

# Syngenta Foundation for Sustainable Agriculture

Review 2016-2018

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# Changes in pursuit of a constant goal

## Letter from the Director



Dear readers,

In earlier Reviews, the introductory page has been exactly that – a page. Given all the recent and current developments at the Syngenta Foundation, however, this will be more of a re-introduction, and definitely more than a page!

First of all, I would like to say a big thank you to my predecessor, Marco Ferroni, and to our former Chairman, Michel Demaré. As mentioned on page 8, they both retired from the Foundation last year. They have handed over an organization in robust good health, of which it has been an honor and pleasure to become Executive Director. I wish Marco and Michel great enjoyment in their many and various activities – to talk of ‘retirement’ in the usual sense of the word would be inappropriate for men of such energy and dedication.

At the Foundation, I have inherited an excellent international team. As you will see on page 53, we have been fortunate to recruit additional Headquarters talent over the last couple of years. This has been mirrored by a growth in our local teams. Our Board, too, has seen changes in that period, including the arrival of Erik Fyrwald as our new Chairman.

Erik’s nomination by our founder, Syngenta, underlines the company’s commitment to supporting our work not only with funds, but also with expertise at the highest level. Erik Fyrwald is the Syngenta CEO; his three predecessors were Chairmen of the company’s Board.

Quite independently of this hand-over, the Foundation and the company realized last year that they could create greater shared value through better alignment of their activities. With both organizations focused on sustainable agriculture, this could bring more benefits to smallholders, as well as to the sector in which the company operates. But what will greater coordination mean in practice?

### Aligned on themes, independent in initiatives

Syngenta has been an occasional Foundation partner in the past, notably in the area of Research & Development. We are now looking carefully at new opportunities to create inclusive partnerships together with other organizations with similar objectives. From 2018 onwards, for example, we are both contributing our respective skills to a project strengthening the smallholder tomato value chain in Nigeria, and to a major conservation partnership that spans East Africa and China. You will hear more about these soon on our website, [www.syngentafoundation.org](http://www.syngentafoundation.org), completely reshaped in 2016, via our @syngentafdn tweets, begun in 2017, and LinkedIn, active since 2018.

Both our Foundation and the company are also keen contributors to agricultural debate. We focus on different types of farmers, ‘ours’ being pre-commercial smallholders in developing countries. But whatever nation, farm size or crop focus, rural families face many of the same challenges worldwide. Two are unpredictable and potentially disastrous: politics and the weather. The third, related to both of these, is farmers’ near-universal difficulty in finding a successor. Across the globe, fewer and fewer young people want a future in farming. Appropriate reactions to agriculture’s three major risk factors – governments, climate change and youthful disinterest – are just some of the topics that lend themselves to expert discussion by both Syngenta and its Foundation.

We also share a number of views with the company. Both of us believe strongly in the importance of the private sector in agricultural development, in the need for and value of multi-stakeholder partnerships, in the benefits of a science-based approach to research, and, in the crucial need for smallholders to be able to access the resulting new technologies in ways that address risks and create value for all players. Sadly, there are some organizations that oppose all of these views. Our experiences in the field, however, show that we are right to promote them. As you will see in this Review, the Foundation continues not only to talk and write about smallholder farming, but also to work hard for its improvement. This includes several initiatives designed to provide remunerative rural employment for young people.

Importantly, however, principled agreement with Syngenta does not mean a compromise on our mission, or subservience to corporate priorities. Our statutes stipulate that we operate outside the commercial arena of the company. We have done so for 35 years, and shall continue to carve out our own areas of activity. To its great credit, Syngenta gives the Foundation complete freedom to operate – our work has, for example, included work with the company’s competitors. Our aim is to enable smallholders to earn better incomes; we are free to choose the route to that goal, and the partners with whom to achieve it.

Over the last few years, the Foundation’s achievements have attracted increasing external investment. Syngenta continues to provide our core funding, but in 2018 we expect that outside organizations will finance about one-third of the work in which we are involved. These organizations include national donors and other foundations. If we are to enable our innovations to benefit smallholders at scale, it is imperative we continue to grow partnerships with third-party funders and investors. To this end, we have recently recruited our first-ever Program Development Manager, with a particular responsibility for partnership building.

What other changes can you expect to see?

One will be geographical. As we aim to create positive impact on smallholders at significant scale, we need to operate in countries which have the largest numbers of smallholders mired in poverty. At the same time, we will continue designing and prototyping innovations in the most receptive markets, which are not necessarily the largest.

Shifts in our country focus are nothing new in themselves. The evolution of our project portfolio has always led to new countries joining the development and scale-up phases, while in others, project maturity enables us to withdraw, and then devote our resources elsewhere. In the period covered by this Review, we have been building a stronger regional presence in West Africa. Our team based in Senegal works across several countries. These include Mali, which for most of the Foundation's history was the sole focus of our work there. We will continue to strengthen our regional approach in the near future, with expansion into Nigeria in particular.

In Asia, we shall shortly be concluding an impactful initiative in Vietnam. It has enabled peri-urban smallholders to earn good incomes by selling more and safer vegetables to city supermarkets. We are delighted that local expertise and processes now enable this to continue without our involvement. As usual at the Foundation, we are looking for opportunities to replicate the initiative in other places.

At the same time, we are investigating possible initiatives in China. In the past, we have worked with several Chinese state and academic institutions, for example on the topic of agricultural extension. China has the world's largest number of smallholders. Many of them live in remote regions with harsh natural conditions and remain very poor. Given our Foundation's mission to improve small farmers' livelihoods, China is therefore a natural choice of country in which to operate. ChemChina, the new owners of Syngenta, are among the organizations in favor of us stepping up our activities there. In July 2018, we received registration for our office in Beijing. We are currently examining how we can best add value to China's smallholder agriculture. You will hear more soon.

