2003).

Increase in rice self-sufficiency of **16% per annum** (2008–2018)

The Coalition for African Rice Development (CARD), initiated by the Government of Japan, AfricaRice, Japan International Cooperation Agency and national agricultural research systems, was established to boost rice production and self-sufficiency following the 2008 food crisis. The cumulative impact of CARD was estimated to be **67.7 million tonnes** of paddy production between 2008 and 2018, and CARD policies helped to slow the increase in rice import dependency in 23 countries. On average, activities conducted under CARD contributed to a **16% increase** in rice self-sufficiency per annum between 2008 and 2018 (Arouna *et al.*, 2021b). In 2018, rice self-sufficiency would have been 37% without CARD compared with the observed value of 59%. By 2020, several countries (including Chad, Egypt, Mali, Madagascar, Nigeria and Tanzania) were more than **75%** self-sufficient in rice (USDA, 2020; see Figure 5).



BY 2020, CHAD, EGYPT, MALI, MADAGASCAR, NIGERIA AND TANZANIA WERE MORE THAN **75%** SELF-SUFFICIENT IN RICE.

Skills development for more than **43,000 people**, including **1,300** next-generation **rice scientists**

AfricaRice views capacity-building as a cornerstone of the process of developing and strengthening the skills, abilities, processes and resources needed by individuals to thrive in a fast-changing world. AfricaRice has invested huge technical and financial efforts in capacity development for groups of farmers and individual members of farming households, as well as for other actors engaged in rice system development. Between 1971 and 2019, AfricaRice and partners provided group training and education to a total of **43,264 people**, thereby improving their skills and knowledge. This includes **1,319 next-generation rice scientists**, who have been empowered through individual training between 1971 and 2020.



BETWEEN 1971 AND 2019, AFRICARICE AND PARTNERS PROVIDED GROUP TRAINING AND EDUCATION TO A TOTAL OF **43,264** PEOPLE.

AfricaRice and partners publish 865 scientific journal articles (2000–2021)

Between 2000 and 2021, scientists from AfricaRice and partners published a total of **865 journal articles**, an average of about 39 articles per year (Figure 6).

