



ANNUAL REPORT

2021



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ON THE COVER

Malian Farmer Nana Guido laughs with joy at her improved harvests using climate-smart fertilizers.





LETTER FROM IFDC'S LEADERSHIP: A CALL TO ACTION

Again, the world finds itself in a time of crisis. Global energy and crop markets, already unstable from the pandemic, face catastrophic consequences due to Russia's war in Ukraine. As a result, global fertilizer and food prices continue to rise. Many low- and middle-income countries dependent on food imports risk unprecedented undernourishment or even starvation due to a significant increase in basic commodity prices. For small-scale farmers in sub-Saharan Africa, decreased availability and affordability of fertilizers, specifically nitrogen, phosphorus, and potassium, are serious issues and will negatively impact staple food production. Many governments in Africa and Asia were caught off guard by the conflict, as high fertilizer prices at the end of last year were projected to ease. As noted by David M. Beasley, executive director of the World Food Programme, "There is no precedent even close to this since World War II."¹

Now, more than in decades, the need for fertilizer and food self-sufficiency is clearly evident, not to mention further fertilizer innovations to increase global nutrient use efficiency (NUE). The reduced application of soil nutrients due to the pandemic and current war in Ukraine will further exacerbate the current degradation of 40% of the world's soils. During the United Nations Food Systems Summit (UNFSS), soil was realized as a key means to "[deliver] the productive and sustained ecosystems needed to transform food systems to nature-, people and climate-positive." Thus, the [UNFSS Coalition of Action 4 Soil Health \(CA4SH\)](#) was formed to convene "a multi-stakeholder coalition to facilitate the adoption and scaling of restoration practices that improve soil health in productive landscapes through investment and policy action." As a member of this coalition, IFDC's mission is as relevant as ever – to identify and scale sustainable solutions for soil and plant nutrition to achieve our vision of a food-secure and environmentally sustainable world through healthier soils and plants.

THE EFFORTS YOU ARE SUPPORTING ARE MORE THAN RESEARCH FOR ITS OWN SAKE.

In 2021, work began that would support the world as it came out of the pandemic and unexpectedly entered our current context. [Dashboards](#) and [decision support tools](#) were launched to provide accurate data of input demand, supply and use; IFDC programs assisted in [harmonizing regional fertilizer regulations](#); [climate-smart and yield-improving technologies](#) were introduced to farmers; and IFDC scientists validated [next-generation fertilizer products](#). Clearly, IFDC's work has real implications in a world that, as demonstrated throughout these last few years, is always one step away from catastrophic impacts on food systems. While many things may be out of our control, one thing we can do is continue pursuing solutions that support the most vulnerable and build their resilience against climatic and economic shocks.

Business as usual cannot continue. Therefore, IFDC, as an international research-for-development organization, is embarking on two new initiatives that not only spearhead existing solutions but also will safeguard the future, which is a responsibility shared by all.

First, plans are in the works to hold an African Fertilizer and Soil Health Summit in 2023, bringing together high-level stakeholders to reach an agreement on a 10-year action plan for sustainable food security growth in Africa. Sign up for updates here: <https://ifdc.org/africa-fertilizer-summit-ii/>.

¹ <https://www.nytimes.com/2022/03/20/world/americas/ukraine-war-global-food-crisis.html>

The event will be held under the auspices of the African Union Commission (AUC), which has mandated IFDC, the Regional Network of Agricultural Policy Research Institutes (ReNAPRI), and the Alliance for African Partnership (AAP) to support the preparation of an agenda in close collaboration with the Food and Agriculture Organization of the United Nations (FAO), the Forum for Agricultural Research in Africa (FARA), the Alliance for a Green Revolution in Africa (AGRA), and many others.

Second, it is well known in farming and fertilizer industry circles that truly innovative fertilizer products are needed to improve global soil health and make truly regenerative agriculture a reality. Most of the basic high-analysis fertilizers in use today were developed last century at the Tennessee Valley Authority (TVA) National Fertilizer Development Center (NFDC) in Muscle Shoals, Alabama, to combat the desertification of U.S. farmland during the 1930s. A sense of urgency drove the creation and funding of the NFDC, where over 1,000 scientists worked toward the singular goal of transforming U.S. agriculture from a dustbowl-ridden and failing industry into the powerhouse that it is today.

This sense of urgency must be renewed for global soil health, especially in Africa, where old and weathered soils cannot support the agricultural growth the continent needs to keep pace with its growing population.

As such, IFDC is proposing the establishment of a Soil Health and Plant Nutrition Innovation Center to be housed at its campus, where labs, a pilot plant complex, and researchers are already in place to fast-track new solutions for ever-emerging issues. This hub will become the global focal point of soil health and plant nutrition innovations, in which scientists, innovators, entrepreneurs, industry, and visionaries can collaborate to realize the rapid development and delivery of “concept to crop” products and technologies that promote sustained soil health and environmentally sustainable productivity increases and contribute to global food security.

We call to action those who committed their organizations to promoting soil health at the 2021 United Nations Food Systems Summit to support these efforts. Those of us most privileged to be involved in solving these challenges must do so, and quickly. It is past time to save our earth and its inhabitants from the certain hardship and famine caused by the events of these past few years.

We hope you will join us in our mission.



Albin Hubscher
President and CEO

A handwritten signature in black ink, appearing to read "Albin Hubscher".



Rudy Rabbinge
Chair of the Board, IFDC

A handwritten signature in black ink, appearing to read "Rudy Rabbinge".



ONGOING RESULTS

OUR VISION

Healthier soils and plants for a food-secure and environmentally sustainable world.

OUR MISSION

Bring together innovative research, market expertise, and strategic public and private sector partners to identify and scale sustainable solutions for soil and plant nutrition that benefit farmers, entrepreneurs, and the environment.

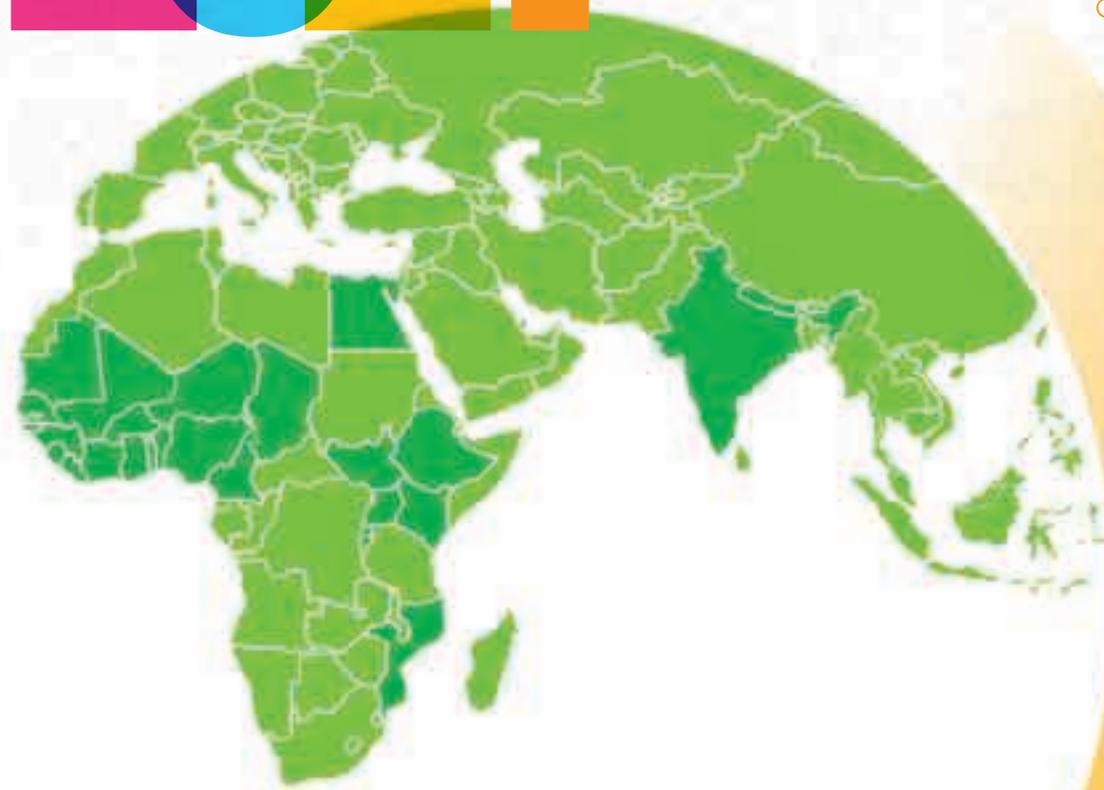
MEASURING IMPACT 2018–2021

INDICATORS	2018		2019		2020		2021	
	TOTAL	PROJECTS	TOTAL	PROJECTS	TOTAL	PROJECTS	TOTAL	PROJECTS
<i>Hectares under improved technologies</i>	406,984	11	102,661	17	193,768	17	419,652	13
<i>Farmer participants who applied technologies</i>	549,184	14	213,654	17	416,522	18	527,003	11
<i>Farmers trained (% women)</i>	508,961 (45%)	16	256,685 (31%)	20	267,023 (46%)	18	408,557 (53.4%)	14
<i>Demonstration plots established</i>	1,207	11	13,439	20	14,501	20	9,383	14
<i>Public-private partnerships formed</i>	331	15	523	21	838	24	245	14
<i>Outreach activities</i>	818	16	4,207	26	5,133	25	4,054	15

The number of projects represents how many projects contributed to each indicator.