Another change concerns our self-assessment. Over the years, the Foundation and its partners have written numerous project reports. Most of these are discrete and retrospective, typically completed after we hand over our innovations to the organizations that will take them forward in the long term. A number of these reports are available on our website, often accompanied by journal publications on selected aspects of the work. We have recently been reviewing how we can measure our performance and impact more consistently while programs are in progress. We also want to compare initiatives better across the different streams of our work. Improving how we measure our impact will guide future decisions. It will enable us to compare our innovations better with others, and identify those that bring smallholders the greatest success. In addition, we plan to invest more efforts in reflection on programs' lasting legacy and impact several years after they end.

A third change will be the addition of a new topic to our range of activities. Soil health is an increasingly vital issue for farming and food security. Worldwide, soil degradation continues and weather is increasingly volatile. Working for the health of farmland is therefore more important than ever. Over the years, we have been involved in various initiatives to improve the quality of smallholders' soils. What has been missing, however, is a coordinated drive by a Foundation-led partnership to reverse soil degradation and raise fertility – underpinned by compelling business cases. We are now looking into various possible activity areas. Here, too, we look forward to announcing details in the near future.

### Long-term commitment remains essential

With all this talk of change, I would also like to emphasize our strong continuity. As a foundation, we are fortunate to be able to take a long-term view and stay the course in addressing very profound challenges. This is often neither the case for companies, driven by the pressures of shareholders and quarterly earnings statements, nor for public donors driven by political cycles. Many agricultural research teams or implementing NGOs struggle from one short-term grant to the next. We remain committed to our approach of testing a concept, incubating it to become a viable business proposition, and then scaling it up with partners to benefit very large numbers of farmers. This can take five to ten years. Willingness to risk failure needs to go hand in hand with the patience to achieve success. We have both of these, plus the energy to catalyze processes that would not move without us.

Continuity is also visible in our three main work themes, or as we call them, 'streams'. Like other recent Reviews, this one showcases our work in Agriservices, Risk Management and Access to Seeds. We have already amassed considerable experience in all three, on which we keep building. We also continue to find partners with similar thematic interests. They trust and respect us, as we do them. We may not always agree on everything in the field of agricultural development. But together, we know we can improve smallholders' livelihoods better than any of us could alone. We are also prepared to devote the considerable amount of time required to build and support complex partnerships to achieve that change.

Supporting the three streams, we also continue to work in the areas of Policy and R&D. Access to better seeds, for example, requires both. Our R&D partner scientists develop improved varieties that meet smallholders' needs; politicians ideally legislate to make them available faster and able to be traded more widely. One of our tasks over the coming years is to ensure a maximum of synergy across all our activities, especially in the communities and countries where we work. As well as Policy and R&D, for example, how could Risk Management also best serve smallholders' needs in rapidly adopting new seeds? And none of our innovations in seeds, soils or risk management can reach the pre-commercial smallholders without appropriate Agriservices supported by continuing innovation in digital tools. There are endless ideas waiting to be explored!

On that note: We are also keen to meet potential partners with ideas and enthusiasm for exploration. If you can imagine working with us to improve smallholder agriculture, please get in touch. Our address is on the back page.

Meanwhile, I hope you enjoy our Review. Please do send us your comments, questions and suggestions for future editions, and for our work in general.

Simon Winter

Executive Director

# Welcomes and farewells

SFSA Director and Chairman hand over to successors

2017 was a year of change in our leadership. Marco Ferroni retired as Executive Director, to be succeeded by Simon Winter. Our Board Chairman, Michel Demaré, stepped down on December 31. His successor, Erik Fyrwald, took up office in 2018.



**Marco Ferroni**

Marco led our Foundation (SFSA) for nine years. With his guidance, SFSA considerably expanded its reach, both geographically and thematically. New teams started operations in several Asian and African countries; SFSA began enabling smallholders' access to both insurance and better seeds. Marco was also much in demand as a conference speaker and panelist. The Publications page of our website bears testimony to his skills as an author. This Review primarily reports on progress under Marco's leadership.



**Michel Demaré**

Michel Demaré was the third Chairman of Syngenta. Like his predecessors, he was fascinated by the work of SFSA, and chose to chair our Board as well. Despite the many other calls on his time, Michel was generous in his attention to the Foundation's activities. His guidance over the last five years was invaluable, and will be greatly missed. Fortunately, we are able to draw on the considerable expertise of the remaining Board members (see p. 52), most of whom joined us under Michel's Chairmanship.



**Simon Winter**

Simon became Executive Director in September 2017. He joined us from TechnoServe, where he had most recently been Senior Vice President, Development. From 2015-2017, Simon was also a Senior Fellow of the Mossavar-Rahmani Center at the Harvard Kennedy School of Government. Today, he chairs the board of ACRE\*, and is a board member of Root Capital. Simon additionally holds advisory positions with the World Economic Forum, the Farm to Market Alliance and the Initiative for Smallholder Finance.

In a website interview on his arrival, we asked Simon what had attracted him to SFSA. He listed several points: "In the development community, there is typically a large divide between science and implementation. SFSA is one of the few organizations that really tries to bridge that gap, both internally and with its many partners. Like I do, it believes strongly in the importance of properly functioning markets. SFSA also has a great team of talented people around the world. They are open, creative and willing to take well-judged risks. Thankfully, Syngenta makes that easier by strongly backing its Foundation, while also giving us a very free hand operationally. The company's 2017 acquisition by ChemChina adds an additional fascination – not least because the purchase agreement specifically mentioned safeguards for continuing our work."

\* [www.acreafrica.com](http://www.acreafrica.com). SFSA set up the company ACRE to take forward our former Killimo Salama insurance initiative in Africa.



**Erik Fyrwald**

Erik Fyrwald became SFSA Board Chairman in early 2018. As CEO of Syngenta, he continues the tradition of our high-level access to company expertise and resources. Erik leads a Board with four independent Directors.

# Our complementary activities make agriculture more sustainable

Introduction by Erik Fyrwald, Syngenta CEO and new Foundation Chairman



Dear friends, partners and beneficiaries of the Syngenta Foundation,

I am delighted to have become Chairman in 2018, and greatly look forward to building on the work of my dedicated predecessor, Michel Demaré.

