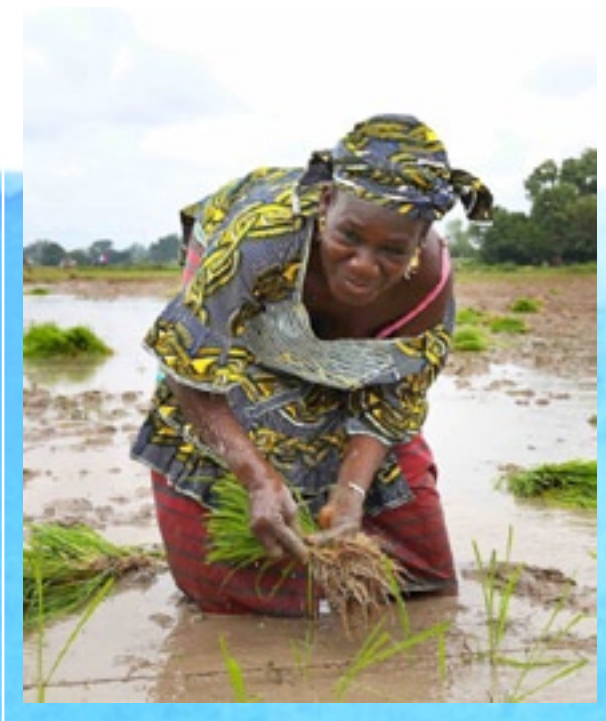




# 2019

## Annual Report



# TABLE OF CONTENTS

<i>Letter from IFDC Leadership</i> .....	1
<i>Reach for Results</i> .....	2
<i>Our Strategy to Feed the World</i> .....	4
<i>IFDC Research</i> .....	8
<i>North &amp; West Africa</i> .....	12
<i>East &amp; Southern Africa</i> .....	22
<i>Asia</i> .....	30
<i>International Training</i> .....	36
<i>Publications &amp; Presentations</i> .....	37
<i>2019 Financial Statement</i> .....	40

**ON THE COVER:** After the death of her husband, 57-year-old Nabintou Ouattara, seemingly all alone, faced a new task: feeding an entire family. Undeterred by poor fortune, she and 65 other women in Kadiolo, Mali, established a rice producers association, Dabakala. These courageous women, once caught in a cycle of poverty and food insecurity, have doubled their rice production with improved fertilizer technology.

“We never thought we could grow enough rice to sell, but now we are selling so much we have our own cash. Many of our women are independent. They no longer depend entirely on their husbands,” said Ouattara, humbly beaming.

Read more on page 18 about how IFDC and its partners, through the TAAT program, deliver production-boosting technologies to West African farmers.

## PUBLICATION CREDITS

<b>Executive Editor:</b>	Andy Thigpen
<b>Editor:</b>	Julie Kohler
<b>Graphic Designer:</b>	Meg Ross
<b>Production Consultant:</b>	Donna Venable

## Contributors:

Felix Deyegbe, Julie Kohler, Latha Nagarajan, Egide Nduwayezu, Upendra Singh, Kasta Staggs, Andy Thigpen, James Thigpen, Dan Waterman

Copyright © 2020 by IFDC. All Rights Reserved.  
All photographs, unless otherwise noted, are from the IFDC photo archives.

# 2019 IFDC BOARD OF DIRECTORS

**Dr. Jimmy Cheek**  
Chairperson  
United States

**Dr. Rudy Rabbinge**  
Vice Chairperson  
The Netherlands

**H.E. Rhoda Peace Tumusiime**  
Vice Chairperson  
Uganda

**Dr. Mohamed Badraoui**  
Morocco

**Dr. Josué Dioné**  
Ethiopia

**Ms. Charlotte Hebebrand**  
United States

**Mr. Douglas H. Horswill**  
Canada

**Dr. Mark Keenum**  
United States

**Dr. Steven Leath**  
United States

**Ms. Esin Mete**  
Turkey

**Mr. William P. (Tip) O'Neill, Jr.**  
United States

**Dr. Rajendra (Raj) Paroda**  
India

**Mr. Jason Scarpone**  
United States

**Mr. Peter McPherson**  
Chairperson Emeritus  
United States

**Mr. Albin Hubscher**  
(Ex Officio) President & CEO  
United States

# LETTER FROM IFDC LEADERSHIP

As we navigate our way through the uncharted waters of 2020, we reflect on our work and successes accomplished in 2019.

Last year, Albin Hubscher took the lead as President and CEO of IFDC. Almost immediately, management and select staff, encouraged by the Board, set about crafting a new strategy and way forward for the organization. IFDC's new streamlined strategy, completed early in 2020, focuses on developing better technologies, increasing on-farm productivity, strengthening market systems, and facilitating an enabling environment for smart agricultural policy and knowledge sharing. The strategy is discussed in our feature on page 4.

Our staff continued their excellent work and, by the end of last year, converted more than 100,000 hectares of smallholder farmland to improved agricultural technologies. More than 200,000 farmers utilized these technologies on their land, and more than 250,000 farmers participated in training and capacity building, with women representing 31%. In addition, we established more than 13,000 demonstration plots, formed and facilitated an astounding 523 public-private partnerships, and led over 4,000 outreach activities.

We were also able to sign a new Master Agreement with the OCP Group in Morocco. As part of this public-private partnership, IFDC and OCP will work together with the Mohammed VI Polytechnic University (UM6P) on various research, implementation, and education projects with the ultimate goal of developing and increasing farmer access to new fertilizer products and boosting their incomes.

Thanks to the combined efforts of the IFDC team, we were able to finalize the process with the Dutch Ministry of Foreign Affairs that led to the signing of a Coordinated Relationship Management agreement facilitating partnership with IFDC and providing for simplified review and reporting processes. This agreement will continue to strengthen our relationship as we work with the Dutch Government and in-country embassies throughout Africa.

Our great work in sub-Saharan Africa and South Asia is built upon a strong foundation within the organization. In 2019, we strengthened internal

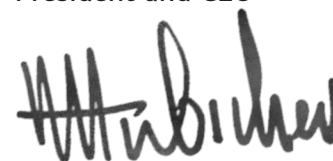
processes by transitioning to an accounting software powered by NetSuite, which allows for an improved procurement process and faster delivery of financial results. In addition, we fully implemented the EthicsPoint platform, which provides employees a safe whistleblower mechanism to anonymously report misconduct if that should occur.

Unfortunately, we mourned the passing of Dr. David Glenn. David was the Chief of Party of our Dry Zone and Uplands Agro-Input and Farm Services project, funded by the Livelihoods and Food Security Fund (LIFT) in Myanmar. His passing was truly a tragedy and a great loss for our team.

We express our sincere gratitude to all donors and partners that have supported IFDC during the past year. 2019 was a successful year for IFDC, from both a project implementation and a financial perspective. However, we face many new challenges in 2020. It will take the best effort and ingenuity of the IFDC Board, management, and staff to negotiate this unprecedented time and to ensure that food security of the most vulnerable of our society is not compromised any further. We are optimistic that we will successfully meet these challenges with our passion, creativity, and determination.



**Albin Hubscher**  
President and CEO

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

**Jimmy Cheek**  
Chair, Board of Directors

A handwritten signature in blue ink, appearing to read 'Jimmy L. Cheek'.



# REACH FOR RESULTS

## VISION

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

## 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.



13,439

**DEMONSTRATION  
PLOTS ESTABLISHED**

*Management practices  
and/or technologies  
tested in farmer fields  
for dissemination*



256,748

**FARMERS TRAINED  
(31% WOMEN)**

*Direct farmer participants  
in short-term  
capacity building on  
management practices  
and/or technologies*



213,654

**FARMERS APPLYING  
GOOD AGRICULTURAL  
PRACTICES**

*Farmers who have  
applied improved farm  
management practices  
and/or technologies*





# OUR REACH 2019

BANGLADESH ■ BENIN ■ BURKINA FASO  
 BURUNDI ■ CÔTE D'IVOIRE ■ ETHIOPIA ■ GHANA  
 INDIA ■ KENYA ■ MALI ■ MOZAMBIQUE  
 MYANMAR ■ NEPAL ■ NIGER ■ NIGERIA  
 SENEGAL ■ TOGO ■ UGANDA



**102,661**

**AREA UNDER  
GOOD AGRICULTURAL  
PRACTICES**

*Hectares under  
improved management  
practices and/or technologies  
(managed or cultivated  
by farmer partners)*



**523**

**PUBLIC-PRIVATE  
PARTNERSHIPS**

*Agreements between  
public and private  
firms/actors and  
research, academic,  
civil society, and  
stakeholder associations*



**4,207**

**OUTREACH  
ACTIVITIES**

*Dissemination activities:  
workshops, forums,  
stakeholder consultations,  
publications,  
and print, radio, and  
television media*