OUR REACH

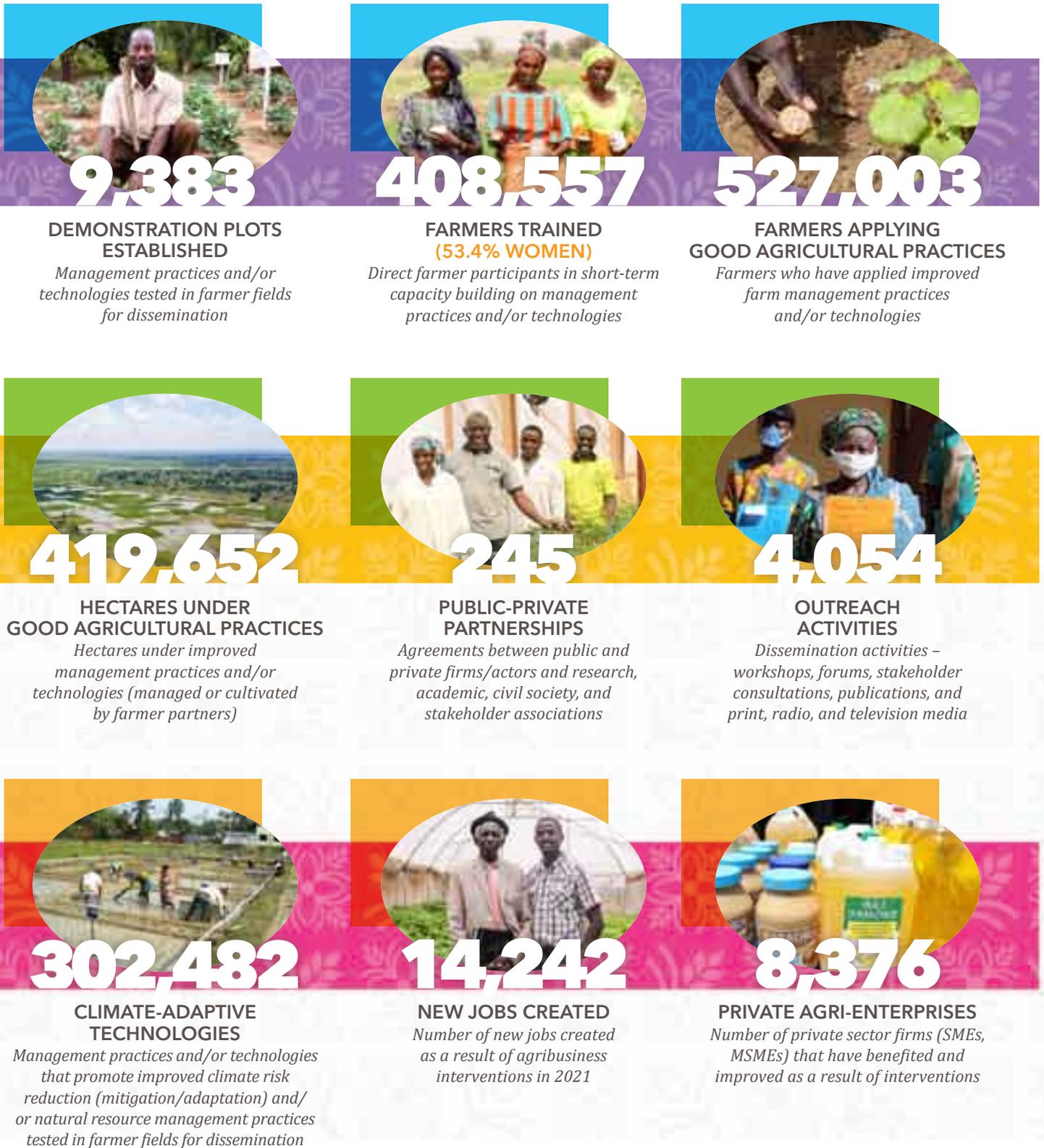
2021



- BENIN
- BURKINA FASO
- BURUNDI
- CABO VERDE
- CAMEROON
- CHAD
- CÔTE D'IVOIRE
- EGYPT
- ETHIOPIA
- GAMBIA
- GHANA
- GUINEA
- GUINEA-BISSAU
- INDIA
- KENYA
- LIBERIA
- MALI
- MAURITANIA
- MOZAMBIQUE
- NEPAL
- NIGER
- NIGERIA
- RWANDA
- SENEGAL
- SIERRA LEONE
- SOUTH SUDAN
- TOGO
- UGANDA

■ Indicates presence of a country office/representative

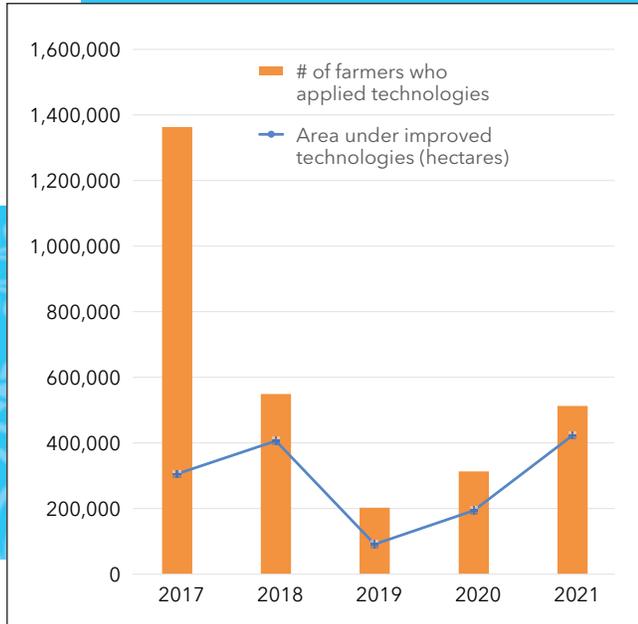
INSTITUTIONAL RESULTS IN 2021



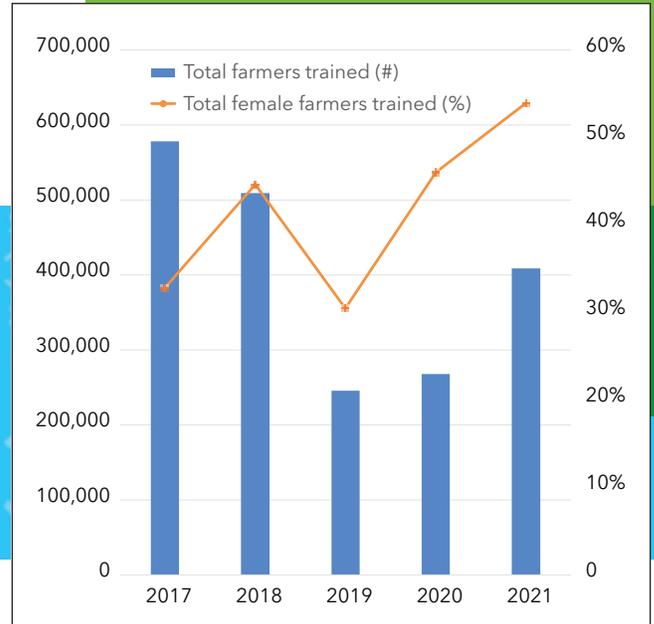


RESULTS INDICATORS FOR 2021

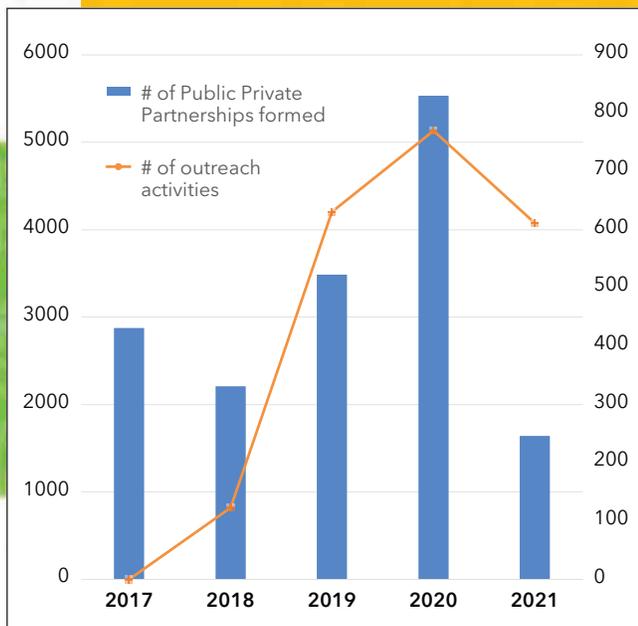
USE OF TECHNOLOGIES



FARMERS TRAINED



PARTNERSHIPS & ACTIVITIES



DEMONSTRATION PLOTS



RESEARCH ACTIVITIES

The overall goal of IFDC research is to significantly boost the production of higher quality food using less land and water; improve the climate resilience of farming systems, and reduce the adverse environmental impacts associated with agriculture. Our research activities focus on improving nutrient use efficiency, reducing nutrient losses, and improving soil health through organic and inorganic sources and products to achieve sustained, balanced fertilization that ensures optimal economic returns for resource-constrained smallholder farmers globally.

During 2021, IFDC research efforts primarily focused on improving soil health, and thus yields, in sub-Saharan African countries. Activities supported improvement of the efficiency of inorganic and organic (microbial) fertilizers, including the use of local resources such as phosphate rock (PR), and implementation of integrated approaches involving decision support tools and soil maps and analyses to guide and validate research findings.

ENHANCED EFFICIENCY FERTILIZERS

Improving the fertilizer use efficiency of both nitrogen (N), currently low at 35-50%, and phosphorus (P), at less than 20%, is crucial for both economic and environmental reasons. The U.S. Environmental Protection Agency (EPA) and U.S. Department of Agriculture

(USDA), in collaboration with The Fertilizer Institute (TFI), the National Corn Growers Association, The Nature Conservancy, and IFDC, launched the Next Gen Fertilizer Challenges in 2020. The agronomic and environmental competition investigating enhanced efficiency fertilizers (EEFs) from 14 global companies was conducted at IFDC in 2021. This study was the first of its kind in which 16 nitrogenous and 12 phosphatic fertilizers (EEFs and conventional) were evaluated for environmental and agronomic criteria under identical conditions using two soils from the Corn Belt (Minnesota and Iowa). The following laboratory studies were conducted: (1) Quantification of Ammonia Volatilization; (2) Quantification of N Transformation using a Soil Incubation Technique; (3) P Release Characterization; (4) N and P Leaching, (5) Accelerated Nutrient Release Technique for Slow-Release Products; and (6) Quantification of Nitrous Oxide Emission. Yield and nutrient use efficiency were determined using sorghum as the test crop under greenhouse conditions. A complete evaluation of results from these crop trials will be made available in late 2022.



Above left: Testing enhanced efficiency fertilizers in a research lab at IFDC HQ. Left: Sorghum growing in the IFDC Greenhouse during a fertilizer trial.