Our Statutes stipulate that the Syngenta Board appoint the Foundation's Chairman. By choosing the CEO to take on this task, Syngenta has underscored its long-standing commitment to the Foundation's work. My three immediate predecessors were all Syngenta Chairmen. With this tradition of support at the highest level, the Foundation knows that it can continue to draw not only on Syngenta funding, but also on the company's wealth of agricultural expertise.

The Foundation has been working successfully with smallholders for over 35 years. It is my task and that of the other Board Members to extend that legacy, and help the Foundation to improve the incomes and food security of vast numbers of farmers in developing countries.

As you can see on page 52, I am joining a highly experienced group of Trustees. Three of them are unconnected with Syngenta, one is a retired company executive, and the fifth is the Foundation's Director, Simon Winter. As is usual with Swiss foundation Boards, our task is to

provide guidance and ensure good governance. Our remit covers approval of Foundation policy, activities, budgets and accounts.

The Syngenta Foundation stands as a unique institution in our sector. It promotes sustainable agriculture by smallholders in poorer regions of the world – with a strong mission focus on helping them leave poverty behind. The Foundation's approach is to anchor innovations firmly in research, and then ensure they are fit for purpose through its own actions on the ground. As its Statutes emphasize, the Foundation “supplements the primary contribution made by the Syngenta Group” in this field. It does so by focusing on smallholders as clients who deserve the best solutions, wherever these come from. In so doing, it can in some cases also establish markets in which Syngenta and other companies may one day wish to compete.

Syngenta commits core funding to these activities each year. However, the Foundation works in partnerships across the public and private sectors. Syngenta is occasionally a project partner, typically in the scientific field. The partnerships include technical and business collaborators, as well as a wide range of co-funders. Simon Winter and his team are now focused on scaling up their impact. To do so, they need to increase the extent of external support significantly in the near future.

Syngenta and its Foundation complement each other ideally. They work with different groups of farmers, and in different ways. Syngenta sells crop protection products and seeds to existing commercial farmers. The Foundation works across many areas of agriculture to assist pre-commercial smallholders in developing countries. Improving market systems so that the private sector can work more effectively to benefit smallholders is a huge and fascinating challenge. I am very excited now to be part of the team working to advance the cause of inclusive sustainable agriculture worldwide.

Erik Fyrwald



# More choice, better access: Seeds2B

Helping smallholders get the good seed they need

**Millions of smallholders currently lack access to good seed. Sowing better varieties would enable them to raise their yields and income, and improve food security. That is the guiding thought behind our Seeds2B program.**

“Our main goal is to help small farmers access high-quality, affordable seeds of improved varieties for the crops they need”, declares Ian Barker. He is the Foundation’s Head of Agricultural Partnerships and leads the program. “Better access to seed fundamentally requires two elements”, Barker adds. “The first is identification and breeding of suitable varieties; then one needs to produce and distribute the seeds to smallholders. In many developing countries, particularly if the private sector is to be involved, these steps are not well connected. Seeds2B acts as an independent builder of the necessary links.”

In agriculture, seeing is often believing. Seeds2B’s Theory of Change is based on that principle. “Our partners and we aim first to demonstrate a profitable business model for a given crop”, explains Barker. “Then small companies become more confident about investing in that seed value chain, and copy the model on a larger scale. We have already seen this with several companies in East Africa dealing in potato and bean seed.”

The Syngenta Foundation now has considerable experience in this area. We have found that small and medium-sized companies typically reach profitability after four to five years’ assistance. “By that stage, and depending on the crop, they’re each achieving sales of about one quarter to half a million dollars, or are supplying 0.5 -1% of national seed demand”, Ian Barker believes. Seeds2B’s crucial contribution is to provide a range of support services, and de-risk early seed production. The following pages provides some specific examples.

## Recent highlights

By the end of 2017, Seeds2B had facilitated cumulative production and sale of seed worth some US\$ 14.8 million. We estimate that this seed generated an additional US\$ 45 million in smallholder income.

In September 2017, we entered into a three-year Global Development Alliance with USAID\*. The resulting project is called PASTTA, Partnerships for Seed Technology Transfer in Africa. It aims to develop and implement new models for private sector delivery of improved varieties. The seeds will include many from local public breeding programs. An important element of PASTTA is the strengthening of ‘South-South links’ between the seed sector in Africa, Latin America and Asia.

In India, Seeds2B is working with public and private partners to deliver a very promising affordable drought-tolerant corn hybrid. More information about this ‘AAA’ project can be found on page 40. In Indonesia, we have assisted a vegetable seed company to expand its portfolio to produce high-quality potato seed for the first time. This reduces the need for seed imports. The program seeks to expand to other crops in Indonesia as well as starting work in Myanmar in 2018.

## What’s coming up?

Looking ahead, Ian Barker says: “We will continue to increase the choice of varieties, and to build capacity at small and medium-sized companies. We also want to widen our circle of partners.”

A major new initiative to help such seed companies is the AECF\*\* ‘Seeds for Impact’ Program. Launched in June 2018, this ambitious program will support a number of seed companies with risk-funding and technical assistance to help them build their portfolios for key crops. The Syngenta Foundation and AGRA are key contributors. Companies from twelve African countries may apply.



## Seeds2B: findings and challenges

Based on the first five years’ of experience, the Syngenta Foundation sees the following needs for the establishment of properly functioning seed systems:

1. A demand-led approach, notably to breeding (see p. 42)
2. An increase in both supply and demand
3. Greater local private sector involvement
4. Better links between seed producers/distributors and breeders
5. An independent intermediary to link breeders and seed producers
6. Less risky market entry for producers, through ‘patient capital’, better seed regulations (see p. 16) and more efficiently communicating the demand for seed to producers (through seed aggregators, and advanced market commitments)
7. Easier adoption of improved inputs by farmers, through access to credit, savings, insurance and better links to markets

Frequent challenges we face are:

- Lack of up-to-date and accurate information on varieties’ availability and how they suit market needs (public variety catalogues)
- Lack of clarity from the available statistics whether market gaps are a supply or demand issue. (We therefore aim to engage much earlier with demand-side partners).
- Seed producers and distributors are understandably risk-averse. (So we need to help manage their risk in investing in seed of new varieties).