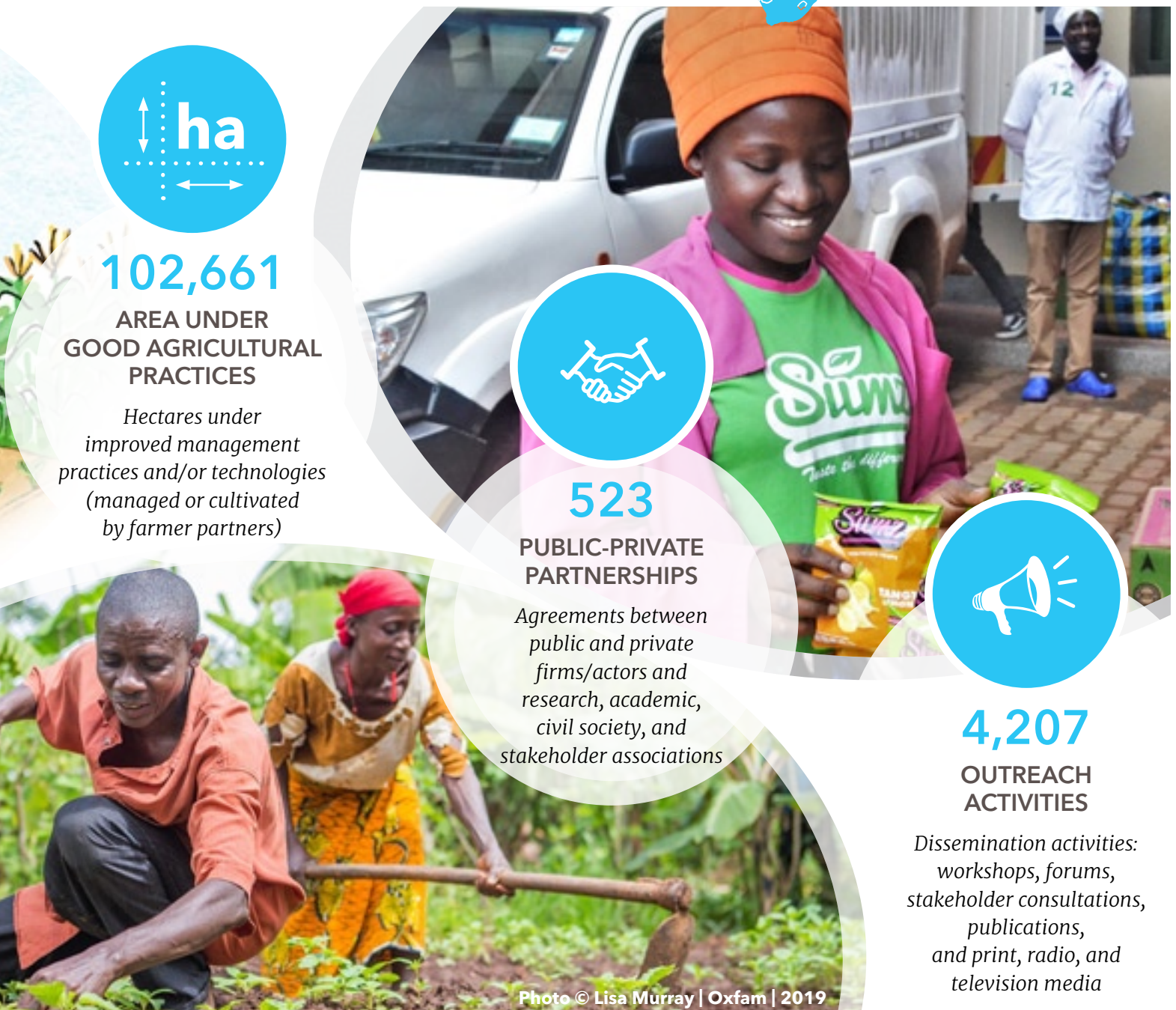


Photo © Lisa Murray | Oxfam | 2019



# OUR STRATEGY TO FEED THE WORLD

DEVELOP BETTER TECHNOLOGIES

CATALYZE FARM PRODUCTIVITY

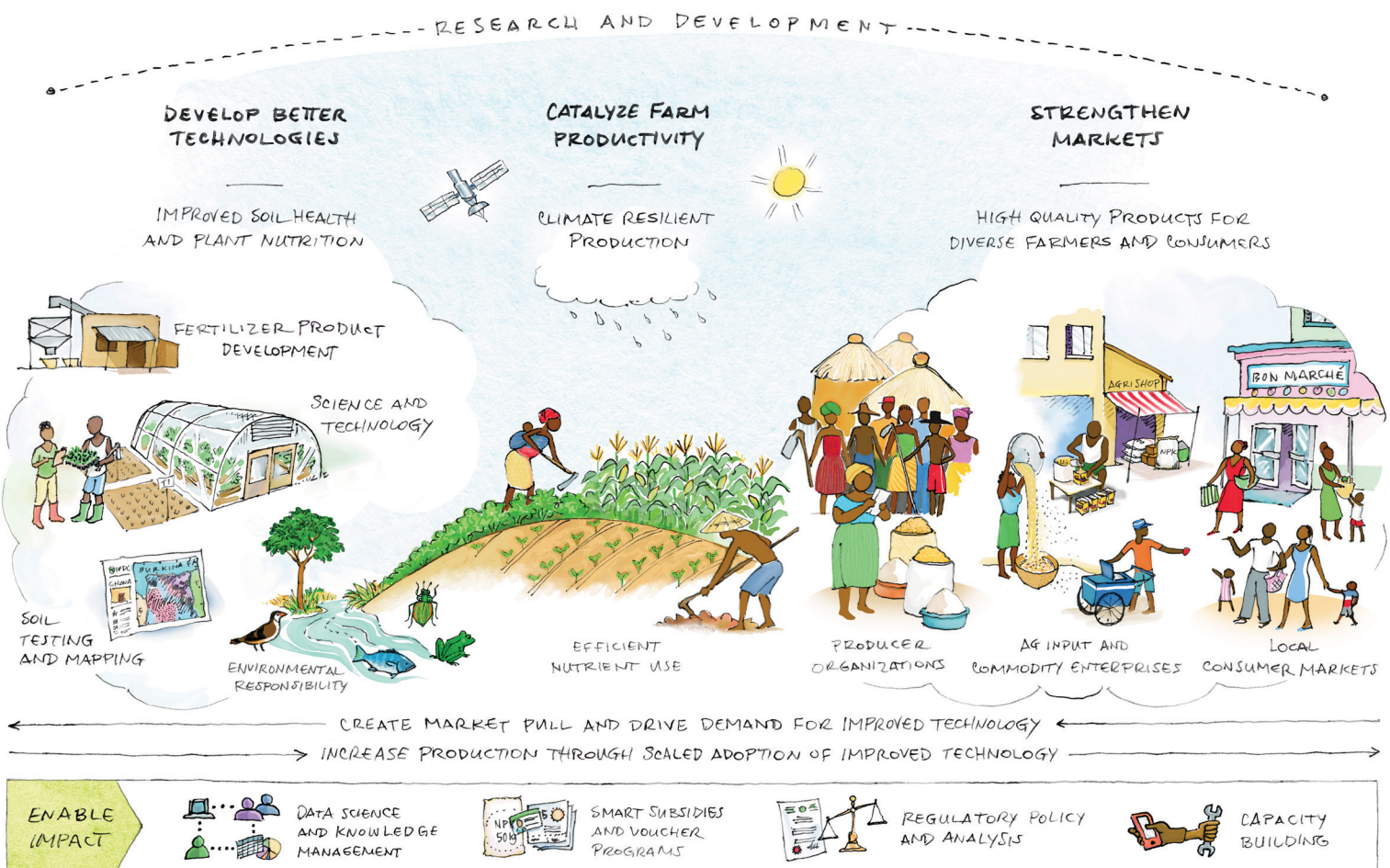
STRENGTHEN MARKETS

ENABLE IMPACT

**IFDC** believes fundamental improvements in soil and plant nutrition are required to meet the challenge of sustainably feeding 10 billion people by 2050. Global population growth will drive a substantial increase in food demand, while climate change is already accelerating risks to food production, especially in poorer regions. Major changes in agricultural systems – especially nutrient use efficiency – will be needed to ensure food security and environmental sustainability.

Over the past 70 years, NPK adoption fueled spectacular increases in agricultural productivity in much of the world, but the ecological costs of inefficient fertilizer use have been high. Over half of the estimated 120 million tons of nitrogen fertilizers used each year ends up in waterways. Agriculture, forestry, and land-use change were responsible for a quarter of global annual greenhouse gas emissions during 2007–2016.

## MISSION IN ACTION



In sub-Saharan Africa, deficiencies of zinc, boron, and sulfur have contributed to poor fertilizer profitability, low adoption rates, and a vicious cycle of soil degradation. Soil and environmental degradation results as nutrients are continually extracted through cropping and as agricultural production expands onto new, often marginal, lands. Declining soil fertility limits biomass production and surface cover, leading to poor soil structure and increased runoff and erosion.

To meet these challenges, IFDC has revamped its strategic approach. For more than 40 years, IFDC has led the research and implementation of many novel technologies. As our shared challenges become more complex, we must find innovative ways to look ahead and solve them. Our strategy outlines four strategic objectives that guide us as we strive for a food-secure, environmentally sustainable world.

## OUR STRATEGIC SOLUTIONS

Achieving impact at scale requires adapting research and technology to smallholder needs, but it must go further. IFDC experts and their partners work across the discovery-to-consumer continuum to bridge the traditional gaps between research, technology dissemination, and market systems that often undermine efforts to realize and sustain impact at scale. With an emphasis on working with partners and strengthening local capacity, IFDC focuses on integrating project-level research and development efforts across four priority areas.

### ➔ DEVELOP BETTER TECHNOLOGIES

- ✓ **Develop more nutrient-efficient, environmentally sound fertilizers.** IFDC tests and adapts advanced fertilizers, including stabilizers, inhibitors, and biodegradable polymer and micronutrient coatings. These improvements regulate nutrient release, helping to reduce runoff, leaching, and greenhouse gas emissions.
- ✓ **Improve fertilizer recommendations.** Working with national partners, IFDC validates new technologies that advance the quality and spread of fertilizer recommendations. These include spectral soil and crop analysis, satellite imagery showing spatial variation in yield and water use efficiency, improved soil test kits, and information and communication technologies (ICT).
- ✓ **Scale up the production and adoption of new fertilizers.** IFDC uses its Soil-SMaRT framework (Soil testing, Mapping, Recommendations development, and Technology transfer) to map soils at national and regional levels and to evaluate balanced fertilizers through crop trials and modeling. IFDC's Pilot Plant team works with public and private partners to test the technical and financial feasibility of manufacturing improved fertilizer blends, coatings, and compounds at scale.
- ✓ **Refine and scale Integrated Soil Fertility Management (ISFM).** Fostering a Green Revolution in Africa will require rebuilding degraded soils, but ISFM strategies developed in the



*In our greenhouses, laboratories, and pilot plant – as well as in field sites all over the world – our scientists and engineers work with public and private sector partners on **developing new, better soil and plant nutrition technologies.***

*Our Feed the Future **Soil Fertility Technology (SFT)** Adoption, Policy Reform, and Knowledge Management project aims to bridge the gap between scientific research and effective technology demonstration. From new research on subjects such as activated phosphate rock, to policy reform and consortium-led activities, the SFT project has a research-focused, cross-cutting initiative.*

***Read more about this project on page 8.***



1990s used ex-situ organic materials that were costly and challenging for smallholders. Going forward, IFDC and partners will focus on a combination of integrating organic biomass from the field itself and applying balanced inorganic fertilizers. Key approaches will include production ecology modeling; designing organic/inorganic fertilizers and management strategies that work with the soil microbiome; managing biomass and its impact on soil health and plant nutrition; and developing fertilizers produced with local resources.

## ➔ CATALYZE FARM PRODUCTIVITY

- ✓ **Conduct on-farm research and demonstrations.** IFDC works with smallholders and other partners to test the impact of key practices, including soil and water conservation techniques, no-till farming, relay cropping, cover crops and organic matter recycling methods, on climate resilience and the environment.
- ✓ **Expand engagement of women and youth.** IFDC is expanding training for these groups and working to improve their access to productive resources and services. Increasing the successful participation of women and youth in new agribusiness partnerships on and off the farm is a key objective.
- ✓ **Use ICT to scale adoption of improved technologies.** Working closely with youth as early adopters and trainers, IFDC is harnessing mobile phones and apps to change how farmers access and use information about markets, weather and pest forecasts, and crop management and business management advice.



*The **Fertilizer Deep Placement and Microdosing (FDP MD)** project, funded by the United States Agency for International Development (USAID), worked with rice, millet, sorghum, and vegetable farmers in Mali to boost productivity using proven fertilizer-based technology. They utilized both on-farm demonstrations and innovative information and communication technologies (ICT) approaches to reach and train farmers.*

***Read more about this project on page 17.***

*The **Accelerating Vegetable Productivity Improvement (AVPI)** project in Bangladesh focused exclusively on catalyzing productivity and empowering women farmers. As a result, more than 40,000 women farmers are applying improved practices on their farms.*

***Read more about this project on page 31.***



## ➔ STRENGTHEN MARKETS

- ✓ **Develop agribusiness clusters.** IFDC brings together groups of farmers, commodity buyers, agro-input dealers, banks, service providers, and processors, building the trust and long-term relationships that are necessary to expand access to input, finance, and output markets for smallholders. Key priorities include developing agribusiness opportunities, especially for youth and women, and ensuring the supply of quality commodities to buyers and processors.
- ✓ **Identify scaling pathways, partners, and potential risks/opportunities.** Working with local partners, IFDC conducts scalability assessments that estimate financial and economic profitability, analyze the business case for new technologies at smallholder, input dealer, and commodity market levels, and review environmental outcomes.

## ➔ ENABLE IMPACT

- ✓ **Support global, regional, and national dialogues.** IFDC is working with partners to improve the level and quality of investments in soil fertility and plant health.
- ✓ **Strengthen policies and regulations.** IFDC facilitates the development of fertilizer industry and agro-dealer platforms to address policy and regulatory issues and environmental concerns; improves local capacity to assess market demand and supply, analyze marketing margins, and develop cost buildup studies; provides technical support to assess impacts and inform adjustments to policies and regulations; and strengthens the capacity of national standards authorities and research systems to assess the quality of new and existing fertilizer products.
- ✓ **Improve the technical capacity of public and private sector partners.** Key activities include IFDC's International Training Program Series; training on fertilizer production and quality control from IFDC's Pilot Plant scientists and engineers; training scientists to use advanced crop and soil system simulation modeling techniques; and the hands-on training, mentoring, and increasing delegation of responsibilities to local partner organizations that are built into every IFDC project.
- ✓ **Widely share new knowledge and data.** IFDC is committed to making its scientific, economic, and policy analyses available through the IFDC website, scientific publications, and relevant agronomic and policy platforms.

The **Resilient Efficient Agribusiness Chains in Uganda** (REACH-Uganda) project, funded by the Embassy of the Kingdom of the Netherlands in Uganda, is utilizing a market systems approach to ensure markets for potato and rice are functioning **more efficiently and sustainably** for farmers and agribusinesses. In 2019, more than U.S. \$4.8 million was leveraged for business and infrastructure activities, and more than 36,000 farmers, a majority being women, were trained on “farming as a business,” climate-smart agriculture, and resilience measures.

**Read more about this project on page 26.**

As Strategic Objective 4 is cross-cutting, many of our projects overlap. Concerning policy development, the **Feed the Future Enhancing Growth through Regional Agricultural Input Systems** (EnGRAIS) project for West Africa engages and supports national and regional governments to cultivate policies and regulations that work for farmers and agribusinesses. In 2019, the project disseminated the Regional Fertilizer Subsidy Program Guide, which will help improve national subsidy programs using a “smart” subsidy approach.

**Read more about this project on page 13.**

Another highlight of the fourth priority area is training. Training and capacity building are built into all of our programs and projects. As an example, the OCP-funded **Fertilizer Research and Responsible Implementation** (FERARI) project is training the next generation of agriculture students and researchers to enter the job market. It is also working with several institutions to strengthen their scientific capabilities.

**Read more about this project on page 15.**



# IFDC RESEARCH

INNOVATIVE  
RESEARCH  
SOLUTIONS

FERTILIZER  
ENGINEERING,  
PRODUCTION,  
AND RESEARCH

ECONOMICS  
AND POLICIES  
FOR CHANGE

SOILS  
CONSORTIUM

**IFDC** Research plays a unique intermediary role by transforming innovative fertilizer products and soil fertility management technologies into adaptable and scalable production technologies. We undertake applied research and implementation, involving scientific discovery, development, and testing of advanced fertilizers and related soil fertility management technologies; design of fertilizer manufacturing and quality control processes; market system development; and applied policy and regulatory analysis. 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 adverse environmental impacts associated with agriculture. Our research was made possible by the Feed the Future Soil Fertility Technology (SFT) Adoption, Policy Reform, and Knowledge Management project, as well as partnerships with the private sector.

## INNOVATIVE RESEARCH SOLUTIONS THROUGH PARTNERSHIPS

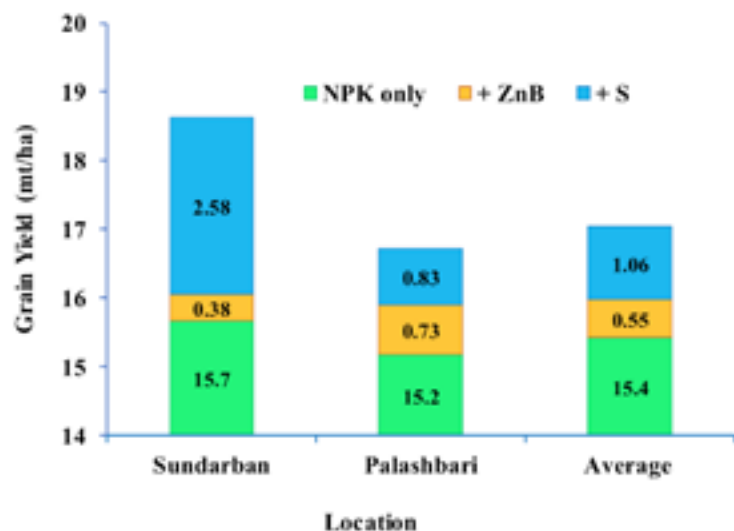
Partnerships are crucial to our applied research. In 2019, our team worked with private sector and university partners on maximizing nutrient use efficiency of nitrogen (N), phosphorus (P), potassium (K), and sulfur (S) fertilizer products; improving soil and plant health through balanced nutrition; and promoting sustainable soil intensification practices, such as conservation agriculture and integrated soil fertility management. Laboratory, greenhouse, and field trials were conducted to quantify the effect of various coating materials (polymer, lignin, peanut shell, corn starch, S, micronutrients,



*Lab-scale coating of urea for controlled release.*



Effects of NPK, S, and micronutrients (zinc and boron) on maize grain yields across two locations in Northern Bangladesh.



polyhalites, nanomaterials, etc.) and inhibitors (urease and nitrification) on ammonia volatilization loss, N leaching loss, nitrous oxide emissions, yield, crop N uptake, and protein content.