BALANCED FERTILIZATION



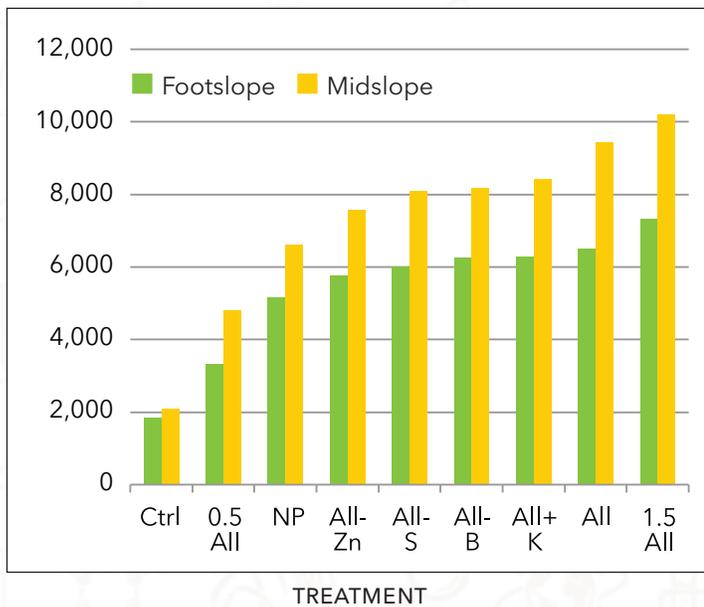
The Bureau for Resilience and Food Security (RFS)-funded **Sustainable Opportunities for Improving Livelihoods with Soils (SOILS) Consortium** implemented nutrient omission trials in the Amhara and Oromia regions of Ethiopia. The trials were conducted in 15 farmer-owned plots across Dembecha and Sekoru districts to evaluate crop response to different nutrient combinations and rates, with an emphasis on sulfur (S), zinc (Zn), and boron (B), in addition to N and P. Most of the farmlands in both districts were identified as deficient in N, P, S, Zn and B by the Ethiopian Soil Information System (EthioSIS) soil fertility map. The trials were replicated three times per farmer plot. A total of 30 preplant soil samples were collected from two depths (0-20 cm and 20-60 cm). These samples were analyzed in both Ethiopian and IFDC headquarters laboratories to determine the accuracy of the national laboratory in Ethiopia and to identify any gaps for building its capacity in the future. The trials showed that both landscape elevation and fertilizer treatments affect maize yield significantly. As expected, response varied between sites. The results indicate:

- S, Zn, and B addition increased yields by 27%-43%, depending on the location and slope position.
- K addition did not increase yields in maize and significantly decreased yields at some locations and slope positions. Further research will be conducted in 2022 trials.
- Maize yields continued to increase substantially with application of 150% of the recommended fertilizer rate. Higher rates may be justified.

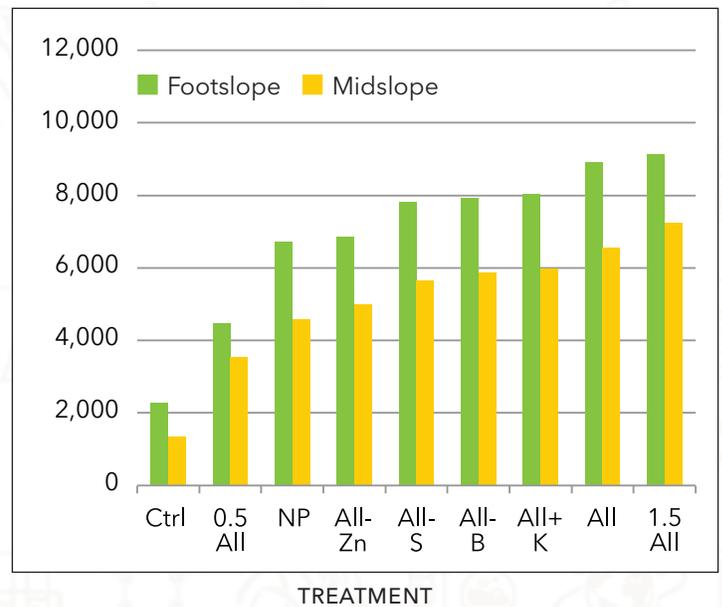
Above: Farmer-managed maize trial site.

Below: Effect of the various treatments and landscape elevations on the grain yield of maize in Dembecha and Sekoru districts.

DEMBECHA



SEKORU



IMPROVED EFFICIENCY OF **LOCAL PHOSPHATE ROCK**

Greenhouse studies conducted by IFDC have consistently shown that activation of phosphate rock with water-soluble phosphate fertilizers that do not contain calcium, such as diammonium phosphate (DAP) or monoammonium phosphate (MAP), significantly improves its solubility, with low to medium reactivity and an average relative agronomic efficiency of more than 80%. With such promising results, IFDC, through **SOILS Consortium activities in Niger**, considered activation of Tahoua natural phosphate rock (TNP) to take advantage of locally available deposits by improving its overall agronomic efficiency for farm-level use. Activated TNP could be as effective as the water-soluble phosphate fertilizers currently available on the market. To confirm this, IFDC and the National Agricultural Research Center in Niger (INRAN), in partnership with SOFFIA, a private mining firm based in Niger, conducted farmer-managed field trials using activated TNP for sorghum and cowpea in Doutchi (Kallon-Mota) and Gaya (Bengou, Tanda, and Tara) during the 2021 winter cropping season.

The results from the trials showed that activated TNP had a significantly positive effect on cowpea and sorghum yields; it was more effective than untreated TNP and just as effective as DAP, the water-soluble P source. Activation thus improved the reactivity of the TNP, making it roughly equivalent to DAP in the fertilization of these crops. The trials will be repeated in the upcoming season and will elaborate on the economic aspect of activated TNP use, as a cost-effective alternative to DAP, by smallholder farmers in Niger.



Above: Advanced fruiting stage of cowpea in Doutchi.

Below right: Sorghum at physiological maturity in Tara.





Above: Granular micronutrients blended with NPK.

At right: Micronutrient powders coated onto granular NPK.

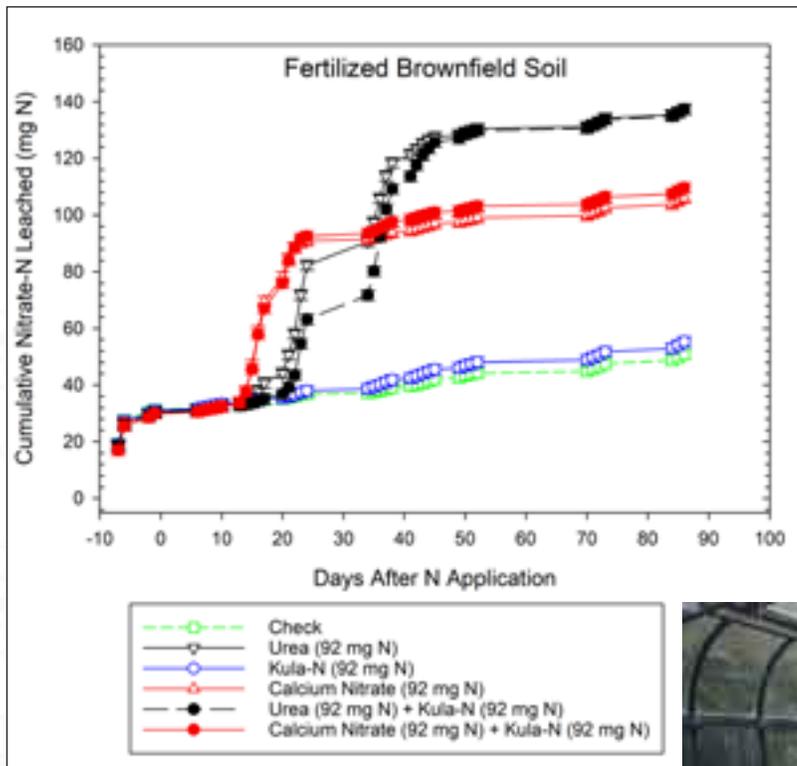
Field research trials in **Rwanda**, comparing compounds (fertilizers with consistent nutrient concentrations in every granule) and blends (fertilizers containing mixtures of granules of varying nutrient compositions), showed no difference in yields, provided that micronutrients (Zn, B, and copper [Cu]) were coated onto the blends rather than applied in granular form. This technique improves micronutrient distribution.



A blending video was produced to aid those conducting experiments involving multi-nutrient fertilizers, including omission trials, in the creation of blends at the trial level. The 15-minute video, called “Making Fertilizer Blends in Small Batches,” incorporated IFDC’s seven-plus years of experience in trial implementation and provided information on ingredient compatibility, rates and sources of micronutrients, and how to avoid toxic application levels. Coating micronutrients onto granular macronutrient fertilizers was also demonstrated. The blending procedures taught in the video can be directly transferred to a commercial blending facility.

MICROBIAL BIOFERTILIZERS

Controlled experiments under laboratory and greenhouse conditions were conducted to evaluate **Kula-N, a microbial biofertilizer produced by Kula Bio**. The biofertilizer can work with any crop, fixing nitrogen from the air in the soil. Soil incubation and leaching studies have shown that nitrate-N leaching losses with Kula-N, whether applied alone or in combination with urea or calcium nitrate, are negligible. Preliminary greenhouse studies conducted in 2021 with sorghum as the test crop indicate that up to 50% of the urea-N requirement could be replaced by Kula-N with no significant difference in grain yield. The product has also been evaluated for its impact on nitrous oxide emission, and **the results showed that application of 50% urea-N plus 50% Kula-N had an emission rate similar to 50% urea**. Our initial studies have shown N losses are lower with Kula-N biofertilizer. Trials are currently underway with tomatoes.



At left: Results of trials in brownfield soil revealed that the Kula-N biofertilizer leaches less nitrogen than many traditional fertilizers.

Below: Greenhouse trials indicated that if Kula-N is applied, crops need only half of the typical urea fertilizer requirement to reach the same yield levels.





ENGINEERING & PILOT PLANT SERVICES

During 2021, the pilot plant and engineering teams executed projects for nine companies, representing five countries. The projects involved developing new fertilizer technologies, investigating various raw materials to lower production costs and methods to improve existing processes, and producing material for physical properties evaluation and field trials.

Work involving new technologies:

- Lab and pilot plant work involving granulation of a mined ore and a nitrogen source.
- Pilot plant granulation of a phosphate efficiency enhancer.
- Pilot plant granulation of pH-modified NPK materials.

Work to improve existing processes or lower production costs:

- Pilot plant granulation of NPK fertilizer using a challenging acid blend.
- Pilot plant investigation of binders for ammonium sulfate granulation.
- Ongoing physical and chemical properties evaluation for customer-generated samples.

Work to produce material for agronomic studies:

- Pilot plant granulation of mined ore incorporated into NPK fertilizers.

Engineering and technical assistance:

- Engineering review of a high-pressure ammonia system.
- Onsite technical assistance at a commercial NPK production plant to troubleshoot processing issues.



Above right: Looking into the chamber of the large-scale dryer.

Below right: Sample of an experimental granulated urea formulation.

Several improvements were made to the pilot plant facilities, including an upgrade of the anhydrous ammonia system and replacement of the internal components of the rotary drum dryer and cooler in the large-scale plant. A multi-year improvement plan to refurbish existing assets and enhance capabilities was developed for the pilot plant, which will be executed in the next few years.