\* [www.usaid.gov](http://www.usaid.gov), \*\* [www.aecfafrica.org](http://www.aecfafrica.org)

# Sorghum and soybeans stride ahead

Partnerships add dynamism to Mali's seed sector

**More Malian smallholders than ever before have access to clean seed of new varieties. However, there is still considerable room for further improvement. Better access would enable farmers to raise their yields and income, and enhance food security. An essential route to success lies in building capacity in the National Agricultural Research program (IER), and strengthening its links with seed companies and other partners.**

Sorghum is a case in point. In Mali, the crop grows on more than a million hectares, but farmers have used the same varieties for an average of 20 years. Hybrids account for less than one-tenth of the seeds planted. In collaboration with CIRAD\* and Syngenta AG, we invested in the breeding of new open-pollinated sorghum varieties by IER between 2011 and 2015. This program used modern molecular breeding to produce high-yielding varieties which enable farmers to react to changing patterns of rainfall. Six promising varieties completed registration trials in 2017. For the first time, IER scientists used the new regionally harmonized ECOWAS trials protocols. The National Seed Authority assessed the trial results.

Once registered, new varieties should automatically enter the West African Seed Catalogue. We then plan to engage Malian companies to produce and commercialize the seed. Together with partners, we have provided specialized legal training on licensing to key individuals at IER and selected companies. Seed multiplication will run through 2018, with the aim of supplying the first farmers next year. The Malian seed trade association ASSEMA is highly supportive.



Tackling the problem of distributing quality seeds to farmers is the aim of our partners at myAgro\*\*. This Malian-based social entrepreneur supplies seeds and fertilizer directly to villages, with payment linked to a savings approach called 'lay-away'. Some 10,000 smallholders have already bought seed of sorghum and other crops, including improved vegetables. In 2018, the Skoll Foundation recognized the work of myAgro and its CEO Anushka Ratnayake with a prestigious social entrepreneurship award.

Another approach is to promote sales of publicly bred varieties through commercial channels. The Malian oilseeds company JMI began work in 2008 and now has about 2000 smallholders under contract. Since 2015, Syngenta Foundation agronomists have worked with JMI to test new tropically-adapted soybeans. The company licensed a variety bred by Ghana's National Research Program, and has now begun multiplication. "Licensing agreements of this type were new for us", explains JMI's Africa Director Guillaume Salle. "Fortunately, the Syngenta Foundation was there to guide us."

\* [www.cirad.fr/en](http://www.cirad.fr/en), \*\* [www.myagro.org](http://www.myagro.org)

# Protecting good seed for better harvests

Farmers learn safe use and benefits of seed treatment

**Better seeds are vital for raising crop yields. But good seed protection can boost harvests further. We have recently shown Senegalese smallholders how to benefit.**

In Senegal, many people struggle to afford enough food. Almost half the country's 15 million inhabitants live in poverty. The situation is worst in rural areas. However, food security remains a major issue for the entire nation. Despite having a sizable percentage of the population engaged in agriculture, Senegal is one of the world's countries most dependent on imports. About 46 percent of its food comes from abroad. Only a decade ago, rising food prices sparked riots, for example in the capital Dakar.

There are numerous reasons why agricultural production in nations such as Senegal is failing to keep pace. Among these are rapid population growth and urbanization, together with environmental, resource and infrastructure challenges. Inadequate rainfall, flooding and crop pests all reduce farm yields. Gains in food production are insufficient, and typically come from using more land rather than improving productivity.

Improving seed quality can sustainably lift crop yields, thus increasing food security and income. That is the principle behind our Seeds2B program, which improves smallholders' access to the good seeds they need. Currently, unfortunately, farmers in sub-Saharan Africa only plant high-quality seeds on about ten percent of the cropping area.

Making good seeds more widely available and affordable is one vital contribution to raising yields. However, even stress-resistant, high-yielding, tropically-adapted varieties often need extra protection. In Senegal, major crops include sorghum, millet, corn, rice and groundnut. All of these are vulnerable to diseases, whether from fungus, bacteria or viruses.

## Widespread access to training

Tackling this issue was one of the aims of the 2015-17 Scaling Seeds and Technologies Partnership (SSTP). Within this USAID-AGRA project, our Senegalese team



was responsible for training local farmers on the safe use of protective seed treatment. USAID chose to use Apron® Star, a Syngenta product that controls seedling diseases. It also boosts root development, which enables 'climate-smart' use of residual soil moisture.

"Our partners and we got four treatment centers and 18 service points going", reports Abdoulaye Diop from the Seeds2B team in Senegal. "Through these, over 27,000 farmers learned about the safe use of crop protection, with a particular focus on treating and handling seeds."

Following the training, smallholders were able to see the harvest improvements for themselves. In 2016 alone, our team established over 250 demonstration plots. "We compared Apron® Star with a standard local treatment", says Diop. "Over the whole project, all the major crops showed significant yield gains. The lowest were for rain-fed rice, but even those rose 20 percent. The largest were in corn, cowpea and sorghum, up by 74 to 86 percent."

Income gains have been correspondingly impressive. With irrigated rice, for example, smallholders can earn about FCFA 84'000 more. In corn, net additional income is over FCFA 200'000, about 350 dollars. Further figures are available on request.

SSTP has proved seed treatment's potential to improve Senegal's food security and reduce dependence on inputs. The Syngenta Foundation has established a good basis for its further use. Time will show the supply chain's readiness to meet demand, and how far this promising new approach can actually become standard smallholder practice.

# Regional cooperation helps farmers access new seeds

Further steps to African harmonization

**Our seeds policy work focuses on harmonizing regulations in Sub-Saharan Africa. The COMESA region, in particular, is improving cross-border access to varieties. This makes it easier for seed companies to meet smallholders' needs.**

Together with the New Markets Lab (NML\*), we assess legal and regulatory systems' ability to improve smallholders' access to good-quality seed. This work is closely connected to the Foundation's Seeds2B initiative, described above.