Our research showed that, in addition to directly improving N use efficiency, urea products incorporating S, zinc (Zn), or other micronutrients increased yield, enhanced grain quality, and improved resilience to drought. Field trials conducted in Bangladesh increased maize yield by an average of more than 1 metric ton per hectare (mt/ha) with S application. In trials in Nepal on cauliflower, urea with elemental S increased yield by 5 mt/ha with 50% less N. Nutrient omission trials on maize in Ghana also demonstrated the importance of balanced fertilization and soil amendments.

While promoting multi-nutrient fertilizer sources for balanced plant nutrition, we also paid attention to negative interactions between nutrient elements that may reduce bioavailability. Laboratory, greenhouse, and field trials were conducted to evaluate different sources of Zn with urea and monoammonium phosphate (MAP) using combinations of coatings, including polymer and seed-core Zn.

We have worked with private sector partners to develop and evaluate new fertilizer products with enhanced nutrient use efficiency, low cost, local resources, recycled raw material, and decentralized production. For example, IFDC research on P relates to improving phosphate availability to plants from low-medium reactive phosphate rocks (PRs) by developing phosphatic fertilizers that have 25% or less P supplied by water-soluble P (WSP) sources. This process would utilize PR deposits that are



View of test plantings in greenhouse (Muscle Shoals, AL).

not large enough or economically feasible for conventional P fertilizers (Box 1).

IFDC partnered with an Alabama-based startup to explore opportunities to increase the quantity and quality of organic fertilizers available to improve soil fertility and soil health. Use of organic fertilizers and amendments is an essential component of integrated soil fertility management. The effective recycling of nutrients using black soldier fly larvae to enhance shelf life and use efficiency of poultry manure can facilitate nutrient flows away from hotspots to fields that are nutrient deficient. This activity also involves a partnership with Auburn University to evaluate soil health parameters.



Threshing of trial plots, Sundarban, Bangladesh.

## BOX 1. ACTIVATED PHOSPHATE ROCK (PR): MAKING PHOSPHORUS FERTILIZERS AFFORDABLE

Today, PR, a finite resource, provides virtually all the P fertilizer used. Globally, 72–75% of PR mined worldwide is used to produce phosphoric acid, an essential precursor to high analysis WSP fertilizer. Although many countries in sub-Saharan Africa are endowed with PR deposits, most of these deposits are too small for commercial mining for P fertilizers. Also, the PRs from these deposits are of low reactivity, making the direct application of PR ineffective for most crops and soils. When plant-available WSP is applied, it is rapidly converted to different soil P pools, with less than 10–20% of applied P taken up during the intended crop cycle. This low efficiency leads to substantial economic and environmental costs; therefore, WSP application is an unsustainable practice in low input agricultural systems with marginal profit potential. Our research, supported by public-private partnership, focused on improving the efficiency of PR for direct application with minimal acidification or chemical alteration to provide only the necessary amount of WSP and reducing environmental and economic damage.

Our process of “activating” PR includes thorough mixing of ground PR (75% or more P supply) and ground monoammonium phosphate (MAP) (25% or less P supply), followed by compaction and/or granulation. MAP provides immediately available P as a “starter-effect” on root growth and it also acidifies the soil around the fertilizer microsite, thus facilitating

dissolution of PR. This process is energy efficient and environmentally desirable compared to the current WSP fertilizer production technology. Activated PR also promotes release of calcium (Ca) from PR, whereas MAP does not contain any Ca. This essential plant nutrient is deficient in many weathered soils.

Activated PR has been tested under greenhouse conditions on a wide range of soils with pH ranging from 5 to 8 and with rice, soybean, sorghum, and wheat. The performance of activated PR was 80–100% as effective as the treatment with 100% P supplied from MAP. Field trials conducted in Ghana and Kenya have verified greenhouse results. Our research eliminates constraints such as PR reactivity and soil pH and makes PR more agronomically efficient.

*Comparison of maize crop response to application of activated (on left) and untreated Togo phosphate (on right).*



## FERTILIZER ENGINEERING, PRODUCTION, AND RESEARCH

IFDC’s fertilizer engineering and pilot plant services help fertilizer producers solve production problems. In 2019, we:

- Conducted research on various binders for use in granulation to produce products for the fertilizer industry.
- Worked on incorporation of new raw materials into existing fertilizer processes.
- Conducted physical properties testing on new fertilizer products introduced into the market.

Research on fertilizer formulations, properties, technical feasibility and overall market feasibility of products is made possible through an interdisciplinary team of engineers, technicians, scientists, and economists.

### PILOT PLANTS & LABORATORIES

- ✓ Fully continuous fertilizer granulation plants.
- ✓ Phosphoric acid plants.
- ✓ Laboratories for chemical and physical characterizations of fertilizer materials.
- ✓ Laboratories for fertilizer compaction/ granulation, briquetting, pelletizing, and tableting.



## ECONOMICS AND POLICIES FOR CHANGE

During 2019, IFDC's economics and policy work focused primarily on research and advocacy efforts through focused surveys and consultations among stakeholders. The Kenya Fertilizer Platform (KeFERT) initiated in 2018 was formally launched in July 2019. KeFERT facilitated meetings with fertilizer sector stakeholders in partnership with the Kenya Bureau of Standards and the Ministry of Agriculture to set fertilizer standards and streamline fertilizer subsidies in Kenya. At the request of the Principal Secretary of the Ministry of Agriculture, IFDC conducted a detailed technical assessment of the subsidy program and submitted a modified design using electronic vouchers, known as the Kenya National E-Incentive Inputs Program. Since then, the Ministry has held several consultations to generate consensus on shifting

to a countrywide e-voucher system during the 2020 cropping season.

In 2019, an empirical estimation of the economic and environmental benefits of using urea deep placement (UDP) technology was conducted in Bangladesh using the life cycle analysis (LCA) approach. Results indicated UDP reduced greenhouse gas emissions by 50% while minimizing N in runoff compared to broadcast urea application. Economic benefits associated with UDP include a 33% savings in the amount of N fertilizer applied, reduced weeding cost, and increased paddy yield by about 500 kg/ha compared to broadcast application. The analysis further indicated that Bangladeshi farmers using UDP technology may have opportunities to gain carbon credits.

## SOILS CONSORTIUM LAUNCHES

IFDC, in partnership with the Feed the Future Innovation Lab for Collaborative Research on Sustainable Intensification (SIIL) at Kansas State University and financed by the United States Agency for International Development (USAID), initiated a collaborative research consortium focusing on Sustainable Opportunities for Improving Livelihoods with Soils (SOILS). The SOILS Consortium brings together national and international partners to develop and implement soil health and fertility-enhancing innovations. Academic and research partners include Michigan State University, University of Colorado, Auburn University, and the U.S. Department of Agriculture's Agricultural Research Service. The primary goal of the SOILS Consortium is to improve soil fertility in the most vulnerable regions of sub-Saharan Africa. Through innovative research, coordination, capacity building, networking, data sharing, and communication approaches, the SOILS Consortium will provide sustainable solutions to build resilient households with access to nutritious food.

Following a soft launch during the Soil Science Society of America meeting in San Diego in January 2019, the formal launch of the SOILS Consortium was held in Washington, D.C., in March 2019 to showcase USAID and IFDC's leadership and solidify activities for the first



*Formal launch of the SOILS Consortium, Washington, D.C., March 2019.*

year. The consortium further invited detailed concepts to enhancing soil fertility research, leveraging ongoing work by partners in Niger and Ethiopia.

The SOILS Consortium conducted a series of summits in Niger and Ethiopia during May and November 2019, bringing together research stakeholders leading soil health activities across major production zones in each country, and co-developed unified regional strategies to improve soil health and soil fertility recommendation in alignment with national and regional priorities. A Common SOILS Agenda was drafted, outlining ongoing activities that meet the recommendations of the summits and proposing a new set of activities to address gaps in soil fertility research.



# NORTH & WEST AFRICA

BENIN

BURKINA FASO

CÔTE D'IVOIRE

GHANA

MALI

NIGER

NIGERIA

SENEGAL

TOGO

**IFDC** seeks market-driven solutions to structural problems in the agriculture sector in North and West Africa. Core activities include capacity building of all agricultural value chain actors and facilitation of an enabling policy environment. We support agricultural policy reform processes and provide policy advice aimed at supporting entrepreneurship.

Our work in the region supports the development and implementation of regional agricultural policies within the Economic Community of West African States (ECOWAS) and the West African Economic and Monetary Union (UEMOA). We also work with national public research and regulatory institutions to improve infrastructure and ensure that public services reach the smallholder farmers who need them the most.

IFDC aims to strengthen smallholders' resilience in rural communities in West Africa. The use of balanced fertilizer products and application methods, such as fertilizer deep placement and microdosing technologies, is improving nutrient use efficiency and increasing yields and income. In addition, we help farmers identify and access profitable markets, usually through public-private partnerships, agribusiness clusters, and farmer-based organizations. Our projects also improve technology transfer, promote integrated soil fertility management, and enable sustainable farming systems.

*ACMA project beneficiary Pauline Fadonougbo, of Dasso commune in Benin's Zou Department, displays her packages of gari, a regional specialty made of dried ground cassava.*



## AFRICAFERTILIZER.ORG

### *Africa-wide (ongoing)*

**Implementing Partners** – International Fertilizer Association (IFA), Argus Media, and Development Gateway

The AfricaFertilizer.org (AFO) initiative is the premier source for fertilizer statistics and information in Africa. It is hosted by IFDC and supported by several partners, including IFA, Argus Media, and Development Gateway. Since 2009, AFO has been collecting, processing, and publishing fertilizer production, trade, and consumption statistics for the main fertilizer markets in sub-Saharan Africa. AFO has an extensive network of fertilizer industry players in the principal fertilizer trade corridors and maintains key information on the major producers, their production facilities and capacities, importers/suppliers, various distribution channels, and agricultural service suppliers (laboratory services, research, credit providers, and warehousing/storage services).

### 2019 HIGHLIGHTS

1. Fertilizer Technical Working Group workshops were held to validate 2018 statistics data on production,

imports, exports, and apparent and actual fertilizer consumption for nine countries across sub-Saharan Africa.

2. The Visualizing Insights on Fertilizer for African Agriculture (VIFAA) initiative was launched by Development Gateway and implemented with AFO in Kenya, Ghana, and Nigeria, with the aim to holistically address the supply, demand, and use of fertilizer data at both country and regional levels to encourage the use of fertilizer data for decision-making.
3. The fourth edition of the Register of Fertilizer Manufacturing and Processing Plants was published. It included information on 14 manufacturing plants and 87 processing plants, noting a 47% increase in the installation of fertilizer processing plants.
4. Retail prices, subsidized prices, and international prices of fertilizers have been monitored on a monthly basis in 14 countries in sub-Saharan Africa and form the FertiNews e-bulletin that is distributed to more than 3,200 subscribers across Africa and globally.



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

*ECOWAS Member States and Chad and Mauritania (2018–2023)*

**Key Partners** – 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/West Africa Regional Mission

EnGRAIS supports African-led regional institutions to address critical issues that constrain the effective supply and use of agricultural inputs, especially fertilizer, in West Africa. The program applies a multi-faceted approach, working throughout the fertilizer supply chain as a facilitator and enhancing strategic actors' ability to improve the business environment and transition to a private sector-led fertilizer market that responds to an effective demand for productivity-enhancing inputs in the region.

### 2019 HIGHLIGHTS

1. EnGRAIS assisted WAFA and Argus in the organization of the 2019 West Africa Fertilizer Forum (WAFF) in Lomé, Togo (more than 200 participants from over 30 countries) and the West Africa Fertilizer Financing Forum, in partnership with the African Development Bank/African Fertilizer Financing Mechanism, in Abidjan, Côte d'Ivoire. It also published the 2019 version of the West African Fertilizer Business Information Map, conducted cost buildup studies, and reviewed procedures for selected fertilizer trade corridors in West Africa.
2. EnGRAIS updated and continued implementation of its two-year joint work plan with WAFA to build their



capacity and continue activities to ensure WAFA is the representative and chief advocate of the fertilizer private sector in the region, which included the development of a five-year capacity building action plan and the signing of a Memorandum of Understanding with ECOWAS, recognizing WAFA as the representative of the fertilizer private sector for the region.

3. The Fertilizer and Seed Recommendations for West Africa Map (FeSeRWAM) was developed, based on the Fertilizer Recommendations for West Africa Map previously developed by EnGRAIS, with new fertilizer and seed recommendations and good agricultural

practices for specific agroecological zones (AEZs) and crops. It now comprises at least 40 agro-input package recommendations for 10 crops across AEZs of 12 countries in West Africa. It will contain at least 200 fertilizer recommendations and be fully optimized as an online application in 2020.

4. EnGRAIS disseminated the Regional Fertilizer Subsidy Program Guide to ECOWAS Member States, worked in several countries, especially Ghana, on using it to reform and improve national fertilizer subsidy programs, and transformed it into an ECOWAS draft directive, which is expected to be issued in 2020.



## FEED THE FUTURE SENEGAL DUNDËL SUUF PROJECT

*Senegal (2019–2022)*

**Implementing Partners** – Institut Sénégalais de Recherche Agricoles (ISRA), Agence Nationale pour le Conseil Agricole et Rural (ANCAR), Direction de l'Agriculture, Organisation de Producteurs, and the private sector

**Donor** – USAID

The Feed the Future Senegal Dundël Suuf Project is a three-year USAID/Senegal Bilateral Mission buy-in to the Feed the Future Enhancing Growth through Regional Agricultural Input Systems (EnGRAIS) project for West Africa.

Dundël Suuf is designed to address the use of inappropriate fertilizer formulas, lack of adoption of improved fertilizer products and technologies, poor enforcement of fertilizer quality control regulations, and the inefficient subsidy program of the Government of Senegal. The project is, therefore, a vehicle for improving soil fertilization to sustainably increase agricultural productivity and production in Senegal.

The project aims to increase agricultural productivity to foster inclusive and sustained reduction in hunger,

poverty, and malnutrition and is expected to help increase availability and use of new and quality fertilizers through efficient private sector-led supply systems to improve and sustain soil fertility in Senegal. Dundël Suuf targets various beneficiaries who have the potential to accelerate impact. These include: smallholder producers who are already connected to markets and are ready to engage in the new technologies for the priority crops in five agroecological zones; actors in the input/fertilizer supply chain including agro-dealers, fertilizer importers, blenders, distributors, and retailers; extension and research agents; and vulnerable groups, women and youth.