SUCCESS STORY RESEARCH

GENDER DYNAMICS & WOMEN IN AGRIBUSINESS

Studies show that female farmers are as efficient as male farmers, but they produce less because they control less land, use fewer inputs, and have less access to important services, such as knowledge and information sources and finance. During 2021, the SOILS Consortium engaged in field surveys to gain an understanding of factors associated with women's access to and use of fertilizers and soil management practices in Uganda. There were obvious differences between male and female farmers in knowledge and information pathways on fertilizer products and application, as well as accessibility to agro-input dealers and other

Below: Two farmers at work applying Grainpulse Quality Fertilizer to their Irish potato plot in Uganda.



embedded services. These are affected by the gender roles of men and women, including socio-cultural factors, capital, resource control, and ownership.

Analyses of preliminary data indicate that women were much more inclined to use organic inputs generated from farm wastes and manure on their farms compared to men. This was more evident in home gardens versus cash crop farming systems. Women were



At right: An agro-input dealer proudly displays a bag of crop-specific fertilizer at her shop in Uganda.

constrained by mobility issues in traveling beyond 5 kilometers from their villages, restricting inorganic fertilizer use in general. Women farmers gained most of their knowledge on fertilizers and soil management practices from extension services and their participation in farmer groups; men gained knowledge from multiple sources, including extension services, agro-input shops, neighbors, and external training programs. The agro-input shops owned by women were more active in attracting women farmers in their communities.

In general, access to credit by women farmers, with minimal to no collateral, was a major constraint to financing farming operations. Women farmers also expressed the need for more capacity building, exclusively for women, to understand the complexities involved in soil-water-nutrient management technologies.

More in-depth analyses regarding gender dynamics in the supply of agro-inputs and implications on the access to and use of fertilizers among women farmers, along with their perceptions, will be carried out in 2022 for further policy inferences.



NORTH & WEST AFRICA



In 1987, IFDC opened its first office in West Africa, located in Lomé, the capital city of Togo. IFDC now has offices in nine additional countries (Benin, Burkina Faso, Côte d'Ivoire, Egypt, Ghana, Mali, Niger, Nigeria, and Senegal) and projects operating in all ten countries plus Cabo Verde, Cameroon, Chad, Gambia, Guinea, Guinea-Bissau, Liberia, Sierra Leone, and Mauritania.

2021 highlights of IFDC's work in West Africa include developing fertilizer data management, visualization and dissemination methods, increasing the adoption of efficient and targeted fertilizer techniques, supporting seed sector development and professionalization, building more inclusive farm-to-market agribusiness clusters, and enhancing interactions between scientific, financial, and government bodies.

AFRICAFERTILIZER.ORG



Bags of NPK fertilizer are properly stored in a warehouse in West Africa.

Africa-wide (ongoing)

BUDGET – U.S. \$1,500,000

IMPLEMENTING PARTNERS – International Fertilizer Association (IFA), Argus Media, Development Gateway, and the Nigerian private sector

As the premier source for fertilizer statistics and information in Africa, the [AfricaFertilizer.org](https://africafertilizer.org) (AFO) initiative has been collecting, processing, and publishing fertilizer production, trade, and consumption statistics for the main fertilizer markets in sub-Saharan Africa (SSA). Working with Development Gateway, AFO expanded its innovative dashboard for fertilizer data – Visualizing Insights on Fertilizer for African Agriculture – to include

Ghana and Nigeria, in addition to Kenya. The project published the [2021 Register of Fertilizer Manufacturing and Processing Facilities](#), which monitors and maps operational fertilizer plants throughout SSA, excluding South Africa. AFO updated fertilizer data and statistics at [11 country validation workshops](#) held in West and East Africa. Four quarterly editions of the [Africa Fertilizer Watch](#) were published to detail the fertilizer sector's response to COVID-19. Twelve editions of the [FertiNews](#) e-newsletter were disseminated on fertilizer statistics, market comments, and general fertilizer news, and 11 country [factsheets](#) were distributed to partners and donors. In terms of partner engagement, the AFO team underwent training provided by IFA to build capacity in demand forecasting and gave presentations on the fertilizer situation to IFA members during the organization's annual Strategic Forum.



FEED THE FUTURE ENHANCING GROWTH THROUGH REGIONAL AGRICULTURAL INPUT SYSTEMS (ENGRAIS) PROJECT FOR WEST AFRICA



Representatives from USAID, ECOWAS, UEMOA, WAFA, CORAF, and IFDC attending an EnGRAIS Regional Validation Workshop.

ECOWAS Member States and Chad and Mauritania (2018-2023)

BUDGET – U.S. \$14 million

KEY PARTNERS – Economic Community of West African States (ECOWAS), West African Economic and Monetary Union (UEMOA), West and Central African Council for Agricultural Research and Development (CORAF), and West African Fertilizer Association (WAFA)

DONOR – United States Agency for International Development (USAID)/ West Africa Regional Mission

While COVID-19 and soaring prices have negatively impacted the development of the fertilizer market in West Africa, EnGRAIS has continued to support the public and private sector at the regional and national levels to address critical issues. The project has provided policy advice to key decision-makers, flagging risks so that supply shocks caused by global forces can be better mitigated. The West Africa Fertilizer Business Information Guide was published to facilitate more relevant policy interventions and trade decisions. To increase productivity and promote good agricultural practices, the online Fertilizer and Seed Recommendations for West Africa Map has been expanded to offer 110 agricultural input packages, covering 15 crops in 11 countries, and 50 regional trainers will disseminate these to more than 600,000 producers. The project has advised ECOWAS, UEMOA, and several governments on how to respond to crises and to improve their public interventions and subsidy programs, including those in Burkina Faso, Ghana, and Niger. Through its assessment of 43 public and private laboratories, the EnGRAIS project is also helping to improve the quality control of fertilizers across the region.

FEED THE FUTURE NIGERIA RURAL RESILIENCE ACTIVITY (RRA)



USAID, Mercy Corps, Save the Children, and IFDC staff members brainstorm during an RRA Agro-input Policy Dialogue Workshop in March of 2021.

Nigeria (2019-2024)

BUDGET – U.S. \$1.5 million

IMPLEMENTING PARTNERS – Mercy Corps leads the consortium including IFDC and Save the Children International

DONOR – USAID

RRA is facilitating economic recovery and growth in vulnerable, conflict-affected areas by promoting systemic change in market systems. IFDC is championing interventions aimed at improving farm practices for increased productivity and incomes for farmers through engagement with value chain actors, public/private extension service providers, and others by ensuring appropriate technologies and practices are mainstreamed into the primary activities of the respective partners. In 2021, the project successfully established 385 demonstration plots to promote the adoption of good agronomic practices; trained 23,450 smallholder farmers in Gombe, Adamawa, Borno, and Yobe states on enhanced productivity; and supported over 15,000 smallholder farmers in the Sahel, Sudan, and Guinea Savannah agroecologies to increase their yields in rice, cowpea, maize, and groundnut from the average 1.80 metric tons per hectare (mt/ha) to about 2.35 mt/ha. The project held the North-East Agro-Input Policy Dialogue

and successfully established the North-East Input Resilience Network, responsible for the promotion of agro-input policy and investment. A total of 50 agrochemical safety ambassadors were trained by RRA to serve as private service providers and campaign for safe use of agrochemicals. With project support, smallholder farmers, women-led farmer associations, and Arewa Young Women Graduates formed or transitioned into 100 producer organizations, and their institutional capacity around group dynamics, leadership, and marketing for rural transformation was built.

FEED THE FUTURE SENEGAL DUNDËL SUUF PROJECT



Senegalese farmer Abdoulaye Diallo proudly shows his rice harvest after experimenting with FDP, a climate-smart technology, on his farm.

Senegal (2019-2023)

BUDGET - U.S. \$8.5 million

IMPLEMENTING PARTNERS - Institut Sénégalais de Recherche Agricoles (ISRA), Agence Nationale pour le Conseil Agricole et Rural (ANCAR), Directorate of Agriculture, producer organizations, and the private sector

DONOR - USAID

Dundël Suuf is being implemented in five agroecological zones of Senegal to address the use of inappropriate fertilizer formulas, lack of adoption of enhanced fertilizer technologies, poor enforcement of fertilizer quality control, and an inefficient subsidy program. The program supports

improvement of soil fertility to increase agricultural productivity in the country. In its second year, 17 partners were selected to establish 3,053 fertilizer deep placement (FDP) and microdosing (MD) demonstration plots on 8,092 hectares (ha) for 87,682 beneficiaries, 900 of whom received agro-input packages (AIPs) for COVID-19 impact mitigation. A total of 122,644 participants (55% women and 15% youth) have been trained on FDP and MD application standards. To contribute to subsidy reform, 8,000 flyers on the smart fertilizer subsidy program guidelines were shared with partners, particularly decision-makers. A total of 2,556 soil samples have been analyzed, and 15 soil fertility maps are being generated for Senegal, the project's flagship activity. Two training workshops were held on environmental impact mainstreaming as well as Stata and advanced Excel software for team capacity building. A partnership with the University of Sine Saloum El-Hâdj Ibrahima Niass (USSEIN) was initiated, resulting in eight student internships.

Omar Diamanka and his family happily display a portion of the chilis they produced after receiving seeds, fertilizer, and training from the Dundël Suuf project.





FERTILIZER RESEARCH AND RESPONSIBLE IMPLEMENTATION (FERARI)



Bertha Ansah, an extension worker with MoFA in the Sunyani West District of Ghana, documents on-farm trial crops.

Ghana (2019-2024)

BUDGET – U.S. \$7.1 million

IMPLEMENTING PARTNERS – Mohammed VI Polytechnic University (UM6P), OCP, Wageningen University and Research, University of Liège, University of Ghana, Kwame Nkrumah University of Science and Technology, University for Development Studies, Ghana Ministry of Food and Agriculture (MoFA), and other universities and research institutes

DONOR – UM6P/OCP and institutional contributions

FERARI is an international public-private partnership that builds science-based approaches to site-specific fertilization for widespread adoption by Ghanaian farmers for improved food and nutrition security. In its first two years, 350 on-station and on-farm fertilizer response trials of maize, rice, and soybean were conducted and demonstrated to about 2,000 farmers. FERARI established the Fertilizer Platform for Ghana, which is currently registered as a private entity and operates according to its own constitution. FERARI's soil mapping expertise is being developed as a step toward an IT platform. Project activities support the Ghanaian government's Planting for Food and Jobs program so that development efforts are embedded into national policy priorities to reach impact at scale. Activities are being conducted using a transdisciplinary approach, with 30 master's-level students supervised by staff from nine universities in Ghana, Morocco, the Netherlands, and Belgium and the FERARI team. Ten master's-level graduates from UM6P who were trained by the project are now employed in various international companies in North and West Africa. Five doctoral students from Wageningen and UM6P have conducted initial surveys and are completing course work at Wageningen University. Two postdocs at the University of Liège are developing and testing innovative nano-based fertilizers.