At the national level, we identify good practices through case studies and advocate for their wider adoption. Regionally, we work on harmonizing seed regulation between countries. A particular challenge here is the implementation of the rules and regulations that exist on paper. We also run test cases with seed companies. These 'stress-test' the system and enable us to identify unsolved issues.



As of early 2018, NML and SFSA had developed and written case studies for four countries. Each study is designed to stand alone, but the series enables comparison of regulatory practices. Three of the countries are members of more than one Regional Economic Community (REC), which complicates their situation. Kenya belongs to the EAC and COMESA, Zimbabwe and Zambia to both COMESA and SADC. Ghana is a member of ECOWAS\*\*. Our harmonization test cases examine all four RECs, assessing regional seed regulatory structures, and documenting their implementation in practice.

Also as of early 2018, NML and SFSA had completed or initiated test cases in three RECs: COMESA, the EAC and SADC. In COMESA, we are focusing on regional variety release for seed potatoes, soybean, groundnuts, sorghum, wheat and hybrid corn (maize). Our work in SADC also focuses on seed potatoes and corn, and in the EAC we have successfully helped speed up the release of new bean varieties. Testing of soybean varieties registered in Ghana is underway in Mali, with the intention of registering these in the ECOWAS Seed Catalogue. If successful, this will be the first time that a soybean variety is registered using the ECOWAS protocol, which will help facilitate access to new seeds for smallholders in the future. We are also studying how various EAC countries are dealing with seed potato varieties.



## COMESA catalogue provides more choice

In 2017, the Tanzanian National Variety Release Committee approved nine new bean varieties, as a result of our test case with CIAT\*\*\*. The COMESA Regional Seed Catalogue adopted 24 new varieties of bean, groundnut, sorghum, corn, soybean and wheat. 23 of these were test case varieties. In 2016, our test cases had already resulted in the entry of three new seed potato varieties into the COMESA Regional Seed Catalogue. These were the first-ever listings there for a crop other than corn.

Regional variety registration is considerably easier in COMESA than SADC. As of November 2017, the COMESA Variety Catalogue therefore contained more varieties: 40 to SADC's 23. The crop scope of COMESA's catalogue widened substantially in 2017; the SADC catalogue continues to consist mainly of hybrid corn. Companies appear to favor the COMESA system. Reasons for this probably include the option of online applications and the ability to communicate directly with the regional Seed Office. Furthermore, in COMESA National Seed Authorities provide the crucial DUS<sup>1</sup> and VCU<sup>2</sup> data, rather than applicants. Online applications are possible in SADC, but applicants must provide DUS and VCU information. We are currently observing progress on SADC applications submitted under our test cases.

The EAC's work on streamlined variety release within the region has largely taken place through ASARECA – a sub-regional association. Under the system, any variety registered in one country's catalogue could be registered in another following one year of domestic testing, if adequate data are provided. Such data typically come from previous trials in similar agro-ecological zones. As a result, companies are more willing to apply for national variety release. The fast-track approach enables seed varieties to become available for farmers more rapidly.

The system in ECOWAS is similar to SADC and COMESA; the regional catalogue allows for marketing of varieties across member states. An advantage for seed companies, however, is that the West African version is a compilation of all the national catalogues. There is, therefore, no need to complete an additional application for regional listing. However it is not always clear whether and how the ECOWAS protocol should be followed for all new seed variety registration instead of national rules.

In February 2017, the Syngenta Foundation organized a Seed Policy Workshop, which took place in connection with the AFSTA seed congress in Dakar, Senegal. We brought together representatives from seed companies, NGOs, policy-makers and researchers to discuss the progress and challenges of regional harmonization. NML and our Foundation presented findings from the seed policy work, which met with considerable interest.

Looking ahead, SFSA and NML will continue to work in the seed regulatory arena, nationally and regionally. At the national level, countries are at various stages of harmonization. Regulatory collaboration will help lagging countries to catch up with more advanced neighbors. Regional harmonization is still at an early stage; new implementation issues will arise. We would like to work together with local partners to help address those issues and provide solutions. In 2018, we are expanding our activities, including focusing on additional countries such as Nigeria and broadening the range of test cases. We will also keep engaging with relevant stakeholders to ensure dissemination and impact of our work.

\* [www.newmarketslab.org](http://www.newmarketslab.org)

\*\* EAC = East African Community, COMESA = Common Market for Eastern & Southern Africa, SADC = Southern African Development Community, ECOWAS = Economic Community of West African States.

\*\*\* [ciat.cgiar.org](http://ciat.cgiar.org)

<sup>1</sup> Distinctness, Uniformity and Stability

<sup>2</sup> Value for Cultivation and Use

# “Agriservices release the energy of rural youth”

Entrepreneurs help their neighbors farm more profitably

**Young people continue to leave farms for the cities. Some, however, seize rural business opportunities if these become available. Their enthusiasm can lift entire agricultural communities. Robert Berlin, our Head of Agriservices, explains.**

**SFSA Review:** *When you think of smallholders, what do you see as the greatest barrier to improving their livelihoods?*



**Robert Berlin:** In developing countries, a major agricultural challenge is access. For smallholders, access to a wide range of goods and services can catalyze the move from subsistence agriculture to sustainable income. These elements include markets, infrastructure, training, technologies, seed and other inputs, credit and machinery.

*Access alone is surely not enough on its own, though?*

No, that's just part of the story. Another key to making farming a rewarding profession is the energy, enthusiasm and commitment of rural communities, particularly youth. When young people see their parents work very hard for little reward, a life spent in farming is not an attractive prospect. New opportunities are essential.

*What sort of opportunities does your Agriservices team provide?*

Young people's entrepreneurial dynamism is at the heart of three current models: Agri-Entrepreneurs (AE), Farmers' Hubs (FH) and Mechanization Service Centers (CEMA). These started in India, Bangladesh and Senegal respectively. They are all driven by young people linking farmers in their communities to modern agricultural technologies and practices. The success of these models is now leading to their replication in other countries.