## 2019 HIGHLIGHTS

1. Dundël Suuf documented soil fertility mapping initiatives in Senegal to identify potential complementarities and synergies for the project's soil fertility mapping activity.
2. A study was conducted on the characterization of the fertilizer sector in Senegal, and six organic fertilization technologies and two chemical fertilization technologies were identified as ready for diffusion.
3. Draft complementary texts for the implementation of the ECOWAS fertilizer quality control regulation were revised and will be validated by stakeholders under the leadership of the Ministry of Agriculture and Rural Equipment.
4. The performance of the current national subsidy program was reviewed, and key factors required for private sector involvement in the reform process were identified.





## FERTILIZER RESEARCH AND RESPONSIBLE IMPLEMENTATION (FERARI)

*Ghana (2019–2024)*

**Implementing Partners** – Mohammed VI Polytechnic University, OCP, Wageningen University, University of Liège, University of Ghana, Kwame Nkrumah University of Science and Technology, University for Development Studies (Ghana), Ministry of Food and Agriculture (Ghana)

**Donor** – OCP and institutional contributions

Fertilizer Research and Responsible Implementation (FERARI) is a public-private program in Ghana that integrates an on-the-ground implementation program to develop the fertilizer value chain with transdisciplinary research by Ph.D. and postdoctoral researchers, supervised by internationally renowned universities, and to build the research capacity at the involved institutions.

The overall objective of the program is to develop the evidence base for the need of a systematic approach to

support widespread adoption of balanced fertilizers by farmers in the less developed markets of sub-Saharan African countries, specifically Ghana, as a means to improve their food and nutrition security.

Sub-objectives of the FERARI program include:

- Develop on-the-ground experience in pre-competitive activities to create appropriate market conditions for balanced fertilizers and their widespread adoption by farmers.
- Convert tacit knowledge into formal knowledge to allow more effective science-based up- and out-scaling of practical approaches.
- Train highly qualified M.Sc., Ph.D., and postdoctoral researchers to enter the international research and implementation market after graduation.
- Strengthen the transdisciplinary scientific capabilities of involved institutions.

### 2019 HIGHLIGHTS

FERARI's strategic approach was prepared during a kickoff meeting in 2019. Activities have been aligned with the Ghanaian governmental programs "Planting for Food and Jobs" and the "Fertilizer Expansion Program." Through synergies with the IFDC-coordinated EnGRAIS project that harmonizes fertilizer policies in Western African countries, FERARI has already ensured commitment from a large network of relevant actors to help transform the Ghana fertilizer sector. Ghanaian research institutions are fully engaged in the execution of the program.

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

*Benin (2017–2021)*

**Implementing Partners** – CARE International Benin-Togo and Royal Tropical Institute (KIT)

**Donor** – Embassy of the Kingdom of the Netherlands in Benin

ACMA2 aims to improve the food and nutritional security of rural populations in 28 municipalities in the departments of Ouémé, Plateau, Zou, and Collines in Benin Republic, West Africa. The target groups are producers, processors, traders, and particularly young people (ages 18 to 35) and women. The project's approach

is to facilitate access to local and international markets (particularly Nigerian) for economic actors of agribusiness clusters (ABCs). This is accomplished through targeted interventions in product value chains (access to inputs and innovations, access to financing, marketing and professionalization, and access to new communication technologies for agriculture) and multi-stakeholder dynamics, considering the resources and potential within the communes.

### 2019 HIGHLIGHTS

1. ACMA2 reached 103,619 individuals, including 44,735 women (43%), 58,884 men (57%), and 45,578 young people (44%), through 65 ABCs involving seven value chains (maize, palm oil, fish, chili pepper, soybean, groundnut, and cassava).

2. 44,000 agricultural stakeholders have been trained to improve agricultural productivity. The producers who received agricultural intensification kits (seeds, fertilizers, and herbicides) and participated in demonstration plots have increased yields by at least 48% for corn, 44% for peanut, 135% for soybean, and 302% for chili pepper.
3. A total of 28 market infrastructure and equipment projects were built to boost sales of agricultural products and 296 business meetings were organized between sellers and buyers, which contributed to

more than 16,000 metric tons of agricultural products marketed by the ABC stakeholders at a value of CFA 3,359,000,000, or more than U.S. \$5,600,000.

4. A partnership has been signed between the Intercommunal Consultation Frameworks (CCICs) of Ouémé, Plateau, and Zou (three regions targeted by ACMA2) and Ogun State, Nigeria. A similar partnership between the CCIC of Collines (the fourth region of ACMA2) and Oyo State, Nigeria, is planned. These partnerships aim to facilitate cross-border trade.



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

*Niger (2018–2021)*

**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 contribution of the fertilizer sector to agricultural development in Niger through the private sector. Specific objectives are to: facilitate the development and implementation of a new policy and regulatory framework; assist in the establishment of a renewed fertilizer subsidy system; build the capacity of actors

involved in the implementation of the reform; and assist in disseminating gains made in knowledge and ownership by the stakeholders of the reforms.

### 2019 HIGHLIGHTS

1. The main reform bodies (Niger Fertilizer Market Observatory [OMEN] and Technical Committee for Fertilizers of Niger [COTEN]) have been installed and are operational; the capacities of these reform bodies have been strengthened.
2. Regulatory decrees concerning the quality control of fertilizers, import authorizations, and approvals have been developed, finalized, adopted, and popularized. Four decrees have already been signed by the Minister of Agriculture; a bill has been adopted by the Government of Niger and forwarded to Parliament for adoption.
3. 60 fertilizer inspectors have been trained on fertilizer inspection at border crossings and in the main fertilizer markets.
4. A census of all private fertilizer operators was conducted, and a directory of these operators is available. Private fertilizer players were encouraged to organize and have formed the Nigerien Association of Importers and Distributors of Fertilizers (ANIDE). Four training sessions have been organized to strengthen the capacity of fertilizer importers, distributors, retailers, and officers of ANIDE.
5. A fertilizer subsidy system based on vouchers was tested and validated in 10 pilot rural districts. The system was used to distribute 1,400 metric tons of fertilizer to 7,211 targeted beneficiaries. Lessons learned from the pilot phase will be used to scale up the system to a greater number of rural districts.





## SCALING UP FERTILIZER DEEP PLACEMENT AND MICRODOSING TECHNOLOGIES (FDP MD) IN MALI

*Mali (2014–2019)*

**Strategic Partners** – ACDI/VOCA Cereal Value Chain Project, World Vegetable Center, International Crops Research Institute for the Semi-Arid Tropics (ICRISAT), Livestock for Growth Program (L4G)–Mali, and Regional Directorates of Agriculture

**Donor** – USAID/Mali

FDP MD is increasing cereal and vegetable productivity through innovative fertilizer-based technologies (fertilizer deep placement and microdosing) while improving resource-poor farmers' access to quality and nutritious food in Mali. The project supports various actors along the rice, millet/sorghum, and vegetable value chains. The main stakeholders include producers, agro-input dealers, rural entrepreneurs, private sector actors in fertilizer production and distribution, research and extension institutions, and government technical bodies responsible for formulating and implementing enabling policies for a productive agriculture sector. Special emphasis is placed on women's involvement in rice, millet, sorghum, and vegetable production.

### CUMULATIVE HIGHLIGHTS

1. 307,526 individuals were trained on FDP fundamentals, including 26% women; 284,865 individuals were trained on MD fundamentals, including 22% women.
2. Yields of FDP rice, lowland rice, MD millet, and MD sorghum were increased by 2,309 kg/ha, 1,327 kg/ha, 491 kg/ha, and 840 kg/ha, respectively.



## SMALLHOLDER AGRICULTURAL PRODUCTIVITY ENHANCEMENT PROGRAM (SAPEP)

*Benin, Burkina Faso, Cameroon, Mali, and Niger (2015–2021)*

**Donor** – Islamic Development Bank

SAPEP is designed to overcome major productivity challenges, including poor soil health, limited seed production, poor access to markets and finance, and weak research-extension-farmer linkages. The objective is to increase agricultural productivity and smallholder farmers' income for rainfed and irrigated food crops.

The program seeks to increase the use of integrated soil fertility management technologies by smallholder farmers, enhance access to improved crop varieties, and improve access to financial services and output markets for smallholders and other producers along the agricultural value chain.

### 2019 HIGHLIGHTS

1. Reports were prepared on value chain analysis for principal food crops in Burkina Faso, Mali, and Niger.
2. Five regional workshops were organized for SAPEP country experts in soil, seed, markets and finance, and monitoring and evaluation.
3. Field visits were carried out to provide technical backstopping to project activities.
4. New activities using the SAPEP approach were developed for Guinea on integrated rural development and crop value chains and for Niger on the rice value chain.



## SOIL FERTILITY MAPPING FOR BALANCED FERTILIZER RECOMMENDATIONS IN THE DOSSO REGION (AFRAD)

*Niger (June 2019–December 2019)*

**Donor** – World Bank through the West Africa Agricultural Productivity Program (WAAPP)

Under the initiative of the Ministry of Agriculture in Mali, IFDC in collaboration with Institut National de Recherche Agronomique du Niger (INRAN) implemented a pilot soil fertility mapping project in the Dosso region in Niger.

The objectives were to determine and map soil nutrient deficiencies and acidity constraints to guide balanced fertilizer formulation for crops in the Dosso region.

### CUMULATIVE ACHIEVEMENTS

1. A laboratory audit was conducted to assess the capacity of the national laboratory to deliver full and quality analysis.

2. Representative soil samples were collected in the Dosso region and processed for full chemical analysis.
3. Soil nutrient deficiency maps were generated.
4. Initial balanced fertilizer recommendations were proposed for the Dosso region in Niger.
5. Field trials (240) were conducted on rice, millet, sorghum, cowpea, peanut, and vegetables to evaluate the performance of balanced fertilizer containing sulfur, zinc, and boron.
6. Scientists from INRAN and the Ministry of Agriculture were trained on the fundamentals of integrated soil fertility management, soil sampling and procedures for balanced fertilizer formulation, and management of an analytical laboratory.



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

*Benin, Burkina Faso, Ghana, Mali, and Nigeria (2018–2021)*

**Lead Implementer** – International Institute of Tropical Agriculture (IITA)

**Donor** – African Development Bank

The TAAT program goal is to radically transform African agriculture from subsistence to commercial farming to

support the “Feed Africa” pillar of the African Development Bank’s agricultural development strategy. TAAT is increasing agricultural productivity in Africa through the deployment of proven and high-performance agricultural technologies at scale along selected value chains, such as rice, maize, cassava, wheat, sorghum and millet, orange-flesh sweet potato, high-iron beans, livestock, and aquaculture. TAAT operates as a network of interacting “compacts,” with nine devoted to specific commodity value chains and six serving as “enablers” that provide specialist services, such as soil fertility, water management, capacity building, youth, policy, and fall armyworm control. IFDC’s role is to lead the TAAT Soil Fertility Enabler, which is scaling up agro-input technologies for accelerated productivity growth, resilience, and improved livelihoods. The components of the TAAT Soil Fertility Enabler are threefold – Component 1: Creation of an enabling environment for a responsive agro-input dealer system and access to finance to support the scaling up of agro-input technologies; Component 2: Strengthening the regional technology delivery infrastructure for the agro-inputs sector; and Component 3: Deployment of appropriate technologies and proven soil fertility technologies to support the seven TAAT commodity crop compacts.

### 2019 HIGHLIGHTS

1. A survey of key stakeholders of the fertilizer industry was conducted in Nigeria to identify major bottlenecks in the agricultural input delivery systems.

2. Mapping of agro-input dealers has been implemented in Burkina Faso, Mali, and Nigeria.
3. Terms of Reference (ToR) and Request for Expression of Interest (REOI) were submitted to the African Development Bank for approval to conduct regional training of agro-input dealers in 21 African countries.
4. In collaboration with National Agricultural Research Systems (NARSs) in Benin, Burkina Faso, Mali, and Nigeria, site-specific fertilizer formulations are being implemented for crops using the Soil testing, Mapping, Recommendations development, and Technology transfer (SMaRT) approach. 1,697 georeferenced soil samples were collected in each country for analysis to map soil nutrient deficiencies.
5. Three subcontracts were signed with partners for conducting analysis of soil samples from Nigeria, producing soil fertility maps of Tanzania, and scaling up balanced fertilizer on cassava, sweet potato, and maize and urea deep placement on rice.
6. In collaboration with NARSs and private extension service providers, fertilizer efficient technologies, mainly microdosing and urea deep placement, are being demonstrated and videos are being produced on the fundamentals of fertilizer deep placement, microdosing, and integrated soil fertility management for wheat, maize, rice, and cassava.



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

*Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Mali, Niger, and Nigeria (2019–2023)*

**Implementing Partners** – SNV and BoP Innovation Center

**Donor** – Netherlands Directorate-General for International Cooperation and private sector co-investment

2SCALE exclusively works with the local private sector to build sustainable agribusiness models with integrated networks of partners. Small-scale farmers

are connected with each other, with produce buyers and processors, and with other partners who supply goods and services. Through collaboration in public-private partnerships, training, technical advice, and business linkages are provided to help farmers and other local small and medium businesses become more competitive and able to respond quickly to new opportunities. Through all this, entrepreneurial agribusiness clusters are built, which support local economies and create jobs. Most importantly, 2SCALE has shown that the concept of inclusive business – farmers and other entrepreneurs working together for mutual benefit – is not simply a theoretical ideal but a practical, effective development approach.



2SCALE was launched in June 2012 and entered into a second phase of implementation in 2019. In 2019, we built the foundation for 35 of an anticipated 60 new business partnerships for this second phase in eight countries and in 10 different sub-sectors – cassava, maize, rice, sorghum, onion, green vegetables, soy, groundnut, dairy, and poultry. We are laying the foundation to introduce on- and off-farm innovations for eco-efficient agriculture, improve business skills, and develop nutritious, affordable food products for low-income consumers. The goal is to reach 750,000 smallholder farmers and 5,000 private businesses, helping them integrate into commercial agri-food value chains.