INTEGRATED SEED SECTOR DEVELOPMENT IN THE SAHEL (ISSD/SAHEL)



A smallholder farmer in Niger inspects her crops for growth after using high-quality seeds.

Mali, Niger (2020-2024)

BUDGET – €11 million

IMPLEMENTING PARTNERS – IFDC (consortium leader), Sasakawa Africa Association (SAA), International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), and Royal Tropical Institute (KIT)

DONOR – Embassy of the Kingdom of the Netherlands

2021 was devoted to the inception phase of ISSD/Sahel. The project produced a total of 10,723 kilograms (kg) of pre-basic seed (5,933 kg in Mali; 4,790 kg in Niger) and 48,706 kg of basic seed (16,688 kg in Mali; 32,018 kg in Niger), reaching a rate of achievement of 181% for the pre-basic and 100% for basic seed production. With this increase in basic seed production, the project was able to meet 98% of the basic seed demand in the priority regions in Mali and 93% in Niger. The project strengthened the national production and supply system for high-quality seeds through business support to 10 seed companies and technical assistance to 70 of the 408 seed cooperatives operating in the priority regions in Mali. As a result, 59,752 kg (all crops and varieties) of certified seeds were produced by these cooperatives on 297 production

plots. Thirty-one community seed sales points, comprising 29 input stores and two tricycles for mobile sales, were set up near end users, resulting in the creation of 31 jobs. ISSD/Sahel, in collaboration with the Malian and Nigerien state institutes and private entrepreneurs, completed a detailed evaluation of the major constraints to production, certification, and marketing of basic, pre-basic, and certified seeds. Results of this seed sector assessment were validated by stakeholders and led to the identification of key steps for developing national road maps to address constraints. To alleviate these, training and capacity building sessions were organized for the national seed regulatory bodies: the National Seed Laboratory (Labosem) in Mali and the Directorate of Seed Control and Certification (DCCS) in Niger.

LOCAL GOVERNMENT APPROACH TO THE AGRICULTURAL MARKET IN BENIN - PHASE 2 (ACMA2)



Young Beninese agri-entrepreneur, Sisso Afi Pélagie, holds the gari products that her business processes from cassava.

Benin (2017-2022)

BUDGET – €21.1 million

IMPLEMENTING PARTNERS – CARE International Benin-Togo and KIT

DONOR – Embassy of the Kingdom of the Netherlands in Benin

The ACMA2 program is being implemented in four departments of Benin: Ouémé, Plateau, Zou, and Collines. The program seeks to improve the food and nutritional security of rural populations in Benin by increasing the incomes of direct economic actors (men, women, and young people). To achieve this, three specific objectives have been defined: improve the agricultural productivity of producers and processors; increase the trade of agricultural products by the actors organized in agribusiness clusters; and reduce barriers to the trade of agricultural products within Benin and

with neighboring countries, including Nigeria. ACMA2 has impacted nearly 93,400 farmers, processors, and traders (43% men, 57% women, and 33% young people). The program has made good agricultural practices and strategic information accessible on its Information and Communications Technology for Agriculture (ICT4Ag) platform, and nearly 10,900 people (47.35% women and 46.72% young people) have subscribed on a fee-for-service basis. Sales

of more than 83,300 mt of agricultural products have been recorded at a value of almost U.S. \$31.5 million. Loans of more than U.S. \$6.3 million, including nearly U.S. \$300,000 through digital finance, have been made available to stakeholders to support their production, processing, and marketing activities.



Delegates from the Embassy of the Netherlands in Benin, led by Head of Development Cooperation Antonie de Kemp (pictured middle), visit the ACMA2 Project.



NIGER FERTILIZER SECTOR REFORM AND TECHNICAL ASSISTANCE FOR IMPLEMENTATION OF THE REFORM PLAN (PARSEN)



Nigerien farmers prepare their field for planting and appropriate fertilizer application.

Niger (2018-2022)

BUDGET – U.S. \$3,899,854

DONOR – Millennium Challenge Corporation (MCC)/Millennium Challenge Account (MCA)-Niger

IFDC is providing technical assistance for the successful implementation of Niger’s Fertilizer Sector Reform Plan, which is expected to significantly improve the use of fertilizers in agriculture through better involvement of the private sector. In 2021, the project continued to support the reform bodies responsible for monitoring the fertilizer market. Activities also facilitated the dissemination of regulatory texts governing the trade of

fertilizers and operationalization of the Common Fertilizer Fund. The project continued to build the capacity of members of the Association of Fertilizer Importers and Distributors (ANIDE) toward their professionalization and to strengthen their relationship with fertilizer users, the banking/financial system, and the West African Fertilizer Association. In addition, support was provided to start a pilot e-voucher targeted fertilizer subsidy program, financed by MCA-Niger, which will later be expanded to cover the eight regions of the country, and to strengthen the capacity of the Directorate of the Ministry of Agriculture in charge of monitoring and quality control of fertilizers. Two booklets were published by the project: a collection of legislative and regulatory texts on fertilizers and a directory of private fertilizer suppliers in Niger.

SMALLHOLDER AGRICULTURAL PRODUCTIVITY ENHANCEMENT PROGRAM (SAPEP)



Smallholder farmers receive training and education on sustainable practices, technologies, and inputs that can boost their agricultural productivity.

Benin, Burkina Faso, Cameroon, Mali, Niger (2015-2024)

BUDGET – U.S. \$7,315,000

DONOR – Islamic Development Bank

SAPEP is designed to provide proven, appropriate agricultural technologies to improve the living standards of 500,000 households. Specific outcomes of the program include increased use of effective integrated soil fertility management (ISFM) technologies, improved access to seed, improved access to financial services, and increased access to output markets. The program aims to increase yield levels of major crops by at least 70% and farmer income by at least 20%. In 2021, additional funding was received

to coordinate the evaluation of maize, groundnut, soybean, cassava, cowpea, and cover crop germplasm by University of Calavi scientists and expand the development of the inland valley for rice production in Benin. In Cameroon, an inventory credit system was implemented, allowing farmers to purchase fertilizers and improved seed and enabling them to sell their products at a higher price. In Mali, construction began on a modern soil-plant-water analysis laboratory. Additionally, 25 agribusiness centers were built and post-harvest seed treatment equipment was acquired. SAPEP’s high level of performance led to four additional projects being granted by the Islamic Development Bank on the rice value chain in Niger, rice and other crop value chains in Guinea, and integrated rural development in Guinea.

TECHNOLOGIES FOR AFRICAN AGRICULTURAL TRANSFORMATION (TAAT) - SOIL FERTILITY ENABLER COMPACT



A farmer from Kadiolo, Mali, harvests rice from a paddy field.

Benin, Burkina Faso, Ghana, Mali, Nigeria, Tanzania (2018-2021)

BUDGET – U.S. \$1,841,109

LEAD IMPLEMENTER – International Institute of Tropical Agriculture (IITA)

DONOR – African Development Bank

IFDC leads the TAAT Soil Fertility Enabler (SFE), which contributes to increasing productivity in Africa through deployment of proven productivity-enhancing technologies in support of the seven TAAT commodity compacts in soil fertility management and facilitation of access to agro-inputs. The interventions are achieved through three principal

mechanisms: creation of an enabling environment for dissemination of technologies, strengthening of technology delivery infrastructure, and deployment of effective fertilizer technologies. During the past three years, the SFE, with a network of 33 partners including the national agricultural research system and the private sector, registered 2,451 agro-input dealers in the target countries and established an electronic platform in Burkina Faso that links farmers to agro-input dealers to facilitate last-mile delivery of fertilizers. In addition, the SFE established 888 demonstration plots on fertilizer technologies, including urea deep placement, microdosing, and integrated soil fertility management (ISFM); trained 604 stakeholders in ISFM and related skills; produced 62 soil fertility maps to guide fertilizer recommendations; tested 13 fertilizers formulas in farmers' fields; and distributed 1,130 mini-kits (seed + fertilizer) to farmers for their own testing of fertilizer microdosing.

TOWARD SUSTAINABLE CLUSTERS IN AGRIBUSINESS THROUGH LEARNING IN ENTREPRENEURSHIP (2SCALE) PHASE II



Telia Express Money (TEM) owner Amadou Cissé benefitted from 2SCALE's crowdfunding campaign and improved his business operations.

Burkina Faso, Côte d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Mali, Niger, Nigeria, South Sudan (2019-2023)

BUDGET – €150,000,000 (€50,000,000 through public funding)

IMPLEMENTING PARTNERS – SNV and Bopinc

DONOR – Netherlands Directorate-General for International Cooperation and private sector and financial institution co-investment

2SCALE is an incubator and accelerator program that manages a portfolio of public-private partnerships (PPPs) for inclusive business in agri-food sectors and industries across Africa. 2SCALE offers a range of support services to its business champions (farmer groups or small and medium enterprises [SMEs]) and partners, enabling them to produce, transform, and supply quality food products. These products go to local and regional markets, including to base-of-the-pyramid (BoP) consumers. 2SCALE manages a portfolio of 62 active business partnerships in 10 countries. Pilot partnerships began in 2021 in Egypt and South Sudan, countries new to the program. These pilots will determine how inclusive and commercially viable business models can be promoted in areas with a favorable business environment and those where risks and uncertainties are higher. 2SCALE saw considerable growth in BoP



consumers included in the food system from 432,652 in 2020 to 956,517 in 2021, attaining 95.7% of its target. The project also tripled its reach during the year to include 419,819 smallholder farmers who have improved their productivity and gained market access. Due to disruptions caused by the pandemic, 50 SMEs involved in 2SCALE partnerships participated in the program's second crowdfunding campaign, raising about \$283,590 within one month to meet their working capital needs.

Promoter of Agribio and a graduate in Marketing, Diawara Mariétou participated in 2SCALE's crowdfunding campaign.



TRANSFORMING IRRIGATION MANAGEMENT IN NIGERIA (TRIMING) EXTENSION SERVICE SUPERVISION



Kurman Isa, a 35-year-old farmer from Nigeria, used UDP to create a better livelihood for his family.