*How does the Agri-Entrepreneur idea work?*

Launched in 2014, the AE model has become one of our flagship initiatives. It provides what is sometimes called 'last-mile delivery'. An AE is typically a young man or woman, perhaps previously unemployed. He or she works with about 200 local farmers. An AE ensures that smallholders have access to information, inputs, credit and markets.

*What are the key steps to success as an AE?*

The ability to foster trust in close-knit communities is crucial. In return, young people are empowered to play a



vital role in local agricultural development. Competition to become an AE is keen. Successful candidates receive a strong grounding in agricultural techniques, business and entrepreneurial skills. We use digital technology both in the training and daily activities. Once qualified, AE are connected to partner organizations to provide the best services for smallholders. By linking up with a financial organization, for example, an AE can help farmers with loan applications, and ensure the credit is processed. They also help farmers to access markets, offer them knowledge and advice on crops and other related issues, and provide good agri-inputs. Our box on page 21 provides an example.

*AE are individuals. The term 'Farmers' Hub' sounds less personal. What is the story here?*

The service is equally personal, but FH approach the issue of access from a slightly different angle. Many smallholders, for example, face a lack of proper storage. This not only leads to waste; having to sell produce quickly makes them vulnerable to exploitation by middlemen. Farmers also often lack access to up-to-date knowledge, machinery or credit. On their own, they cannot easily supply food companies that pay good prices. FH help tackle all these problems. By combining smallholders' produce in one place, for example, a FH enables them to tap into new markets.

*So a FH is essentially a range of commercial units concentrated on one site?*

That's the starting point. But as their name suggests, Hubs are also a focal point for farmers. They can meet up there, share news and information. Importantly, they can also see machinery and other innovations first-hand. As one farmer said to me recently in Rangpur: "Now we don't need to travel far to sell our produce, or sell at the farm-gate; we get our inputs, advice and sales facilities at the Hub." You'll find further information in the FH box on the next page.

*FH provide a wide range of services. CEMA sound more limited in scope.*

Our Foundation always tries to tackle the key challenges. In West Africa, agricultural mechanization is a major issue. In the past, mechanization services there have tended to be poorly received or implemented. The reasons include some insufficient policies, lack of proper investment, inadequate upkeep of machinery and a shortage of suitably trained managers.

*What are the CEMA doing better?*

Each CEMA is an independent enterprise. On the one hand, it provides local farmers with reliable, year-round, demand-driven services to help them improve their crops and incomes. But a CEMA also enables enter-

prising young people to experience new professional opportunities. Take Madiop Guaye, for example. Aged 29, he runs the CEMA in Pont Gendarme, Senegal. He manages staff and budgets, liaises with farmers on field preparation, and represents CEMA in discussions with various partners. He's noticed the impact of CEMA services on his local community. As he told me: "Due to the quality of machines, we've seen an increase in yield. Farmers now have access to machines when they need them." Madiop also knows that CEMA create jobs for young people nearby.

*So where do the CEMA stand today?*

Over 6000 rice farmers in Senegal can now rent machinery and storage, to take them right through the crop cycle. The CEMA also provide the necessary advice and training. They are farmer cooperatives, receiving guaranteed funds from the National Bank of Agriculture set up with our help. Because CEMA are run by farmers for farmers, they best serve the needs of local growers.

*What about the future? Where are Agriservices heading next?*

AE, FH and CEMA share some common features. At their heart lies our desire to raise the aspirations and productivity of small and sometimes marginalized farmers through the energy and drive of local people themselves. Success is now leading to expansion, and to replication elsewhere. The AE model currently links about 500 entrepreneurs with approximately 75,000 farmers. Local governments in India are sponsoring training of more AE, and investment from the Tata Trusts is ensuring expansion of the scheme. With FH, we are now replicating the Bangladesh model in Indonesia, Senegal and Kenya. And in Mali, we are now working on further CEMA to join those in Senegal.



**A woman succeeds against the social odds**

\*Kavita Patil learned about the AE training program through a family friend. For three years now she has been an AE in Maharashtra, supporting farmers as a retailer and bank correspondent. A typical day for Kavita starts with visits to farmers, advising them, sharing information and resolving any problems. Later she heads to the store where she sells agri-inputs. During the day she answer calls from farmers with various queries, and may make further visits to them. She manages the store, dealing with record-keeping and accounts. With the support they receive from Kavita, farmers in her community can purchase better agri-inputs. Vegetable cultivation has increased as a result; farmers are reaping the benefit of improved yields and income.

In her role as bank correspondent, Kavita helps farmers source credit from our finance partner, IDBI Bank. The bank's credit options help smallholders avoid excessive rates of interest elsewhere. Kavita helps farmers complete the necessary documents for a loan, and guides them on punctual repayments. By late 2017, Kavita had secured credit for 215 farmers. Her greatest achievement, she says, is that over 20 loans have been exclusively for women.

Achieving acceptance as a female entrepreneur in a patriarchal society can be difficult. However, the guidance and inspiration Kavita received in AE training put her in good stead. She notices the effect that her work and presence have on others. "I find it gratifying to see more and more women come out with confidence to be active breadwinners for their family," she say. "I feel happy when they tell me that I have motivated them."

**The hub of change**

\*\*There are well over 60 Farmers' Hubs (FHs) in several districts in Bangladesh, each serving 500 to 1000 farmers. The FHs run as independent business entities, often overseen by agri-entrepreneurs who are already in business and willing to take on the challenge. Called locally *Krishan Bazar*, each FH links farmers to between 10 and 20 buyers. These include medium to large traders, agro-processors and exporters. Jahedul Islam has been associated with the Joldhaka FH in Niphamari since 2013. He sells his vegetables there, purchases seedlings and other inputs, and hires machinery at competitive rates. He has noticed not only an increase in his and other farmers' yields, but also in their farming confidence. Jahedul has recently started his own Farmers' Hub. "Thanks to FH, I've made changes in the past two years that I never made in the previous fifteen."