## 2019 ACHIEVEMENTS

1. Partnering with Bench Maji Farmers' Cooperative Union in Ethiopia to radically change the production

- of honey to engage more women and youth as well as to unlock the opportunity to reach urban base-of-the-pyramid (BoP) markets with honey and honey-based products.
2. Supporting Sweet 'n Dried in Kenya, a female-led company specializing in processing of fruits, vegetables, and grains, to reduce post-harvest losses of African indigenous vegetables through drying, thus making the product available throughout the year and improving smallholder farmers' incomes.
3. In partnership with Agri-wallet, 2SCALE received the FiniAward as part of the inaugural Financial Inclusion Awards, which recognizes and celebrates key organizations and companies that have adopted financial inclusion to increase financial accessibility in Kenya.



## TRANSFORMING IRRIGATION MANAGEMENT IN NIGERIA (TRIMING) EXTENSION SERVICE SUPERVISION

*Nigeria (2017–2021)*

**Implementing Partner** – National Agriculture Extension and Research Liaison Services

**Donor** – World Bank through the TRIMING project under the Federal Ministry of Water Resources in Nigeria

IFDC's consultancy role in TRIMING, which assists farmers in Nigeria's northern irrigation schemes to increase their agricultural productivity, was extended in March 2019. IFDC provides supervisory extension services to state-level Agricultural Development Programs (ADPs) and introduces farmers to agricultural productivity-

enhancing technologies, such as micronutrient fertilizer blends, UDP, and direct paddy seeders.

## 2019 HIGHLIGHTS

1. TRIMING strengthened the capacity of ADP staff through regular supervision of their activities to targeted beneficiaries.
2. 391 farmer field business schools improved the capacities of nearly 10,000 farmers.
3. More than 6,000 farmers, of whom 15% were women and 60% were youth (ages of 15 to 35), learned techniques to increase their agricultural productivity through demonstration plots and field days.

## THE WEST AFRICAN FERTILIZER ASSOCIATION (WAFA)



*In October 2019, WAFA and ECOWAS signed an MoU recognizing WAFA as the voice of the fertilizer industry and as a partner in developing the fertilizer market in West Africa.*

The West African Fertilizer Association (WAFA), registered in 2016 as a regional private sector association, has been looking for partnerships to support its main objective of building a competitive and reliable market that guarantees sustainable access to quality and affordable fertilizers by West African farmers. In just under four years of existence, WAFA represents 85% of the fertilizer trade in the region.

If WAFA succeeds, the fertilizer sector in West Africa will be primed for success. Recognizing this opportunity, the EnGRAIS project has been supporting WAFA to become a strong and efficient association that can organize the private sector and promote quality, accessible, and affordable fertilizers across the region.

With support from EnGRAIS, WAFA co-organizes the annual West Africa Fertilizer Forum (WAFF) with Argus Media. WAFF is a regional platform created to strengthen the West African fertilizer market and sector, encourage private sector investment, and promote the use of quality fertilizers among farmers. This forum gives WAFA the opportunity for key business discussions and to develop these relationships across the region and generate significant financial resources for the association. WAFA has already hosted three successful annual WAFFs.

“We started with nothing, but today WAFF has become a powerful platform in West Africa for fertilizer stakeholders and brings together over 200 key public and private sector players annually to

discuss issues related to fertilizers,” says Moussa Diabaté, President of WAFA. “Many people are eager to participate in this forum now. Everything to do with fertilizer in West Africa passes through this forum.”

WAFA now has credibility that is attracting the attention of major financial institutions, including the African Development Bank and its Africa Fertilizer Financing Mechanism. In the fall of 2019, the Bank worked with WAFA to host the first-ever West Africa Fertilizer Financing Forum, which focused on solutions to the region’s fertilizer sector financing needs.

Logistics and quality issues are among the top priorities for WAFA. The association participated in cost buildup studies conducted by EnGRAIS along four main fertilizer trade corridors in West Africa. The study results provide critical information for suppliers’ logistical planning to make fertilizers available, accessible, and affordable to end users. WAFA is a strong promoter of the ECOWAS regulations on fertilizer quality, and EnGRAIS contributed to development of the regulations, in collaboration with the industry, policymakers, and users.

By signing a new Memorandum of Understanding (MoU) with ECOWAS, WAFA has become a key ECOWAS partner to improve and increase the flow of quality of adapted fertilizers in the West Africa region. The MoU strengthens WAFA’s position as the official voice for all fertilizer sector players in the region. In this position, WAFA is better placed to access greater opportunities for its members to help farmers access appropriate and balanced fertilizers.



# EAST & SOUTHERN AFRICA

BURUNDI

ETHIOPIA

KENYA

MOZAMBIQUE

UGANDA

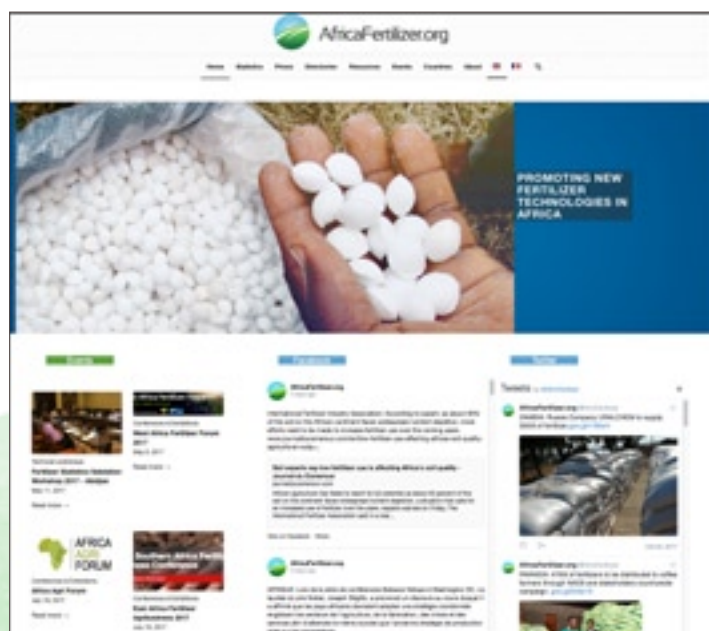
**IFDC** projects in East and Southern Africa bolster local agribusinesses. We work to transform livelihoods for smallholder farmers and their communities by utilizing improved agricultural technologies, creating inclusive income opportunities, and facilitating market access. On the input side, we link farmers with small and medium enterprises that supply quality fertilizers and seeds. On the output side, we connect them with companies that buy their crops. Farmers involved in these agribusiness partnerships collectively sell millions of dollars of crops to buyers. IFDC also works with these agribusinesses and related service providers to increase their capacity to source from smallholder farmers and supply products to domestic and international buyers, including low-income consumers.

All projects include training and mentoring components. We strengthen farmers' knowledge of good agricultural practices, integrated soil fertility management technologies, and other crop management practices that help farmers build resilience to climate shocks. IFDC emphasizes balanced fertilization and crop nutrition, particularly the use of secondary and micronutrients. To ensure farmers in the region have access to fertilizers that meet specific soil and crop needs, IFDC employs its SMaRT framework (Soil testing, Mapping, Recommendations development, and Technology transfer). Regional activities also focus on association building, policy analysis and reform, and market information access.

By collaborating with agribusinesses, service providers, national and regional partner organizations, research institutions, governments, and donors, we support the development of competitive and sustainable agricultural value chains and create an enabling environment for agricultural intensification and private sector development.

*Producers associations, like Ox Plow Farmers Group in Uganda (right), enable farmers to work together to increase production and profits.*





## AFRICA FERTILIZER.ORG

*Africa-wide (ongoing)*

**Implementing Partners** – International Fertilizer Association (IFA), Argus Media, and Development Gateway

The AfricaFertilizer.org (AFO) initiative is the premier source for fertilizer statistics and information in Africa. It is hosted by IFDC and supported by several partners, including IFA, Argus Media, and Development Gateway. Since 2009, AFO has been collecting, processing, and publishing fertilizer production, trade, and consumption statistics for the main fertilizer markets in sub-Saharan Africa. AFO has an extensive network of fertilizer industry

players in the principal fertilizer trade corridors and maintains key information on the major producers, their production facilities and capacities, importers/suppliers, various distribution channels, and agricultural service suppliers (laboratory services, research, credit providers, and warehousing/storage services).

### 2019 HIGHLIGHTS

1. Fertilizer Technical Working Group workshops were held to validate 2018 statistics data on production, imports, exports, and apparent and actual fertilizer consumption for nine countries across sub-Saharan Africa.
2. The Visualizing Insights on Fertilizer for African Agriculture (VIFAA) initiative was launched by Development Gateway and implemented with AFO in Kenya, Ghana, and Nigeria, with the aim to holistically address the supply, demand, and use of fertilizer data at both country and regional levels to encourage the use of fertilizer data for decision-making.
3. The fourth edition of the Register of Fertilizer Manufacturing and Processing Plants was published. It included information on 14 manufacturing plants and 87 processing plants, noting a 47% increase in the installation of fertilizer processing plants.
4. Retail prices, subsidized prices, and international prices of fertilizers have been monitored on a monthly basis in 14 countries in sub-Saharan Africa and form the FertiNews e-bulletin that is distributed to more than 3,200 subscribers across Africa and globally.



## POTATO VALUE CHAIN CAPACITY BUILDING (PCB) PROJECT

*Kenya (2018–2020)*

**Implementing Partners** – IPM Potato Group, Kenya Plant Health Inspectorate Services, Kevian Kenya Limited, Kirinyaga Seed Limited, National Potato Council of Kenya, Nyandarua County Government, Sustainable Food Systems Ireland, Teagasc

**Donors** – Irish Aid, Embassy of Ireland in Kenya

PCB is working with small-scale farmers to increase their revenue from potato farming by at least 30% and with public and private partners to ensure market linkages. The project promotes the adoption of new technologies, including certified potato seed and new varieties that are more productive and marketable, consistent use of



good agricultural practices, improved farm management skills, and market access. The project's mainstay is farmer education facilitated through government extension workers and lead farmers. The hands-on training approach is referred to as the farmer field business school (FFBS) and covers the entire potato-growing season – from land preparation to harvesting.

## 2019 HIGHLIGHTS

1. 1,746 farmers (60% women) were trained using the FFBS model and 4,300 beneficiaries were trained indirectly through various learning platforms, including field days, conferences, and agricultural fairs.
2. A total of 50 trainers were trained as FFBS facilitators (39 lead farmers and 11 extension staff).

3. The project has taken the lead in identifying challenges in late blight management and rallied partners to address the issue by convening private and public partners to develop an action plan that will help relevant government agencies provide guidance on blight management products.
4. Support was given for legislation and policy development and the enactment of the Irish Potato Regulation 2019 Act.
5. Working relationships were established with agrochemical companies, soil nutrition companies, and financial institutions, which supported the project by providing technical advice and free samples of their products used in demonstrations.

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

*Uganda (2017–2022)*



**Implementing Partners** – Royal Tropical Institute (KIT) and Uganda National Potato Platform

**Donor** – Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH

The project is designed to increase smallholder potato productivity and strengthen potato sector coordination while improving household-level nutrition through dietary diversification. PNSP-Uganda encourages diversified diets, particularly for pregnant and breastfeeding women, through the integration of nutrition and potato productivity at the FFBS and community levels.

## 2019 HIGHLIGHTS

1. 1,920 farmers from 120 FFBSs were trained on good agricultural practices for sustainable potato production (74.5% females), with over 70% of the farmers applying 18 of the 25 good agricultural practices.
2. 2,952 farmers from 180 FFBSs were trained on marketing and business (72% females).
3. 3,142 FFBS farmers were reached on key nutrition topics, such as dietary diversity, through training and community dialogues (71% women). The individual dietary diversity score has improved from 3.1 (out of 9 food groups) at baseline to 5.8 food groups by the end of 2019.
4. 16 local seed producers were identified and trained on seed potato production.
5. 30 FFBS facilitators were trained on the agronomy and nutrition curriculum.



## PRIVATE SEED SECTOR DEVELOPMENT PROJECT (PSSD)

*Burundi (2018–2022)*

**Implementing Partner** – Royal Tropical Institute (KIT)

**Donor** – Embassy of the Kingdom of the Netherlands in Burundi

The Private Seed Sector Development (PSSD) project aims to double production and income of 108,000 farmer households in Burundi by ensuring sustainable access to certified seeds and agricultural advisory services. The project is a private sector development project that will incentivize and support Burundian and international seed companies to pilot innovations related to seed production and sales. PSSD will focus on the development of sales strategies that are tailored to farmer household requirements; support seed companies to increase production efficiencies through the provision of technical and targeted financial support; and support initiatives to improve the business-enabling environment in relation to seed production and sales in Burundi.

### 2019 HIGHLIGHTS

1. PSSD partnered with 33 private seed producers to pilot sales and communication strategies tailored to smallholder farmers. Between October 2019 and March 2020, the private seed producers registered 346 mt of commercial seed sales to smallholder farmers. Commercial seed sales to smallholder farmers is unheard of in Burundi, where an estimated 95% of farmers do not have access to high-quality certified seed.
2. Private seed producers installed 3,576 micro-demonstration plots and opened 155 rural points of sale in order to create demand for quality certified seed among smallholder farmers and train smallholder farmers on how to optimally use quality certified seed. Due to increased access, 51% of the registered micro-demonstration plot visitors were women.
3. PSSD, with regional experts, trained 47 Burundian private seed producers on business management and administration. The training serves to help ground sales and communication strategies and prepare private seed producers to grow their businesses in a sustainable manner, in order to ensure continuity of the PSSD efforts beyond the project lifetime.
4. Aside from market transactions, the PSSD project has facilitated policy discussions to build a business-enabling environment that is conducive to the growth of a private sector-led seed industry. Policy discussions facilitated by PSSD included representatives of the Burundian Government, as well as the Cooperative of Seed Producers of Burundi. Together, these discussions have yielded four policy documents that outline standards and guidelines aimed to rationalize the seed sector and ensure sustainability of the current growth trajectory. PSSD contributed to the reduction in time required to certify seed by training 35 accredited seed inspectors. The seed inspectors' mandate has been extended from conducting field inspections to collecting seed samples for analyses, in an effort to overcome two bottlenecks present in relation to seed inspection in Burundi. Since October 2019, 36% of all field inspections were conducted by accredited seed inspectors.