Nigeria (2019-2021)

BUDGET - U.S. \$840,000

IMPLEMENTING PARTNERS - National Agriculture Extension and Research Liaison Services (NAERLS) and Agricultural Development Programs in Jigawa, Kano, Sokoto, and Zamfara states

DONOR - World Bank, through the TRIMING project under the Federal Ministry of Water Resources in Nigeria

TRIMING assists farmers in Nigeria's northern irrigation schemes to increase their agricultural productivity and has now reached 32,114 farmers in selected states. These farmers have been trained through Farmer Field Business Schools (FFBSs) to boost their productivity. IFDC employs a collaborative approach to link these farmers to input and output markets, as well as financial institutions, strengthening their capacities across the value chain. Nine productivity-enhancing technologies have been promoted to farmers, with a particular focus on fertilizer deep placement (FDP). Farmers using this technology have increased their rice yields by more than 50% to 5-8 mt/ha in various project intervention sites. Understanding the critical role that the Agricultural Development Programs (ADPs) play in ensuring sustainability of project efforts, IFDC has worked continuously to supervise and strengthen the institution's capacities in various areas, including delivery of farmer extension and use of information and communication technology.

SUCCESS STORY WEST

UDP: GAME CHANGER IN SENEGAL AND RACINE THIerno HANNE'S WINNING CHOICE

Below: UDP offers many advantages to Senegalese farmers for economy and crop impact.

Racine Thierno Hanne, a 41-year-old farmer, has produced rice and conducted market gardening in Kodith Village, located in Podor Department of the Senegal River Valley, since he started farming at the age of 15. When his father became too old to farm, he left Hanne the family plot to encourage his son to stay in the village.

"I dreamed of emigration. I wanted to go to Gabon where one of my grandparents had emigrated, but my father dissuaded me from leaving. He asked me to stay here and work the land. My father told me that I can get everything I need here. That's how I finally decided to stay. I gave up the thought of migrating and started to cultivate."



Similar to other rice producers in the area, Hanne previously used a lot of fertilizer on his 2-hectare plot. In fact, he said it was common to use fertilizer at a rate of 350 kilograms per hectare (kg/ha) – 250 kg of urea and 100 kg of diammonium phosphate (DAP).

This year, Hanne became a participant in the Feed the Future Senegal Dundël Suuf Project and learned about the advantages of urea deep placement (UDP) technology.

"I joined the Dundël Suuf project after being selected by the Regional Directorate of Rural Development. Through the project, I discovered how to deep place briquetted urea fertilizer. Since I have been using UDP, I have quickly seen its impact on my field."



At right: Farmers in Senegal have discovered the benefits of UDP for crop yields.



He adds that he has used much less fertilizer this year, only 113 kg/ha. Using UDP, Hanne saved an estimated 75,000 FCFA, or about U.S. \$138, on fertilizer purchases for his plot of land.

Hanne believes using UDP has improved his crop performance and saved him money. He says, **"I saw a lot of UDP use in the Feed the Future Senegal Dundël Suuf Project. Now I intend to apply only this method on the different crops I grow."**

With only a few months remaining before harvest, Hanne hopes to see an increase in his crop yield, which is usually 4.5-5 metric tons (mt) per hectare. His good harvests mean that he no longer dreams of moving to Gabon. In order to afford his annual household expenses, Hanne explains, "I sell part of my production to finance my entire market gardening season."

Hanne invites the promoters of the Dundël Suuf project to scale up UDP technology for the benefit of other agricultural producers.

The Feed the Future Senegal Dundël Suuf Project (2019-2022) is working to promote food security in Senegal. By addressing issues such as inappropriate fertilizer use, poor enforcement of quality control regulations, and low adoption of improved fertilizer products and technologies, Dundël Suuf aims to increase agricultural productivity and production to reduce hunger, poverty, and malnutrition.



EAST & SOUTHERN AFRICA



IFDC has worked in East and Southern Africa since the early 1990s and established a regional office in Nairobi, Kenya, in 2009. Today, with offices in Burundi, Ethiopia, Kenya, Mozambique, South Sudan, and Uganda, and projects underway in all six countries as well as research trials in Rwanda, IFDC is helping develop, strengthen, and innovate new paths forward for the smallholder farmers and traders, transporters, banks, and policymakers who work together to put food security first across the region.

2021 highlights of IFDC's work in the region include a focus on strengthening access to improved, quality seed for smallholder farmers, teaching climate-smart practices, and enhancing participation of women and youth in agricultural market systems.

ACCELERATING AGRICULTURE AND AGRIBUSINESS IN SOUTH SUDAN FOR ENHANCED ECONOMIC DEVELOPMENT (A3-SEED)



Dr. George Leju Loro, Director General for Crop Production and Extension Services, Ministry of Agriculture and Forestry of South Sudan, participated in the project launch in June 2021.

South Sudan (2020-2025)

BUDGET – U.S. \$10 million

IMPLEMENTING PARTNER – Royal Tropical Institute (KIT)

DONOR – Embassy of the Kingdom of the Netherlands in Juba

A3-SEED supports the commercialization of the seed sector in South Sudan to transition from humanitarian relief to a commercial, sustainable, and adaptive agriculture sector. In 2021, A3-SEED signed agreements with 10 seed companies that will form the critical private sector to drive the quality seed production, increasing availability down to the last mile. The project successfully completed a baseline study, interviewing more than

2,000 respondents in target areas; this information was used to inform project design and build synergies with existing EKN-funded projects. A soil health study involving a triangulated sampling approach was also conducted, and the results will facilitate the design of extension modules for farmers. In addition, the project is supporting the Seed Trade Association of South Sudan (STASS) in its discussions with relief agencies to prioritize local seed procurement and with the government to establish formal monitoring and certification of seed quality. A3-SEED aims to improve the livelihoods of more than 100,000 farming households, facilitate the development of 100 agro-dealers and 400 new businesses owned or managed by women and youth, and ensure over 42,000 hectares (ha) of farmland is under agroecological production and resilient to shocks and that 50% of relief seed is procured locally.



AFRICA FERTILIZER.ORG



Bags of fertilizer are prepared for shipping and distribution at a port in Africa.

Africa-wide (ongoing)

BUDGET – U.S. \$1,500,000

IMPLEMENTING PARTNERS – International Fertilizer Association (IFA), Argus Media, Development Gateway, and the Nigerian private sector

As the premier source for fertilizer statistics and information in Africa, the AfricaFertilizer.org (AFO) initiative has been collecting, processing, and publishing fertilizer production, trade, and consumption statistics for the main fertilizer markets in sub-Saharan Africa (SSA). Working with Development Gateway, AFO expanded its innovative dashboard for fertilizer data – Visualizing Insights on Fertilizer for African Agriculture – to include Ghana and Nigeria, in addition to Kenya. The project published the [2021 Register of Fertilizer Manufacturing and Processing Facilities](#), which monitors and maps operational fertilizer plants throughout SSA, excluding South Africa. AFO updated fertilizer data and statistics at [11 country validation workshops](#) held in West and East Africa. Four quarterly editions of the [Africa Fertilizer Watch](#) were published to detail the fertilizer sector’s response to COVID-19. Twelve editions of the [FertiNews](#) e-newsletter were disseminated on fertilizer statistics, market comments, and general fertilizer news, and 11 country [factsheets](#) were distributed to partners and donors. In terms of partner engagement, the AFO team underwent training provided by IFA to build capacity in demand forecasting and gave presentations on the fertilizer situation to IFA members during the organization’s annual Strategic Forum.

POTATO VALUE CHAIN CAPACITY BUILDING (PCB) PROJECT



A farmer from Nyandarua County, Kenya holds high-quality potatoes that she produced.

Kenya (2018-2022)

BUDGET – €2.3 million (€1 million cost share from partners)

IMPLEMENTING PARTNERS – IPM Potato Group, Kenya Plant Health Inspectorate Service, Kevian Kenya Limited, Kirinyaga Seed Limited, National Potato Council of Kenya, Nyandarua County Government, Sustainable Food Systems Ireland, and Teagasc

DONOR – Irish Aid, Embassy of Ireland in Kenya

PCB will improve the livelihoods of smallholder farmers and families living within Nyandarua County, Kenya. The market for potatoes in the area is unstructured and mostly patronized by middlemen, who often leave farmers at a crossroads between quitting or progressing with their business. PCB uses the Farmer Field Business School model to promote the adoption of new technologies, including certified potato seed, consistent use of good agricultural practices, and improved farm management skills. The project has enabled about 900 smallholder farmers to reap the benefits of potato farming as a business by linking them with buyers and establishing mutual relationships. Through contract farming, approximately 250 mt of potato, worth nearly U.S. \$50,000, was delivered to processing markets. In 2021, the project reached 1,929 farmers (66% female) directly and another 2,255 indirectly through field days. PCB has trained over 1,900 smallholder farmers on proper feeding of infants, integration of kitchen gardening practices, and food diversification strategies. Relationships established by the

project with both international and local private and public sector partners have resulted in numerous commitments of technical support and other critical infrastructure investments. PCB mobilized over €300,000 in 2021 from the public and private sectors.

PRIVATE SEED SECTOR DEVELOPMENT (PSSD)



Burundian smallholders prepare a plot for the planting of quality seeds.

Burundi (2018-2022)

BUDGET – €7,761,600

IMPLEMENTING PARTNER – Royal Tropical Institute (KIT)

DONOR – Embassy of the Kingdom of the Netherlands in Burundi

PSSD works with private and public sector partners to promote the development of a private sector-led seed industry that can provide farmers in Burundi with sustainable access to high-quality seed and agricultural advisory services. In 2021, 97,394 smallholder farmers purchased seed from PSSD partners, a ninefold increase from 2019. Thus, 205,499 producers, or about 11.8% of the farm households in Burundi, have purchased seed from PSSD partners since project inception. About 1,958 mt of seed was sold in 2021, an increase of 37.3% compared to 2020, for a total 3,742 mt thus far. PSSD provided training on good agricultural practices to 64,180 smallholder farmers, 45% of whom were women, for a total of 122,577 smallholder farmers since the beginning of the project. More than 5,700 demonstration fields were installed, for a total of 17,339 during the life of the project. Of all clients, 81,407 have been women, representing 39% of open-pollinated maize seed clients, 42% of all hybrid maize seed clients, 43% of all bean seed clients, and 38% of all potato seed clients.

PROMOTION OF NUTRITION-SENSITIVE POTATO VALUE CHAINS IN EAST AFRICA (PNSP)



A happy Ugandan farmer displays the potatoes grown during fertilizer field trials in the Elgon Highlands.