# Harvesting the benefits of business

## Training and Hubs create entrepreneurs

**The Syngenta Foundation believes in smallholders' entrepreneurial spirit. With the right training and support, farmers can use new business opportunities to transform their livelihoods. Meet two of the many people who know.**

### A young woman's journey turns her life around

Chandrama Nag comes from the state of Odisha in eastern India. Her earliest days were characterized by adversity and struggle: Her mother died when she was very young, and Chandrama's family was too poor for her to complete secondary education. By the age of 15, she was married and working in her husband's field. In India, few women own the land they farm – and Chandrama was not one of them.

Aged 23, leaving behind an abusive relationship, she returned, penniless, with her six-month-old son to the family home where her father was a daily wage laborer. When he fell ill she took on his work, but the wages she received were barely adequate to support the six members of her family.

In 2012, Chandrama enrolled in a program to become a Community Service Provider. She heard about this opportunity from the not-for-profit organization Harsha Trust. It is not easy to be accepted as a female adviser in a traditionally male-dominated environment. But with support, training and her own perseverance, Chandrama eventually won the trust of the farmers in her community. So when the Syngenta Foundation brought its Agri-Entrepreneur (AE) program to her region, she was an obvious candidate.

As an AE and manager of an agri-input store, she now earns a decent income for herself and her family. Local farmers rely on her skills, knowledge and support for

their own livelihoods. Furthermore, Chandrama is an inspiration for other young female agriculturalists. "I challenged my fate and I won," she says. "Now I help others in their journey to a promising life of opportunities."

### A Hub ends daily uncertainty

Safi Uddin was in his village in the district of Rangpur, Bangladesh, when he first heard about the agricultural business model called Farmers' Hubs (FHs). At the time, Safi was a day laborer, finding seasonal work harvesting mango and jackfruits. The visiting project officer from Syngenta Foundation explained how FHs provide a focal point for hundreds of local smallholders to buy agricultural inputs, sell their crops, and share news and knowledge. As Safi listened, the idea of being involved in this enterprise immediately appealed to him.

Today, Safi is no longer vulnerable to the vagaries of seasonal agricultural labor. "I've been working as a Farmers' Hub owner since 2015," he says. "One of the most attractive things about my business is that I now have a continuous income for relatively little investment." In the first two years, Safi saw his earnings increase fivefold. This enabled him to furnish and repair his house.

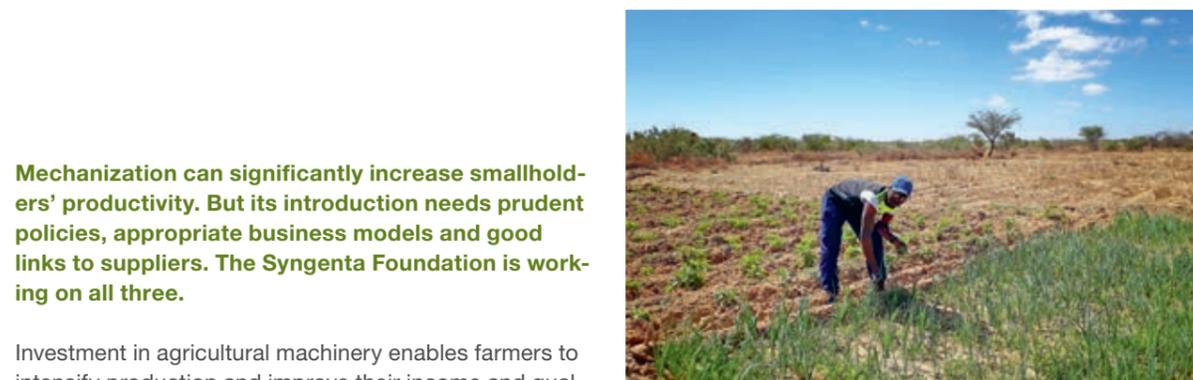
Running a Farmers' Hub involves a wide variety of skills and activities. A typical day for Safi might see him tending his seedling nursery, taking and receiving phone calls from farmers and buyers, aggregating vegetables and selling them to local markets, making field visits, providing farmers with technical advice and keeping up-to-date records.

The successes of the past two years have widened Safi's network, and raised his self-esteem and status in the community. He has ambitious plans for the future: "I want to create a modern Farmers' Hub with heavy machinery and other services for thousands of farmers."



# Adding a machine can add a whole harvest

## Mechanization initiatives in West Africa



**Mechanization can significantly increase smallholders' productivity. But its introduction needs prudent policies, appropriate business models and good links to suppliers. The Syngenta Foundation is working on all three.**

Investment in agricultural machinery enables farmers to intensify production and improve their income and quality of life. In India, China, Brazil and Turkey, for example, rapid expansion in farm machinery demand has already stimulated local manufacturing and helped improve farm productivity. If African farmers were also able to intensify their activities through greater mechanization, this would lead to greater food security and reduced dependence on imports.

The Syngenta Foundation works on mechanization from several angles. At the policy level, we discuss national approaches to mechanization. In February 2017, partners and we organized a workshop on Agricultural Mechanization in West Africa. At the event in Dakar, Senegal, over 70 public and private sector stakeholders debated how to bring much-needed mechanization services to farmers.

"The workshop pointed to the need for appropriate policies and specific strategies to match each country, value chain and production system", reports Youssou Diagne, Regional Coordinator of our rice program. Participants strongly recommended placing the private sector, rather than governments, at the heart of mechanization supply. "There was general agreement that the correct starting point is real demand from growers, not ad hoc external financing opportunities", adds Diagne. "There is also a clear need to coordinate mechanization programs across the regional economic community ECOWAS."

In the policy arena, we are also studying mechanization adoption. In 2017, in partnership with IFPRI\*, we initiated a study of three Asian (China, Nepal and Vietnam) and



three African countries (Ghana, Nigeria and Tanzania). This study aims to provide mechanization policy suggestions for Africa based on experience in Asia. "We are examining a range of aspects", explains Marnie Pannatier, our Program Officer for Agriservices and Research & Policy Analysis. "The study documents mechanization patterns and their evolution over recent decades. It also identifies the factors affecting a household's adoption of machinery. Taken together, our findings will generate policy proposals."