## RESILIENT EFFICIENT AGRIBUSINESS CHAINS IN UGANDA (REACH-Uganda)

*Uganda (2016–2021)*

**Implementing Partner** – Cardno Emerging Markets

**Donor** – Embassy of the Kingdom of the Netherlands in Uganda

REACH-Uganda is an agribusiness project that aims to improve farmers' market engagement, strengthen household resilience, and increase the availability of agricultural support services for 40,000 farmers and businesses organized into 2,000 farmer groups in the rice and potato value chains in Eastern and Southwestern Uganda. The project employs a market systems approach to ensure that markets can function more effectively, sustainably, and beneficially for poor farmers through connecting low-income entrepreneurs to micro, small, and medium enterprises (MSMEs)/agribusinesses. In addition, partnerships with financial institutions are improving access to finance for smallholders.

### 2019 HIGHLIGHTS

1. 30 firms/MSMEs have signed Memoranda of Cooperation with the REACH-Uganda project. 18 MSMEs were actively engaged in REACH-Uganda market systems activities and increased turnover by 27% through the decentralization of primary processing and direct procurement of produce from farmer groups.
2. Through REACH-Uganda's collaboration with the public and private sector, U.S. \$4,852,622 has been leveraged from business partners and district local governments to facilitate business and infrastructure activities.
3. 36,398 farmers (62% women and 38% youth) have been trained in farming as a business (FaaB), climate-smart agriculture, and resilience. 20% of project farmers are reaching optimal yield levels (2 mt/acre for rice and 5.5 mt/acre for potato), which is a 10% increase from the baseline.
4. 67 kilometers of rural feeder roads have been fully rehabilitated to facilitate market access for farmers in partnership with district local governments on a cost-share basis. These roads have improved access not only to markets but also to health and education services for 149,083 community members.
5. The REACH-Uganda project has also facilitated the introduction of 11 innovative business practices, such as commercial production of new Dutch potato varieties, commercial lowland rice seed production, cost-effective and practical screen houses for farmers for production of early generation seed potato, automated chip processing equipment and machinery, gravity flow irrigation systems for year-round potato production, and establishment of modern multistage rice mills to replace single stage mills.



## SUPPORTING AGRICULTURAL PRODUCTIVITY IN BURUNDI (PAPAB)

*Burundi (2015–2020)*

**Implementing Partner** – Wageningen Environmental Research (formerly Alterra), Oxfam Novib, and ZOA

**Donor** – Embassy of the Kingdom of the Netherlands in Burundi

PAPAB is promoting market-oriented, climate-resilient, and sustainable agricultural techniques, supported by targeted fertilizer subsidies. The project is reforming the fertilizer subsidy system to improve farmers' access to fertilizer and knowledge of improved farming methods. PAPAB uses a participatory approach (known as PIP – “Plan Intégré du Paysan”) to boost farmers' motivation and morale to create their own business plans for a sustainable future.

### 2019 HIGHLIGHTS

1. 865,666 farm households registered to receive fertilizer under the 2019 subsidy program, an increase of 38.3% from 2016.
2. 79,922 farmers are involved in the PIP approach, a holistic framework in which all members of a farmer's family are actively involved in planning improvements mostly to a more sustainable and integrated farming system, their homes, and their businesses.
3. 1,342 Solitary Savings and Credit Groups are active, comprising nearly 30,331 members who collectively saved more than U.S. \$996,302.



## FOOD SECURITY THROUGH CLIMATE ADAPTATION AND RESILIENCE (IFDC FAR-Sofala)

*Mozambique (2017–2022)*

**Managing Organization** – Swisscontact

**Donor** – Swedish International Development Cooperation Agency (Sida)

The FAR project is an integrated program that aims to improve food security and resilience to climate change shocks for 30,000–45,000 smallholder farmer households in the provinces of Manica and Sofala in Mozambique. IFDC is implementing the FAR-Sofala project, which introduces improved farming inputs and climate-smart agriculture practices combined with strong market linkages to semi-subsistence and semi-commercial smallholder rice and vegetable farmers. Integrated soil fertility management and slow-nutrient-release products, such as coated urea, are the key innovations used to increase the stable availability of and access to nutritious foods.

### 2019 HIGHLIGHTS

1. Introduced new seed varieties that are highly adaptive and resilient to climate impacts.
2. Despite widespread devastation by Cyclone Idai, FAR-Sofala farmers were able to harvest rice due to the resilient seeds introduced by the project.
3. Technical backstopping provided to farmers, including climate-smart practices and fertilizer, enabled sustainability of scaled-out technologies.





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

*Burkina Faso, Côte d'Ivoire, Ethiopia, Ghana, Kenya, Mali, Niger, Nigeria (2019–2023)*

**Implementing Partners** – SNV and BoP Innovation Center

**Donor** – Netherlands Directorate-General for International Cooperation and private sector co-investment

2SCALE exclusively works with the local private sector to build sustainable agribusiness models with integrated networks of partners. Small-scale farmers are connected with each other, with produce buyers and processors, and with other partners who supply goods and services. Through collaboration in public-private partnerships, training, technical advice, and business linkages are provided to help farmers and other local small and medium businesses become more competitive and able to respond quickly to new opportunities. Through all this, entrepreneurial agribusiness clusters are built, which support local economies and create jobs. Most importantly, 2SCALE has shown that the concept of inclusive business – farmers and other entrepreneurs working together for mutual benefit – is not simply a theoretical ideal but a practical, effective development approach.

2SCALE was launched in June 2012 and entered into a second phase of implementation in 2019. In 2019, we built the foundation for 35 of an anticipated 60 new business

partnerships for this second phase in eight countries and in 10 different sub-sectors – cassava, maize, rice, sorghum, onion, green vegetables, soy, groundnut, dairy, and poultry. We are laying the foundation to introduce on- and off-farm innovations for eco-efficient agriculture, improve business skills, and develop nutritious, affordable food products for low-income consumers. The goal is to reach 750,000 smallholder farmers and 5,000 private businesses, helping them integrate into commercial agri-food value chains.

### 2019 ACHIEVEMENTS

1. Partnering with Bench Maji Farmers' Cooperative Union in Ethiopia to radically change the production of honey to engage more women and youth as well as to unlock the opportunity to reach urban base-of-the-pyramid (BoP) markets with honey and honey-based products.
2. Supporting Sweet 'n Dried in Kenya, a female-led company specializing in processing of fruits, vegetables, and grains, to reduce post-harvest losses of African indigenous vegetables through drying, thus making the product available throughout the year and improving smallholder farmers' incomes.
3. In partnership with Agri-wallet, 2SCALE received the FiniAward as part of the inaugural Financial Inclusion Awards, which recognizes and celebrates key organizations and companies that have adopted financial inclusion to increase financial accessibility in Kenya.



## INTEGRATED FARM PLANNING SUCCEEDS IN BURUNDI

The recently completed Supporting Agricultural Productivity in Burundi (PAPAB) project, funded by the Embassy of the Kingdom of the Netherlands in Burundi, sustainably increased food production in Burundi by promoting market-oriented, climate-resilient, and sustainable agricultural techniques, supported by targeted fertilizer subsidies. A large part of the program was the integrated farm planning (PIP) approach that enabled households to create a long-term vision for their futures and inspired them to take charge in changing their realities. Below are several farmers and farming families that benefited from this approach.



**Dieudonné Ntahimpera, Kirengane Hill Chief, Rugazi Commune, Bubanza Province**

“In terms of our hill vision, we work together to

analyze our strengths and weaknesses, establish an overview of our hill, and decide what we want to do for the development of our hill. We envisioned the road layout, a playground, a secondary school, a community cooperative, electricity in our houses, and the locations of irrigation canals. In collaboration with the community, we have already built the cooperative and the irrigation canals.”

### **Angeline Nibizi and Alphonse Nizeyimana, Husband and Wife Innovative Farmers**

Angeline: “Since we put PIP Mboniyongana (Kirundi for “I know where I go!”) into practice in our household, there have been exceptional changes! Although we already knew how to farm and the old way of doing it, we learned that, first, we need to do some planning within the household. The communication climate between me, my husband, and our children has improved. We make more money, we have more food, and our agricultural production has been good. With our extra money, we improved our living conditions by building a brick house.”



Alphonse: “In truth when we started to be trained and put PIP into practice, I personally thought it was a joke! I thought it didn’t matter, but I was invited to these training sessions as the husband of Angeline, who had benefited from the training before me. The idea

was that I would change my mindset and give up old habits. At the time, I thought I was the sole decision-maker for the family. Now, with [the PIP] approach, our living conditions have improved considerably. Before, we lived in a hut, but today we live in a house made of durable materials. We even have indoor plumbing; can you imagine? All of this is thanks to the change in mentality because of PIP.”

### **Charlotte Bucumi, Lead Bean Farmer, Kizingoma Hill, Makamba Commune and Province**

“After receiving training on agricultural techniques as part of PIP, we changed the way we do things in our fields. We have opted for planting in rows and using quality seeds. For bean farming, we have learned weeding, staking, conservation techniques, and the right way to regularly monitor our fields. Today, I can say without hesitation that we have had a good harvest, giving us something to eat and a good income. With the surplus, we had a gain of 350,000 Burundian francs (about U.S. \$185). Now, we are training our neighboring farmers, because they have seen our model fields, all thanks to the training received under PAPAB on its PIP approach.”



A new four-year project in Burundi, the Soil Fertility Stewardship Project (PAGRIS), will carry on the successes of PAPAB. By scaling the PIP approach, the project aims to reach 100,000 family farms and establish ecologically sustainable management on 14,000 hectares of land.



# ASIA

BANGLADESH

MYANMAR

NEPAL

**IFDC** in Asia serves one of the most diverse areas of the world. Our work seeks innovative ways to develop sustainable agricultural production systems by adopting a holistic approach throughout the entire value chain involving firms, traders, and farmers. This includes developing and testing efficient nutrient technologies and agronomic practices at the farm level, strengthening agri-entrepreneurship, and influencing policy reforms through evidence-based economic analysis. Improving fertilizer efficiency is a major focus of IFDC research in Asia. Climate-smart agricultural technologies, like fertilizer deep placement (FDP), are helping farmers earn more income and mitigate agriculture's impact on the environment. We are also building the capacity of national scientists in measuring greenhouse gas (GHG) emissions from improved technologies compared with traditional practices.

In addition, IFDC's work in the region promotes agribusiness models that engage women and youth. In 2019, we completed a project in Bangladesh that empowered women farmers in Bangladesh to improve horticulture production; as a result, over 35,000 female farmers are using improved technologies and management practices.

In 2020, IFDC plans to expand this work into India to diffuse improved agricultural technologies to peri-urban farmers through good agricultural practices (GAPs), capacity building, micro-enterprise development, and linking farmers to markets.

*The Uplands Agro-Input and Farm Services project boosted smallholder farmer incomes in Myanmar by strengthening networks of agricultural input and service providers, such as Daw Htay Htay, who runs an agricultural input shop.*



## ACCELERATING VEGETABLE PRODUCTIVITY IMPROVEMENT (AVPI)

Bangladesh (2017–2019)

**Donor** – Walmart Foundation

AVPI empowered low-income women horticulture farmers with enhanced agricultural production technologies to improve the income and nutrition of farm families. The project was completed with commendable results among women farmers, strengthening their knowledge of GAPs, enhancing their access to market information, and expanding the use of FDP technology in fruit and vegetable production. In addition, AVPI introduced a method for producing seedlings using polynet houses with trickle irrigation, which improved the income of the women farmers selling quality seedlings.

### CUMULATIVE ACHIEVEMENTS

1. More than 40,000 female fruit and vegetable farmers are applying new agricultural technologies, including GAPs, on more than 13,000 hectares (ha) and FDP on 8,250 ha.
2. Incremental yield increased by 58–200% for 2019 winter vegetable crops (cabbage, cauliflower, bottle gourd, chili, country bean, eggplant, kohlrabi, sweet gourd, tomato, and potato). The average incremental income per farm was U.S. \$372.
3. To increase their income from crop sales, about 300 women participated in marketing seminars to learn more about market information, including crop demand, supplies, and post-harvest practices. These farmers are now assuming leadership roles in their communities.
4. Women farmers' market knowledge about demand for quality crops, timing to receive a premium price, and consumer preferences improved from the baseline of 3–11% to 14–25%.
5. AVPI established 80 demonstration plots on GAPs and 25 on seedling raising and crop production using polynet houses and trickle irrigation. A total of 4,200 female horticulture farmers participated.



## DRY ZONE AND UPLANDS AGRO-INPUT AND FARM SERVICES PROJECT

Myanmar (2015–2020)

**Implementing Partners** – Private sector ISPs, Myanmar Department of Agriculture, and financial institutions

**Donor** – Livelihoods and Food Security Fund (LIFT), United Nations Office for Project Services (UNOPS)

The Dry Zone project, later extended to Upland areas in the southeast region, is improving farm advisory services by strengthening a network of agricultural input and service providers (ISPs) and building the capacity of public sector extension workers to complement private sector advisory services. The project works with the government extension service, private sector ISPs, and farmers to improve access to quality agricultural inputs,



services, and best farm practices, thus increasing their productivity and profitability – and creating opportunities for landless agricultural laborers. Improved services include a wider range of inputs, such as seed, fertilizer, and crop protection products (CPPs), along with crop management services and agri-machinery for land preparation, harvesting, and post-harvest processing. With an extension through October 2020, the project has completed all activities in Dry Zone locations, including conducting tractor operator training, and has expanded activities into the Uplands region.

## 2019 ACHIEVEMENTS

1. Significantly improved the relationship between the government, private sector, and farmers, leading to better services and profits from farming enterprises.