Uganda (2017-2022)

BUDGET – €1,810,500

IMPLEMENTING PARTNERS – Uganda National Potato Platform and National Agricultural Research Organization (NARO)

DONOR – Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ)

PNSP has increased the productivity and associated incomes of 6,996 smallholder potato farmers (67% female) and improved nutrition through dietary diversification for 14,340 farmers (71% female) in Eastern Uganda. By promoting good agricultural practices, potato yields have increased from 12.5 mt/ha at baseline to 18.5 mt/ha in 2021. Due to the shortage of quality seed in the Mount Elgon highlands, the project supported four private seed producer associations to acquire 5,900 potato plantlets to yield a total of 61,174 mini-tubers. Production of around 29 mt of pre-basic seed potato is projected by June 2022, which will then be multiplied into basic seed. Through hands-on training in establishing home kitchen gardens, cooking demonstrations, community dialogues, and radio messaging, knowledge of and practices around nutrition have improved, with the Individual Dietary Diversity Score increasing from 3.1 (out of 9) food groups at baseline to 5.9 in 2021.



RESILIENT EFFICIENT AGRIBUSINESS CHAINS IN UGANDA (REACH-UGANDA)



REACH-Uganda participants proudly exhibit crops from their harvest.

Uganda (2016-2021)

BUDGET – €13,286,700

IMPLEMENTING PARTNERS – Cardno Emerging Markets and Royal Tropical Institute (KIT)

DONOR – Embassy of the Kingdom of the Netherlands in Uganda

By the end of 2021, REACH-Uganda had been implemented in 20 districts in Southwestern and Eastern Uganda, targeting the improvement of potato and rice market systems. Through the market system development approach, the project improved market engagement for farmers, strengthened household resilience, and deepened the availability of agricultural support services and training. As a result, at the farmer level, yields increased from 3.07 to 4.15 mt per acre (35%) in potato and from 0.6 mt to 1.36 mt per acre (126%) in rice. Net income increased from U.S. \$711 to \$1,279 per acre for potato farmers and from U.S. \$338 to \$559 per acre for rice farmers. Additional income of U.S. \$4.5 million was generated for 11,763 farmers through 14 private sector partnerships. The total additional income for farmers from partnerships signed during the project is projected to reach U.S. \$27 million by 2024. Household food security improved from 55% to 62% due to improvements in yield, income, and crop diversification. In addition, 352 full-time jobs were created. By 2024, REACH-facilitated agribusiness linkages between farmers and 26 private sector firms, including banks, will have assisted 63,139 farmers and created 847 full-time jobs.

SOIL FERTILITY STEWARDSHIP (PAGRIS)



Burundian farmers are taught sustainable land management practices.

Burundi (2020-2024)

BUDGET – €8.8 million

IMPLEMENTING PARTNERS – Wageningen Environmental Research and Twitezimbere

DONOR – Embassy of the Kingdom of the Netherlands in Burundi

PAGRIS seeks to achieve ecologically sustainable land management. At the end of its second year, the project had facilitated 294 research farmers to establish plots to demonstrate good agricultural practices and innovations based on integrated soil fertility management (ISFM). The research farmers have been trained to co-create an integrated farming plan and test and implement land stewardship strategies and practices using the Participatory Learning and Action (PLA) approach. The demonstration plots aim to stimulate communities within 215 watersheds to replicate practices to tackle erosion and restore soil fertility. The 14,237 households within these watersheds have been taught to develop a plan to improve landscape management, reach stewardship agreements, and implement integrated practices through collective community action, covering a total of 15,542 ha. At the institutional level, PAGRIS has supported national research institutes on elaborating national soil fertility maps and studying the feasibility of improving the use of dolomite in Burundi to tackle

soil acidity. PAGRIS has also helped the Soil Fertilization Directorate (DFS) improve the strategic and technical quality of fertilizers produced and distributed in Burundi through the National Fertilizer Subsidy Program (PNSEB).

TRANSFER EFFICIENT AGRICULTURAL TECHNOLOGIES THROUGH MARKET SYSTEMS (TEAMS)



Jane Mateos Madinha, a 77-year-old grandmother, purchases certified seeds for a small plot from her local agro-input shop.

Mozambique (2021-2022)

BUDGET - U.S. \$8,000,000

IMPLEMENTING PARTNERS - United Purpose, Associação Kwaedza Simukai Manica (AKSM), and the African Fertilizer and Agribusiness Partnership (AFAP)

DONOR - Embassy of Sweden

TEAMS, the follow-on to the Food Security through Climate Adaptation and Resilience (FAR)-Sofala project, aims to increase food availability and access for 15,500 farmers in Mozambique, with a focus on women's economic empowerment in agriculture (60% women). The program seeks to aid the development of market systems by supporting farmers, agro-dealers, input suppliers, and service providers to establish a continuous supply network of inputs and outputs and to help farmers increase resilience, productivity, and production using climate-smart agriculture. A total of 15,418 farmers (62% women) benefited from interventions to improve productivity by creating access to climate-smart agricultural inputs and increasing resilience to climate shocks by intensifying vegetable production through the promotion of cost-effective and environmentally friendly irrigation systems. As a result, 7,832 producers (57% women) who adopted climate-smart agricultural practices and inputs were able to double their productivity in various vegetable crops, increasing their income from U.S. \$0.38 to U.S. \$1.10 per day. Furthermore, in partnership with the private sector, the program has been facilitating sustainable market linkages between large input suppliers and local agro-dealers, supporting local agro-dealers in developing the capacity to manage their business, and facilitating the construction of improved stores that are resilient to climate change.

Seedling producers from Mozambique stand in front of their seed screenhouse.





TOWARD SUSTAINABLE CLUSTERS IN AGRIBUSINESS THROUGH LEARNING IN ENTREPRENEURSHIP (2SCALE) PHASE II



A young 2SCALE participant stands smiling in a seedling screenhouse.

Burkina Faso, Côte d'Ivoire, Egypt, Ethiopia, Ghana, Kenya, Mali, Niger, Nigeria, South Sudan (2019-2023)

BUDGET – €150,000,000 (€50,000,000 through public funding)

IMPLEMENTING PARTNERS – SNV and Bopinc

DONOR – Netherlands Directorate-General for International Cooperation and private sector and financial institution co-investment

2SCALE is an incubator and accelerator program that manages a portfolio of public-private partnerships (PPPs) for inclusive business in agri-food sectors and industries across Africa. 2SCALE offers a range of support services to its business champions (farmer groups or small and medium enterprises [SMEs]) and partners, enabling them to produce, transform, and supply quality food products. These products go to local and regional markets, including to base-of-the-pyramid (BoP) consumers. 2SCALE manages a portfolio of 62 active business partnerships in 10 countries.

Pilot partnerships began in 2021 in Egypt and South Sudan, countries new to the program. These pilots will determine how inclusive and commercially viable business models can be promoted in areas with a favorable business environment and those where risks and uncertainties are higher. 2SCALE saw considerable growth in BoP consumers included in the food system from 432,652 in 2020 to 956,517 in 2021, attaining 95.7% of its target. The project also tripled its reach during the year to include 419,819 smallholder farmers who have improved their productivity and gained market access. Due to disruptions caused by the pandemic, 50 SMEs involved in 2SCALE partnerships participated in the program's second crowdfunding campaign, raising about \$283,590 within one month to meet their working capital needs.

Women browse 2SCALE's Digital Innovation Directory.



SUCCESS STORY EAST

TRANSFORMING KENYA'S FOOD BASKET: JOSHUA WAIREGI AND HIS 53 METRIC TONS OF POTATOES

Below: Joshua demonstrates the biogas system he set up for household cooking.



The interior of Kanjuri Ridge, situated at an altitude of 7,540 feet, is the heartland of Nyandarua, one of the few places in the county where large farms still stand. On this chilly Friday afternoon, we finally arrived at Joshua Wairegi's house after a 14-kilometer ride on a motorbike from Tumaini Center. Most farmers here grow potatoes using techniques they learned from their parents. They are unaware that certified potato seeds exist; instead, they recycle seed or buy it from their neighbors. Fertilizer use is for the few who have extra resources; however, they still record poor harvests because they use the same fertilizer year after year without seeking expertise on the condition of their soils. This has led to soil acidification, which greatly hinders potato growth.

Wairegi and 15 other farmers formed the Sunrise Farmers Group in 2020 on the advice of the ward agricultural officer (WAO). The WAO had initially informed them about the potato farming training offered by IFDC, in partnership with the Nyandarua County Government. This training is part of the Irish Aid-funded **Potato Value Chain Capacity Building (PCB) project**, a four-year project (2018-2022) that aims to improve the incomes and livelihoods of potato farmers in Nyandarua County.



At right: Certified seed potatoes can help farmers significantly increase their yields while also improving climate, pest, and disease resilience compared to potatoes grown from low-quality or recycled seeds.

Below right: Solar panels installed at Joshua's home.

The WAO helped the group identify a suitable site for a demonstration plot. The officer also discussed soil testing, its importance, and the process of soil sampling. The lessons, given over 15 weeks, involved practical activities, such as identification of diseases and pests, proper use of crop protection products, hilling, harvesting, and sorting and grading.

“We were amazed by the results from the demonstration plots. We discovered the benefits of using the right inputs at the correct rate and at the right time, the need to invest in certified seed, and above all, how recordkeeping helps farmers determine the best price to sell their produce,” says Wairegi. “This was the turning point for me. I prepared an acre of land and practiced what I learned, regularly consulting the extension officer, local inputs agents, and IFDC agronomists. The pleasant surprise came at harvest time! Before the training, I harvested 4 mt of potato per acre. This year, I harvested 16.5 mt after using the new skills and practices. I later scaled up to 2.5 acres and harvested 53 mt,” Wairegi notes. With his proceeds, Wairegi built a biogas system and installed solar power, which fuels his home and equipment, and he plans to build a house.

Thanks to the training conducted by the PCB project, the members of the Sunrise Farmers Group now understand that fertilizer, if used properly, is beneficial for everyone. The Nyandarua community can now rightfully claim their title as the food basket of Kenya as they begin to see their farms flourish.



ASIA



IFDC has worked in Asia since 1977 when the organization's first field trials of fertilizer deep placement (FDP) were conducted in Bangladesh. In 1992, its Asia Division was established, with a permanent office opened in Dhaka, Bangladesh. Since then, IFDC has implemented projects in 30 countries across the continent. In 2020, IFDC opened its first office in India, located in Hyderabad.

2021 saw IFDC projects active in India's Telangana State and in Nepal. These projects worked to improve fertilizer availability, share techniques to improve fertilizer efficiency, conduct soil mapping to identify nutrient requirements, and engage women and youth in the agriculture sector.

ACCELERATING FARM INCOMES: BUILDING SUSTAINABLE SOIL HEALTH, MARKETS, AND PRODUCTIVITY (AFI)



Women in Telangana State, India, prepare rice seedlings for planting in an IFDC field trial.