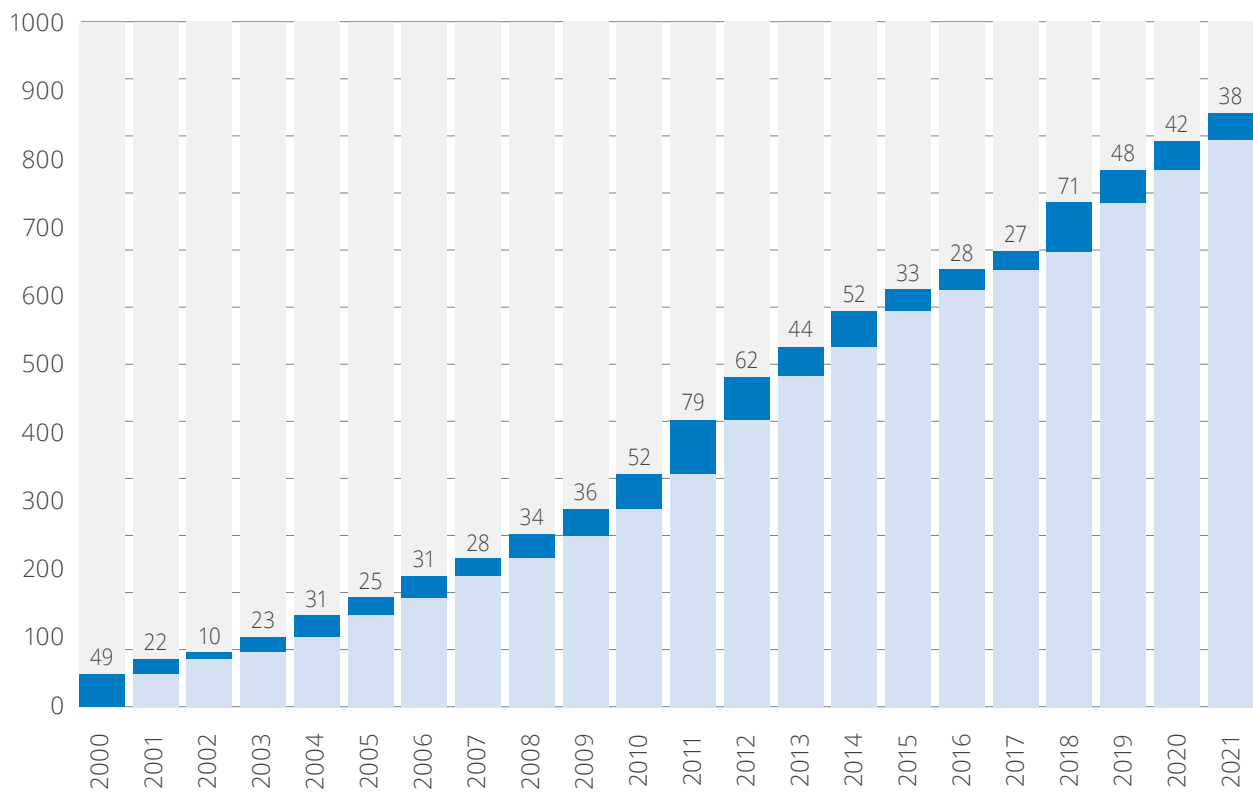


Figure 6. Cumulative number of peer-reviewed publications (2000–2021)

Source: AfricaRice annual reports.

Widespread recognition for AfricaRice achievements

Between 2000 and 2021, AfricaRice staff received 18 awards, representing tangible recognition of their important R4D contributions.

1. Republic of Korea Presidential Award of Achievement 2021 for AfricaRice
2. Norman Borlaug Award for Field Research and Application 2021 for Dr Elliott Dossou-Yovo
3. American Society of Agronomy Emerging Leader for African Agricultural Transformation (ELAAT) Award 2021 for Dr Ali Ibrahim
4. One Planet Fellowship 2021 for Jean-Martial Johnson
5. Al-Sumait Food Security Prize 2019 for AfricaRice and The Pan-Africa Bean Research Alliance (PABRA) jointly
6. Food and Agriculture Organization of the United Nations 70th anniversary commemorative medal 2015 for AfricaRice
7. Louis Malassis Young Promising Scientist Prize 2015 for Dr Kazuki Saito
8. Louis Malassis Young Promising Scientist Prize 2012 for Dr Matty Demont
9. Japan International Award for Young Researchers 2011 for Dr Jonne Rodenburg
10. Global South-South Cooperation Excellence Award 2010 for AfricaRice
11. CGIAR Outstanding Communication Award 2009 for Dr Paul Van Mele
12. CGIAR Outstanding Promising Young Scientist Award 2009 for Dr Jonne Rodenburg
13. United Nations Award for South-South Triangular Partnership 2006 for AfricaRice NERICA initiative
14. Burkina Faso Presidential Award 2006 for Dr Moussa Sié and the rice program of the Institut de l'Environnement et de Recherches Agricoles (INERA) for lowland NERICAs
15. Fukui International Koshihikari Rice Prize of Japan 2006 for Dr Moussa Sié for lowland NERICAs
16. World Food Prize 2004 for Dr Monty Jones for the scientific breakthrough of interspecific hybridization and the development of the NERICA varieties
17. Senegal Presidential Award for Science and Technology 2003 for AfricaRice and partners for the development of the ASI rice thresher
18. CGIAR King Baudouin Award 2000 for AfricaRice for development of NERICA

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All pictures are by staff members of AfricaRice, and networks and consortia convened by the Center.

LOOKING AHEAD

In partnership with stakeholders, governments, policy-makers and donors, AfricaRice has developed a new framework to guide the continued delivery of its mission. Its future work will be directed by the 2030 Rice Research and Innovation Strategy for Africa, entitled Transformation of Rice-Based Agri-Food Systems for Food and Nutrition Security in Africa. This is aligned with the One CGIAR 2030 Research and Innovation Strategy and aims to contribute to the transformation of food, land and water systems in the face of climate change through the delivery of rice-based innovations to rice sector stakeholders in Africa. It will build on current partnerships and investments, and seek to broaden the support of donors and member countries for the delivery of rice-based innovations that will improve the livelihoods of millions of people across Africa.

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AfricaRice is a CGIAR Research Center — part of a global research partnership for a food-secure future.

It is also an intergovernmental association of African member countries.



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