2. 185 farmer training events were held with 4,164 farmers (1,607 women) on conservation agriculture, business and finance, and effective and efficient use of seeds, fertilizers and other agro-inputs.
3. 19 demonstration crops were harvested, attaining an average profit improvement of 82% (maize) and 58% (paddy) over 2018 using good agricultural practices, such as fertilizer management, pest control, soil management, and good variety selection.
4. 29 ISPs in the Uplands area initiated 68 demonstration plots and held 27 field days for 3,188 farmers (895 women).
5. 2 school gardens were launched in partnership with state agricultural institutes in Demoso and Hpa-An.



## FEED THE FUTURE NEPAL SEED AND FERTILIZER (NSAF) PROJECT

*Nepal (2016–2021)*

**Lead Implementing Partner** – International Maize and Wheat Improvement Center (CIMMYT)

**Donor** – USAID

As a sub-grantee to CIMMYT, IFDC's role under NSAF specifically addresses fertilizers and integrated soil fertility management (ISFM), working with a national fertilizer association; policy and regulatory engagement, working with the Government of Nepal; and training and extension work on ISFM and the 4Rs<sup>1</sup> of fertilizer management, working with private agro-input dealers

and farmer cooperatives. The project also explores options for policy reform in collaboration with the Government of Nepal and facilitates an increased private sector role in fertilizer distribution. An IFDC soil scientist based in Kathmandu is currently coordinating the fertilizer component of the project.

## 2019 ACHIEVEMENTS

1. The IFDC team organized a series of meetings with its private sector partner, Nepal Fertilizer Entrepreneurs Association (NEFEA), to build its institutional capacity on fertilizer market development and scaling of improved agricultural practices through agro-input dealers and retailers.
2. Support was provided to NEFEA for preparation of a concept note on a "Fertilizer Blending Plant in Nepal" to be submitted to the Ministry of Agriculture and Livestock Development (MOALD).
3. IFDC organized consultative meetings with MOALD officials to determine the priority policy issues that must be addressed immediately through a policy white paper.
4. MOALD was supported in the development of a road map for balanced fertilization, including the option of in-country production of blended fertilizers, by bringing in regional and international expertise, for which MOALD could possibly allocate a multi-year budget.

1 4Rs – Right Source, Right Rate, Right Time, and Right Place



## FERTILIZER SECTOR IMPROVEMENT (FSI+)

*Myanmar (2014–2019)*

**Implementing Partner** – Syngenta

**Donor** – USAID

The five-year Fertilizer Sector Improvement (FSI+) project, initiated in 2014 and completed in December 2019, led the way for USAID interventions in the agriculture sector of Myanmar. The project contributed to building a strong and resilient food and agriculture system that will transform people's lives. This was achieved by improving incomes equitably and enhancing food security for small-scale farmers in target districts of the Delta and Shan regions. The approach focused on increasing production and income from crops in rice-based farming systems and building the capacity of agricultural input and other service providers to supply and advise farmers. The guiding mantra was to harness the power of science, technology, innovation, and markets to improve food and agricultural system practices dramatically and sustainably.

Such advances were tailored to promote more inclusive income growth for empowered small-scale farmers so they can benefit from the country's economic progress.

### CUMULATIVE ACHIEVEMENTS

1. More than 13,000 farmers were trained, one-third of whom received refresher courses.
2. Another 5,000 farmers were reached through field days and visits to model farms.
3. Trained farmers were encouraged to share information with their neighbors, of whom an estimated minimum of 2,500 (17%) adopted improved technologies.
4. 345 agro-input retailers were trained and, in turn, educated and encouraged their clients in modern inputs and good practices. More than 50,000 (at least 25%) farmer customers have adopted improved technologies as a result.



## SUSTAINABLE SOIL MANAGEMENT COMPONENT (SSMC) OF THE OCP FOUNDATION AGRICULTURAL DEVELOPMENT PROJECT

*Bangladesh (2017–2019)*

**Implementing Partners** – Bangladesh Agricultural Research Institute (BARI), Bangladesh Rice Research Institute (BRRI), Bangladesh Department of Agricultural Extension (DAE), Bangladesh Agricultural Development Corporation (BADC), International Center for Agricultural Research in the Dry Areas (ICARDA), and Soil Resource Development Institute (SRDI)

**Donor** – OCP Foundation

The SSMC project was implemented for a period of three years, from January 2017 to December 2019. The goal of SSMC was sustainable management of soil to enhance yields and farmers' incomes under resilient production systems. Specifically, the project worked to evaluate the

role of secondary and micronutrients on crop productivity as affected by soil acidity. SSMC also promoted balanced plant nutrient solutions and GAPs for improving crop productivity, crop profitability, and soil fertility, working through extension workers and agro-input retailers. The project worked in collaboration with national research and extension institutes. The project targeted rice (wet and dry seasons), maize, potato, lentil, and, to a lesser extent, wheat.

### CUMULATIVE ACHIEVEMENTS

1. The project directly trained 2,210 farmers and 393 retailers (12% women).
2. To demonstrate the results of GAP technology, 120 field demonstrations were established and 34 field days were held with 3,465 participants (24% women).
3. About 1,350 farmers now use improved nutrient management technologies or GAPs as a result of project activities.

## TECHNICAL ASSISTANCE TO BANGLADESHI RESEARCH INSTITUTIONS FOR GHG EMISSIONS MEASUREMENT



*Bangladesh (2017–2019)*

**Implementation Partners** – BRRI and Bangladesh Agricultural University (BAU)

**Donors** – Government of Bangladesh (GOB) through Krishi Gobeshona Foundation (KGF) and International Rice Research Institute (IRRI)

Capacity building of national research institutions and scientists is key to sustaining quality research, particularly in the context of developing climate-resilient technologies. IFDC assisted BRRI and BAU in measuring GHG emissions from FDP technology and ISFM practices, combined with alternate wetting and drying (AWD) technologies, compared with farmers' practices of fertilizer application. Emissions measured included carbon dioxide, methane, nitrous oxide, ammonia, and nitric oxide to provide a complete picture of the role fertilizer and water management technologies play in mitigating GHG emissions. The research also included an estimation of carbon credits associated with improved fertilizer and water management.

### 2019 ACHIEVEMENTS

1. GHG measurement research was completed at BAU; however, it is continuing at BRRI under a rice-based cropping system.
2. One scientific paper was published in 2019 in an international journal.



## SUSTAINABLE IMPROVEMENT FROM SIMPLE TECHNIQUES

The Dry Zone Agro-Input and Farm Services (DZ) project, funded by the Livelihoods and Food Security Fund (LIFT) and operating in Myanmar from 2015 to 2019, uniquely built the capacity of the agriculture sector. By equipping both local input and service providers (ISPs) and Department of Agriculture (DOA) agents with agricultural knowledge, farmers receive agricultural advice from both sources, who work together to transfer good agricultural practices (GAPs) to their customers and beneficiaries. This approach created trust between farmers and ISPs, resulting in increased income for both. Additionally, this reduced the load on DOA agents, who are each responsible for 585 farmers on average.

U Myint Aung is one farmer who has benefited from the DZ approach. Because his ISP received training from IFDC, Myint Aung was plugged into farmer training sessions, a demonstration plot on plant spacing and high-yielding groundnut varieties, and other field day activities.

The biggest changes Myint Aung has made include climate-smart approaches to planting and harvesting. He practices low-till planting to reduce erosion on his farm, and on his plot of mung bean, he composts crop residue to reapply the nutrients into the soil.

His ISP, U Nyi Nyi Naing, collaborated with the DOA, local farmers, and IFDC to organize farmer trainings, establish demonstration plots, and run field day events. Before becoming involved in the DZ project, he had no experience in organizing these types of activities. Now, he serves 225 more farmer customers than before and passes on new knowledge on how to use and manage fertilizers, seeds, crop protection products, and other crop inputs.

When he suggested a pH measurement, Myint Aung took him up on the offer, along with 25 farmers from six other villages. As he visited each farm, Nyi Nyi Naing provided advice on balancing soil pH. Myint Aung learned from him how to balance his soil pH using gypsum. Additionally, Nyi Nyi Naing demonstrated that only using urea limits soil and plant health and nutrition, thus limiting production and profits. Myint Aung now uses balanced fertilizer that includes micronutrients.

Nyi Nyi Naing and Myint Aung have built a good relationship in which the farmer can purchase inputs, farm tools, and services on cash or credit, and the input provider has a reliable, trusted customer.

Altogether, Myint Aung's entire farming operation has improved. Through better planting and preparation practices, balanced fertilizer application, and appropriate pH management, his farm's soil fertility is improving, and its soil pH is becoming more balanced. Thus, he can reduce fertilizer use and climate impacts.

But Myint Aung's operation is not entirely altruistic. Through these new practices, along with other GAPs, he has been able to increase production. His peanut yield, for example, has doubled from 20–30 baskets per acre to 40–60 baskets per acre.

The intertwined approach of ISP, farmer, and DOA capacity building yielded a win-win-win situation, helping farmers and ISPs across Myanmar improve their livelihoods and achieve their goals, which will continue long after IFDC's activity in the country.



*Myint Aung adopted DZ methods and his harvests have increased as the soil on his farm is restored to fertility.*



# INTERNATIONAL TRAINING

## 2019 TRAINING EVENTS:

### ACCRA, GHANA

May 27–31, 2019

*Delivering Balanced Crop Nutrition to Small-Scale Farmers*

### FRANKFURT, GERMANY

June 24–26, 2019

*IFDC/IFA Workshop on Production of Slow-, Controlled-Release, and Stabilized Fertilizers*

### USA

August 19–31, 2019

*U.S. Study Tour: Technology Advances in Agricultural Production, Water, and Nutrient Management*

*International Trainings provided opportunities for attendees to visit state-of-the-art fertilizer production and manufacture sites and farms implementing the latest in precision agriculture.*

**IFDC'S** international training, workshop, and study tour programs are designed for professionals in private, public, cooperative, and non-governmental organizations. Each program is conducted by a multidisciplinary team of experts from IFDC's international staff and partner organizations and companies.

In 2019, IFDC hosted three international training programs in Ghana, Germany, and the United States. Nearly 200 professionals from more than 20 countries brought many disciplines and career levels to the table. They found the international workshops to be an excellent opportunity for networking, exchanging ideas, and learning with and from each other.

“Networking is the hallmark of our international trainings,” says Rob Groot, Director of Business Development and Strategic Partnerships. “In 2019, representatives from both the public and private sectors, composed of CEOs, engineers, managers, and more, from development partners, fertilizer and agriculture companies, governments, and donors participated in our programs. Collaborative learning is our key: it fuels individual capacity building through connecting people who would not normally be working in the same sphere.”

According to one attendee at the workshop in Germany, the biggest benefit was the “excellent networking between experts in the industry... [this workshop was] a great event to increase knowledge of [fertilizers].”

As of publication, precautions taken against the COVID-19 pandemic have put IFDC's international workshop activities on hold. Stay tuned to IFDC.org and our social media outlets to learn about upcoming events.



# PUBLICATIONS & PRESENTATIONS

The following technical publications and presentations are a representation of the work our highly skilled researchers and field experts accomplished in 2019. These, and much of our other research, can be accessed through our online library portal.

## PUBLICATIONS

- Adisa, I.O., V.L.R. Pullagurala, J.R. Peralta-Videa, C.O. Dimkpa, W.H. Elmer, J.L. Gardea-Torresdey, and J.C. White. 2019. "Recent Advances in Nano-Enabled Fertilizers and Pesticides: A Critical Review of Mechanisms of Action," *Environmental Science: Nano*, 6:2002-2030.  
<https://pubs.rsc.org/en/content/articlelanding/2019/en/c9en00265k#!divAbstract>
- Adu-Gyamfi, R., S. Agyin-Birikorang, I. Tindjina, S.M. Ahmed, A.D. Twumasi, V.K Avornyo, and U. Singh. 2019. "One-Time Fertilizer Briquettes Application for Maize Production in Savanna Agroecologies of Ghana," *Agronomy Journal*, 111(6):3339-3350. <https://doi.org/10.2134/agronj2019.04.0292>
- Adu-Gyamfi, R., S. Agyin-Birikorang, I. Tindjina, Y. Manu, and U. Singh. 2019. "Minimizing Nutrient Leaching from Maize Production Systems in Northern Ghana with One-Time Application of Multi-Nutrient Fertilizer Briquettes," *Science of the Total Environment*, 694. <https://doi.org/10.1016/j.scitotenv.2019.133667>
- Agyin-Birikorang, S., I. Tindjina, C. Boubakary, W. Dogbe, and U. Singh. 2019. "Resilient Rice Fertilization Strategy for Submergence-Prone Savanna Agro-Ecological Zones of Northern Ghana," *Journal of Plant Nutrition*, 43:7, 965-986. <https://doi.org/10.1080/01904167.2019.1702209>
- Agyin-Birikorang, S., I. Tindjina, R. Adu-Gyamfi, H.W. Dauda, A.-R.A. Fuseini, and U. Singh. 2019. "Agronomic Effectiveness of Urea Deep Placement Technology for Upland Maize Production," *Nutrient Cycling in Agroecosystems*, 116:179-193. <https://doi.org/10.1007/s10705-019-10039-8>
- Azumah, S.B., M.S. Taylor, O. Camara, and N. Boison. 2019. "Empirical Examination of the Constraints and Causes of Crop Seed Losses in Ghana," *Journal of Crop Improvement*, 33:2, 279-286.  
<https://doi.org/10.1080/15427528.2019.1579775>
- Ba, Mahamadou Nassirou, Marie Claire Kalihangabo, Joseph Rusike and Oumou Camara. 2019. "Fertilizer Subsidies," IN *Feeding Africa's Soils: Fertilizers to Support Africa's Agricultural Transformation*, pp. 110-122, Alliance for a Green Revolution in Africa (AGRA).  
<https://africafertilizer.org/wp-content/uploads/2019/11/AGRA-Feeding-Africa%E2%80%99s-Soils-2019.pdf>
- Camara, O. M., A. Sy Traore, and B. Diagana. 2019. "Fertilizer Distribution and Consumption in West Africa," *Fertilizer Focus*, May/June, 54-56.
- Comer, B.A., P. Fuentes, C.O. Dimkpa, Y-H. Liu, C.A. Fernandez, P. Arora, M. Realff, U. Singh, M.C. Hatzell, and A.J. Medford. 2019. "Prospects and Challenges for Solar Fertilizers," *Joule*, 3(7):1578-1605.  
<https://doi.org/10.1016/j.joule.2019.05.001>