India (2019-2023)

BUDGET - U.S. \$2,513,472

DONOR - Walmart Foundation

PROJECT HOSTING - International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)

AFI is helping peri-urban farmers of Telangana State take advantage of growing consumer demand for fresh produce in the Hyderabad metropolitan area. In 2021, emphasis was placed on disseminating good agricultural practices (GAPs). Diffusion of improved technologies requires attention to creating awareness and enhancing knowledge, as well as stimulation of entrepreneurial investment in quality agro-input supply. The project strengthened farmer-market linkages for timely sales and better prices, with a particular focus on gender and youth, by providing training and advisory services and disseminating innovations for enhancing the efficiency of natural resources, mechanization, quality seed use, and post-harvest loss reduction in rice, maize, pulses, and vegetable cropping systems. Despite a severe second wave of COVID-19 in 2021 that impacted AFI staff and participants, the project trained 1,647 farmers in GAPs, leading to their implementation on 1,565 hectares. The project adopted digital modes to share knowledge on GAPs and partnered



with a leading private company to benefit farmers. Two value chain actor conferences were held to ensure farmer-market linkages, connecting 102 representatives to meet and discuss needs and opportunities.

FEED THE FUTURE NEPAL SEED AND FERTILIZER (NSAF)



A healthy maize field in Nepal.

Nepal (2016-2022)

BUDGET – U.S. \$1,143,000

IMPLEMENTING PARTNER – International Maize and Wheat Improvement Center (CIMMYT)

DONOR – USAID

IFDC is implementing fertilizer sector-related activities on the NSAF project in collaboration with public and private sector actors, including the Nepal Agricultural Research Council (NARC), Ministry of Agriculture and Livestock Development (MoALD), Department of Agriculture, Fertilizer Association of Nepal (FAN), and agro-input companies. The project is working on rice, maize, lentil, onion, cauliflower, and tomato in 26 districts, consisting of 21 Feed the Future Zone of Influence districts in Nepal and five earthquake-affected districts in Bagmati Province. NSAF partnered with the NARC National Soil Science Research Center (NSSRC) to prepare and launch digital soil maps of Nepal, a first for South Asia. The project also prepared the Road Map on Balanced Fertilization in Nepal, which includes technical and financial analysis of the fertilizer blending activity. NSAF designed training materials on integrated soil fertility management (ISFM), covering the 4Rs of nutrient stewardship (right source, right rate, right time, and right place) and organic matter in Nepalese soils. In addition, the capacity of FAN was strengthened by the project to improve the fertilizer distribution system in Nepal.

FAN meets to discuss improved fertilizer distribution in Nepal.



SUCCESS STORY ASIA

WORLD SOIL DAY IN NEPAL HIGHLIGHTS THE CHALLENGE OF SOIL ACIDIFICATION

For World Soil Day, Nepal, with the consent of the Food and Agriculture Organization of the United Nations, modified the Holiday's theme from "Halt Soil Salinization" to "Halt Soil Acidification, Boost Soil Productivity" with the intention of raising awareness of soil acidity and its impacts on crop productivity in Nepal, where soil acidity is a prime challenge to yield increases.

In Nepal, World Soil Day featured a week-long celebration centered around different events. Celebrations were led by the National Soil Science Research Center (NSSRC) and included events such as soil testing at farmers' fields, television shows discussing the importance

of World Soil Day, press meetings, a conference on "The Management of Soil Acidity for Prosperity," a walkathon, and a formal closing ceremony in the presence of high-level government officials.

More than 50% of soils in Nepal are acidic. Therefore, managing soil acidity is critical to increasing soil fertility and the supply of plant nutrients. In addition to natural sources such as acidic parent materials and leaching of basic cations due to rainfall and irrigation, anthropogenic activities such as imbalanced fertilization and low use of organic inputs are increasing soil acidity. Increasing acidity reduces the supply of plant nutrients due to reduced microbial activities; thus, it affects the mineralization of nutrients, resulting in lower crop productivity. The increased availability

Below: Farmers making the field layout for wheat trials in Tikapur, Nepal.





Written by Dr. Yam Gaihre, Soil Scientist, IFDC and Dr. Shree Prasad Vista, Chief, National Soil Science Research Centre (NSSRC), Nepal Agricultural Research Council / Posted Courtesy of Halokhabar.com.

of micronutrients (iron, manganese, and aluminum) due to higher acidity can be toxic to plants.

Management of soil acidity is crucial for improving soil health and crop productivity. Crop productivity is relatively low in Nepal compared to other countries in south Asia. Without managing soil acidity, farmers may not be able to achieve potential yields even after applying the right amount of fertilizers. Application of liming materials is an effective method for managing soil acidity. However, Nepalese farmers do not realize the importance of liming to improve soil fertility and increase crop productivity. Their perception is that the use of the nitrogenous fertilizer urea increases yields. Moreover, liming materials are not available in a timely manner nor in sufficient quantities.

In addition to the use of agricultural lime, farmers should also be advised to use sufficient amounts of organic inputs in soils. When there is scarcity of liming materials, farmers may also focus on adaptation strategies such as selecting crops that can tolerate soil acidity.



2021 PUBLICATIONS & PRESENTATIONS

The following technical publications and presentations are a representation of the work our highly skilled researchers and field experts accomplished in 2021. These, and much of our other research, can be accessed through our [online library portal](#).

PUBLICATIONS

- Abdallah, A., C.M. Parihar, S. Patra, H.S. Nayak, Y.S. Saharawat, U. Singh, M.D. Parihar, S.K. Kakraliya, I.N. Nassar, F. Ugolini, W. Zohir, and M.M. Shalaby. 2021. "Critical Evaluation of Functional Aspects of Evaporation Barriers through Environmental and Economics Lens for Evaporation Suppression - A Review on Milestones from Improved Technologies," *Science of Total Environment*, 788:147800. <https://doi.org/10.1016/j.scitotenv.2021.147800>
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- Adzawla, W., I.N. Kissiedu, E. Martey, P.M. Etwire, W.K. Atakora, A. Gouzaye, and P.S. Bindraban. 2021. "Fertilizer Use and Yields of Maize, Rice, and Soybean Farmers in Ghana," IFDC FERARI Policy Brief No. 6.
- Adzawla, W., I.N. Kissiedu, E. Martey, P.M. Etwire, W.K. Atakora, A. Gouzaye, and P.S. Bindraban. 2021. "Poverty and Food and Nutritional Security Among Farm Households in Ghana," IFDC FERARI Policy Brief No. 5.
- Adzawla, William, I.N. Kissiedu, Edward Martey and Prince M. Etwire, Williams K. Atakora, Amadou Gouzaye, and P.S. Bindraban. 2021. "Baseline Study on Fertilizer Usage and Food/Nutrition Security in Sudan Savannah, Guinea Savannah, and Transitional Zones of Ghana," IFDC FERARI Research Report No. 5.
- Adzawla, William, Williams K. Atakora, Amadou Gouzaye, and P.S. Bindraban, 2021. "Crop Yield and Fertilizer Use Among Farmers in Guinea Savannah and Transition Zones of Ghana," IFDC FERARI Research Report No. 6.
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- Bindraban, P.S., R. Groot, and U. Singh. 2021. "Soil Nutrients: The Key to Meeting the Triple Global Challenge of Food and Nutrition Security, Climate, and Biodiversity," *Fertilizer Focus*, 38(4), July/August.



- Bregaglio, S., L. Willocquet, K.C. Kersebaum, R. Ferrise, T. Stella, T.B. Ferreira, W. Pavan, S. Asseng, and S. Savary. 2021. "Comparing Process-Based Wheat Growth Models in Their Simulation of Yield Losses Caused by Plant Diseases," *Field Crops Research*, 265:108108. <https://doi.org/10.1016/j.fcr.2021.108108>
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- Fugice, Job. 2021. Laboratory Assessment and Capacity Building, Nigeria.
- Pray, C.E., L. Nagarajan, and A. Naseem. 2021 “What is Driving the Growth of Private Agricultural R&D? Understanding the Role of Demand Diversification, IPRs, Technology, and Policy,” presented at the symposium on Privatization of Agricultural R&D and Inclusion of Smallholders in Emerging Markets: Recent Evidence (<https://iaae.confex.com/iaae/icae31/meetingapp.cgi/Session/4047> (login required); Summary: <https://iaae-agecon.org/page/31st-icae---virtual-2021>), International Conference for Agricultural Economists (ICAE) Symposium, August 25 (online).
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2021 FINANCIAL STATEMENT

The following is a summary of financial information for the year ended December 31, 2021. The full financial statements and the independent auditors' reports are available on IFDC's website at <https://ifdc.org/annual-reports/>.

STATEMENT OF REVENUE & EXPENSES

For the year ended December 31, 2021

REVENUES & GAINS (US \$'000)	2021	2020
Alliance for a Green Revolution in Africa	1,102	898
African Development Bank	189	281
Bill & Melinda Gates Foundation	258	–
Board of Directors Donations	41	41
Dutch Embassies	14,393	18,102
International Fertilizer Association (IFA)	100	167
International Food Policy Research (IFPRI)	456	–
Islamic Development Bank	839	674
Embassy of Ireland (Irish Aid)	348	402
GIZ Uganda	497	–
Mercy Corp	386	–
Millennium Challenge Corporation (MCC)	426	690
Netherlands Directorate-General for International Cooperation (DGIS)	15,930	13,304
OCP Foundation	1,566	2,044
RTI International	108	–
Swiss Agency for Development and Cooperation (SDC)	2,311	571
U.S. Agency for International Development	9,288	8,620
Walmart Foundation, Inc.	237	290
Others	3,700	3,579
Total revenues and support	52,175	50,604



EXPENSES & LOSSES (US \$'000)	2021	2020
Research and development	3,901	3,416
Field projects	34,909	36,331
Capacity building	6,733	3,256
Support activities	6,612	5,491
Total Expenses	52,155	48,494
Surplus/(loss)	20	2,110

BALANCE SHEET

For the year ended December 31, 2021

(US \$'000)	2021	2020
Total assets	26,667	29,665
Total liabilities	27,020	30,038
Unrestricted net assets	(353)	(373)
Total Liabilities and Net Assets	26,667	29,665

EXPENSES BY FUNCTION

For the year ended December 31, 2021

(US \$'000)	2021	2020
Personnel	23,274	20,596
Travel	2,662	1,744
Operations	5,370	4,342
Workshops & training	6,725	3,242
Equipment & supplies	2,558	2,639
Subcontracts & grants	11,566	15,931
Total Expenses	52,155	48,494



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