- Dimkpa, C.O., U. Singh, P.S. Bindraban, I.O. Adisa, W.H. Elmer, J.L. Gardea-Torresdey, and J.C. White. 2019. "Addition-Omission of Zinc, Copper, and Boron Nano and Bulk Particles Demonstrate Element and Size-Specific Response of Soybean to Micronutrients Exposure. *Science of the Total Environment*, 665:606–616. <https://doi.org/10.1016/j.scitotenv.2019.02.142>
- Dimkpa, C.O., U. Singh, P.S. Bindraban, W.H. Elmer, J.L. Gardea-Torresdey, and J.C. White. 2019. "Zinc Oxide Nanoparticles Alleviate Drought-Induced Alterations in Sorghum Performance, Nutrient Acquisition, and Grain Fortification," *Science of the Total Environment* 688:926–934. <https://doi.org/10.1016/j.scitotenv.2019.06.392>
- Gaihre, Y.K., W.D. Bible, U. Singh, and J. Sanabria. 2019. "Quantifying Nitric Oxide Emissions under Rice-Wheat Cropping Systems," *Environmental Pollution*, 250:856–862. <https://doi.org/10.1016/j.envpol.2019.04.121>
- Lemo, R., H. Ninsima, D. Lukungu, A. Mafabi, J. Namirembe, R. Masaba, M.D. Kalende, R. Basirima, R. Kemigisha, G. Kimooone, D. Tibanyendera, B. Piloya, H. Bekkers, J. Omunyidde, Zhane, D. Slane, D. Hirst, J. Abdul, L. van Veldhuizen, and B. Wennink. 2019. "Management of Farming Resources: Good Agricultural Practices and Climate Smart Agriculture. Experiences of the IFDC REACH Project on Building Smallholder Farmers' Resilience in the Rice and Potato Value Chains in Uganda."
- Lemo, R., H. Ninsima, D. Lukungu, A. Mafabi, J. Namirembe, R. Masaba, M.D. Kalende, R. Basirima, R. Kemigisha, G. Kimooone, D. Tibanyendera, B. Piloya, H. Bekkers, J. Omunyidde, Zhane, D. Slane, D. Hirst, J. Abdul, L. van Veldhuizen, and B. Wennink. 2019. "Increasing Resilience for Smallholder Farmer Households through Improved Access to Finance. Experiences of the IFDC REACH Project on Building Smallholder Farmers' Resilience in the Rice and Potato Value Chains in Uganda."
- Lemo, R., H. Ninsima, D. Lukungu, A. Mafabi, J. Namirembe, R. Masaba, M.D. Kalende, R. Basirima, R. Kemigisha, G. Kimooone, D. Tibanyendera, B. Piloya, H. Bekkers, J. Omunyidde, Zhane, D. Slane, D. Hirst, J. Abdul, L. van Veldhuizen, and B. Wennink. 2019. "Empowering Women and Promoting Youth Employment for Inclusive Supply Chain Development. Experiences of the IFDC REACH Project on Building Smallholder Farmers' Resilience in the Rice and Potato Value Chains in Uganda."
- Lemo, R., H. Ninsima, D. Lukungu, A. Mafabi, J. Namirembe, R. Masaba, M.D. Kalende, R. Basirima, R. Kemigisha, G. Kimooone, D. Tibanyendera, B. Piloya, H. Bekkers, J. Omunyidde, Zhane, D. Slane, D. Hirst, J. Abdul, L. van Veldhuizen, and B. Wennink. 2019. "Market Systems Development: An Innovative Approach for Strengthening Local Resilience. Experiences of the IFDC REACH Project on Building Smallholder Farmers' Resilience in the Rice and Potato Value Chains in Uganda."
- Rusike, Joseph and Oumou Camara. 2019. "Fertilizer Policy," IN *Feeding Africa's Soils: Fertilizers to Support Africa's Agricultural Transformation*, pp. 88–109, Alliance for a Green Revolution in Africa (AGRA). <https://africafertilizer.org/wp-content/uploads/2019/11/AGRA-Feeding-Africa%E2%80%99s-Soils-2019.pdf>
- Sanabria, J., and J. Wendt. 2019. "Statistical Analysis of Non-Replicated Experiments in Farmers' Fields: A Case of Balanced Fertilization Trials for Bean in Burundi," *Agronomy Journal*, 111(3):1165–1170. <https://doi.org/10.2134/agronj2018.10.0655>
- Sharma, S., H. Malhotra, P. Borah, M.K. Meena, P. Bindraban, S. Chandra, V. Pande, and R. Pandey. 2019. "Foliar Application of Organic and Inorganic Iron Formulation Induces Differential Detoxification Response to Improve Growth and Biofortification in Soybean, *Plant Physiology Reports*, 24(1):119–128.

- Sharma, S., S. Chandra, A. Kumar, P. Bindraban, A.K. Saxena, V. Pande, and R. Pandey. 2019. “Foliar Application of Iron Fortified Bacteriosiderophore Improves Growth and Grain Fe Concentration in Wheat and Soybean,” *Indian Journal of Microbiology*, 59(3):344–350.
- Siddique, I.A., A. Al Mahmud, M. Hossain, M. R. Islam, Y. K. Gaihre, and U. Singh. 2019. “Movement and Retention of  $\text{NH}_4\text{-N}$  in Wetland Rice Soils as Affected by Urea Application Methods,” *Journal of Soil Science and Plant Nutrition*, <https://doi.org/10.1007/s42729-019-00148-2>
- van Vilsteren, Sjoerd, 2019. “Innovation in the Fertilizer Industry. Qualitative Research on the Drivers for Change in the Dutch Fertilizer Industry,” M.Sc. Thesis, Wageningen University and Research. Advisor: Prem Bindraban.
- Wassman, R., B.O. Sander, S. Yadav, B. Bouman, G. Singleton, A. Stuart, J. Hellin, D. Johnson, J. Hughes, K. Butterbach-Bahl, R. Kiese, D. Kraus, B. Janz, B. Linquist, Y.K. Gaihre, N. Chirinda, and E. Wollenberg. 2019. “New Records of Very High Nitrous Oxide Fluxes from Rice Cannot Be Generalized for Water Management and Climate Impacts,” *PNAS*, 116(5):1464–1465. <https://doi.org/10.1073/pnas.1817694116>

## PRESENTATIONS

- Agyin-Birikorang, S., J. Fugice Jr., R. Adu-Gyamfi, I. Tindjina, U. Singh, and Y. Manu. 2019. “One-Time Application of Multi-Nutrient Fertilizer Briquettes for Maize (*Zea mays* L.) Production in the Guinea Savanna Ecological Zone of Ghana,” presented at ASA, CSSA and SSSA International Annual Meetings at San Antonio, Texas, November 10–13, 2019.  
<https://scisoc.confex.com/scisoc/2019am/meetingapp.cgi/Paper/121103>
- Agyin-Birikorang, S., S.A. Nuhu, A. –R.A. Fuseni, H.W. Dauda, J. Fugice Jr., W. Bible, C. Sylvester, A. Mobley, and U. Singh. 2019. “Does Blanket Fertilizer Recommendation Still Work? A Case Study of Maize Production in Northern Ghana,” presented at International Annual Meeting of Soil Science Society of America at San Diego, California, January 6–9, 2019.  
<https://scisoc.confex.com/scisoc/2019sssa/meetingapp.cgi/Paper/113704>
- Dimkpa, C.O. 2019. “Application of Nanotechnology in the Fertilizer Industry,” presented at the USA Training and Study Tour on Technology Advances, organized by the International Fertilizer Development Center (IFDC), Muscle Shoals, Alabama, August 2019.
- Dimkpa, C.O. 2019. “Zinc Fertilization Can Address Crop Productivity, Nitrogen Use Efficiency and Human Nutrition Concerns Associated with Environmental Events,” presented at the Agronomy Society of America Annual Meeting, San Antonio, Texas, November 2019.
- Gaihre, Y.K. 2019. “Nepal’s Experience with Balanced Application of Plant Nutrients and Policy Challenges. Presented at the Regional Dialogue, Innovations for Advancing Farmer’s Use of Balanced Nutrient Application in South Asia,” Kathmandu, Nepal, September 5, 2019.
- Sharma, S., M.K. Meena, A. Kumar, P. Bindraban, and R. Pandey. 2019. “Leaf Proteome Analysis in Soybean Reveals Differentially Abundant Proteins Involved in Foliar Absorption of Iron,” Abstract for poster presentation in XIV Agricultural Science Congress 2019, February 20–23, 2019, New Delhi, India.
- White, J., C. Dimkpa, W. Elmer, and J. Gardea-Torresdey. 2019. “Nanoscale Elements Suppress Plant Disease, Enhance Macronutrient Use Efficiency, and Increase Crop Yield,” presented at the USDA/NIFA Nanotechnology for Agricultural and Food Systems Grantees Conference, Nashville, Tennessee, May 2019.



# 2019 FINANCIAL STATEMENT

The following is a summary of financial information for the year ended December 31, 2019. The full financial statements and the independent auditors' reports are available from IFDC upon request. IFDC's Audited Financial Statements are available online.

## STATEMENT OF REVENUE & EXPENSES

FOR THE YEAR ENDED DECEMBER 31, 2019

REVENUES & GAINS (US \$'000)	2019	2018
Alliance for a Green Revolution in Africa	1,693	1,077
African Fertilizer and Agribusiness Partnership (AFAP)	9	
African Development Bank	833	493
Dutch Embassies	18,531	18,582
International Food Policy Research Institute (IFPRI)		906
International Fertilizer Association (IFA)	151	
Islamic Development Bank	766	190
Embassy of Ireland (Irish Aid)	434	309
Millennium Challenge Corporation (MCC)	1,599	
Netherlands Directorate-General for International Cooperation (DGIS)	8,341	6,932
The Fertilizer Institute		62
Swisscontact		207
Swiss Agency for Development and Cooperation (SDC)	199	443
Walmart Foundation, Inc.	132	537
United Nations Office for Project Services (UNOPS-LIFT)	1,351	1,335
U.S. Agency for International Development	9,310	10,841
Others	4,446	4,385
<b>TOTAL REVENUES AND SUPPORT</b>	<b>47,795</b>	<b>46,299</b>
EXPENSES & LOSSES (US \$'000)		
Research and development	3,602	2,966
Field projects	35,716	34,113
Capacity building	2,710	4,141
Support activities	5,460	6,550
<b>TOTAL EXPENSES</b>	<b>47,470</b>	<b>47,770</b>
<b>DECREASE/INCREASE IN UNRESTRICTED NET ASSETS</b>	<b>316</b>	<b>(1,471)</b>

## BALANCE SHEET

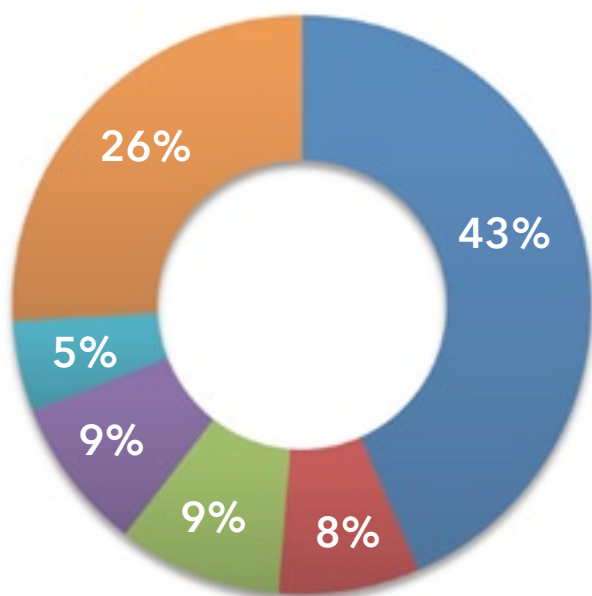
FOR THE YEAR ENDED DECEMBER 31, 2019

(US \$'000)	2019	2018
Total assets	26,204	17,126
Total liabilities	28,543	19,991
Unrestricted net assets	(2,339)	(2,873)
Permanently restricted net assets		8
<b>TOTAL LIABILITIES AND NET ASSETS</b>	<b>(2,339)</b>	<b>(2,865)</b>

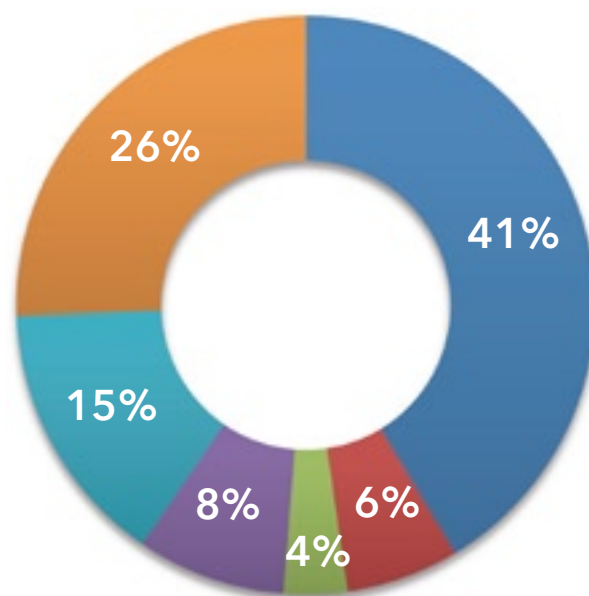
## EXPENSES BY FUNCTION

FOR THE YEAR ENDED DECEMBER 31, 2019

(US \$'000)	2019	2018
Personnel	20,605	19,764
Travel	3,750	3,021
Operations	4,349	1,691
Workshops & training	4,066	3,981
Equipment & supplies	2,422	7,093
Subcontracts & grants	12,287	12,220
<b>TOTAL EXPENSES</b>	<b>47,479</b>	<b>47,770</b>



2019



2018







*P.O. Box 2040*  
*Muscle Shoals, Alabama 35662 USA*  
*+1 (256) 381-6600*

Circular IFDC S-43  
ISSN-1536-0660  
August 2020