### Private sector involvement is essential

Our work on mechanization also includes market initiatives. We are collaborating with CIMMYT\*\* on sustainable access to mechanization for smallholders, with a focus on dry land farming. To make mechanization sustainable, links to local manufacturers or importers and distributors are also essential. In Bangladesh and Zimbabwe, the CIMMYT project has assessed what is already available, either commercially or from international programs, tested and adapted the equipment, and created links with local makers and importers. In Bangladesh, we jointly reviewed the companies supplying corn planting equipment, in order to understand competition in this sector. In 2017, we reached a significant milestone by agreeing with the local company RK Metal to develop the market for planters in northern Bangladesh.

\* [www.ifpri.org](http://www.ifpri.org), \*\* [www.cimmyt.org](http://www.cimmyt.org)



The Foundation is also establishing mechanization services for rice farmers in Senegal and Mali. Since 2015, we have been working with Senegalese farmers to raise rice production. By speeding up harvesting and field preparation using machinery, they can add an extra growing season. Thanks to the CEMA model (see our interview on page 18), significantly more smallholders are now doing double rice-cropping. Alioune Diop, a farmer from Pont Gendarme north of St. Louis, has been a CEMA client from the beginning. In return for the fee he pays, Diop sees major benefits in terms of rice quality and yield, as well as his own knowledge. He has also benefited from training on rice seed production and seed treatment. One of his colleagues, Abdou Hanne, comments that members of the farmers' Union Pont Gendarme are making better use of their time thanks to the machines for field preparation and harvesting. He is also pleased that some formerly unemployed young people have found jobs through the CEMA.

# Transformation at the touch of a button?

Seven 'blogposts' on digital agriculture

Digital solutions allow farmers to record and share information, and to make good decisions. Companies buying from farmers are also seeing benefits. However, the digital revolution also brings challenges. We asked a range of experts for their thoughts.



## Keeping smallholders up to date

Meeting the ever-increasing demand for food from limited land requires tools that improve productivity. Seeds and other inputs are only part of the story. In agriculture worldwide, digital transformation is no longer a choice – it's a need. "Go digital or disappear", I've heard people say. And smallholders mustn't get left behind!

Farmers' and buyers' needs are evolving at an increasing rate. Companies that transact with farmers need to transform themselves to satisfy customers' fast-changing demands. Digital solutions have not only increased farmers' reach and improved farm management. They've also improved food traceability and compliance with production standards. At least as important, in my eyes: Digital solutions also reduce the traditional gap in knowledge and technology between small and large-scale farmers.

*Robert Berlin, Head of Agriservices, Digital Delivery and Country Programs, Syngenta Foundation*



## Time for a mindset change

Smallholders are often trapped in a vicious cycle of low productivity, expensive credit and lack of market links. They farm for subsistence rather than as a business. Increasing smallholders' income requires an integrated approach, improving access to inputs, training and markets. Digital solutions can play a major role here. We expect this market to continue growing fast. That's partly due to more convenient cloud storage incorporated in farm management software.

Digital transformation enables huge progress in farm management, business models and processes. It also requires a major change in mindset. Everybody involved in agricultural development and value chains needs to rethink the whole mechanism of reaching out to millions of farmers. Many smallholders and related agribusinesses have already embarked on their digital journey. We are very excited to accompany them – and, we hope, in some areas lead the way.

*Simon Winter, Executive Director, Syngenta Foundation*



## Digital glue

Over recent years, the Syngenta Foundation has invested in a range of digital solutions that benefit smallholders. In 2011, for example, they began developing Farmforce. This is a pioneering cloud-based platform for companies buying from smallholders. It enables them to document compliance with food standards, ensure crop traceability and improve farm management practices. In 2017, the Foundation spun the service out to us; by early 2018 companies were using it in more than 25 countries.

I see this platform as a 'glue' that helps smallholders connect with professional procurement. Farmforce facilitates transparency and quality assurance in agri-business. This benefits the farmers. Better documentation of inputs and processes gives better access to markets, which in turn gives better access to finance and insurance programs.

*Knut Joerstad, CEO, Farmforce*



## Linking the physical and the virtual

ICT-based solutions make farmers more knowledgeable. They can rapidly access market information and liaise directly with consumers. That connection encourages them to focus on product quality.

In Bangladesh, the e-Hub we've developed provides digital support to the Syngenta Foundation's physical centers known as Farmers' Hubs (FH, see p. 18). This practical mobile technology facilitates the smooth running of FH. It helps staff make sound, data-driven decisions. The e-Hub gives FH on-demand transaction management, market information and analytics (with drill-down to product and customer levels). See for yourself on [www.efarmershubs.com](http://www.efarmershubs.com).

*Bijon Islam, Co-founder & CEO, LightCastle Partners*



## A new route to rural learning

Kuza is a social technology enterprise. We offer digital micro-learning and a community platform to help people at the bottom of the pyramid learn, connect and grow at scale, on their own terms and at their own convenience. The Kuza Edge platform provides 'byte-sized' learning nuggets on practical sector-specific skills, interpersonal and entrepreneurship skills. These are available in ten different languages, international and local. We're delighted that the Syngenta Foundation is using Kuza Edge to build the capacities of agri-entrepreneurs and smallholder farmers in India.

*Sriram Bharatam, Founder of Kuza.One*



**Ensuring that tech is really a tool**

Agriculture is on the verge of a digital revolution. Our company, for example, started from the concept of the 'Internet of Things' to connect everyday items in farming and forestry. We then moved to the concept of 'all-data aggregation', using digitalization to support farmers' profit growth.

There is tremendous potential to optimize production. Success would benefit farmers and consumers. The challenge is to combine wide-ranging digital technologies into tools that help farmers with their daily concerns, such as managing nutrients, water or the workforce. It is essential to develop these tools in iterative processes with farmers, field agents and entrepreneurs who provide agricultural services.

The food sector needs to shift from conventional advisory systems and complex supply chains to reliable cloud-based solutions that are more powerful and cost-effective. This is particularly true for the 'last mile' with smallholders, where transaction costs are traditionally high.

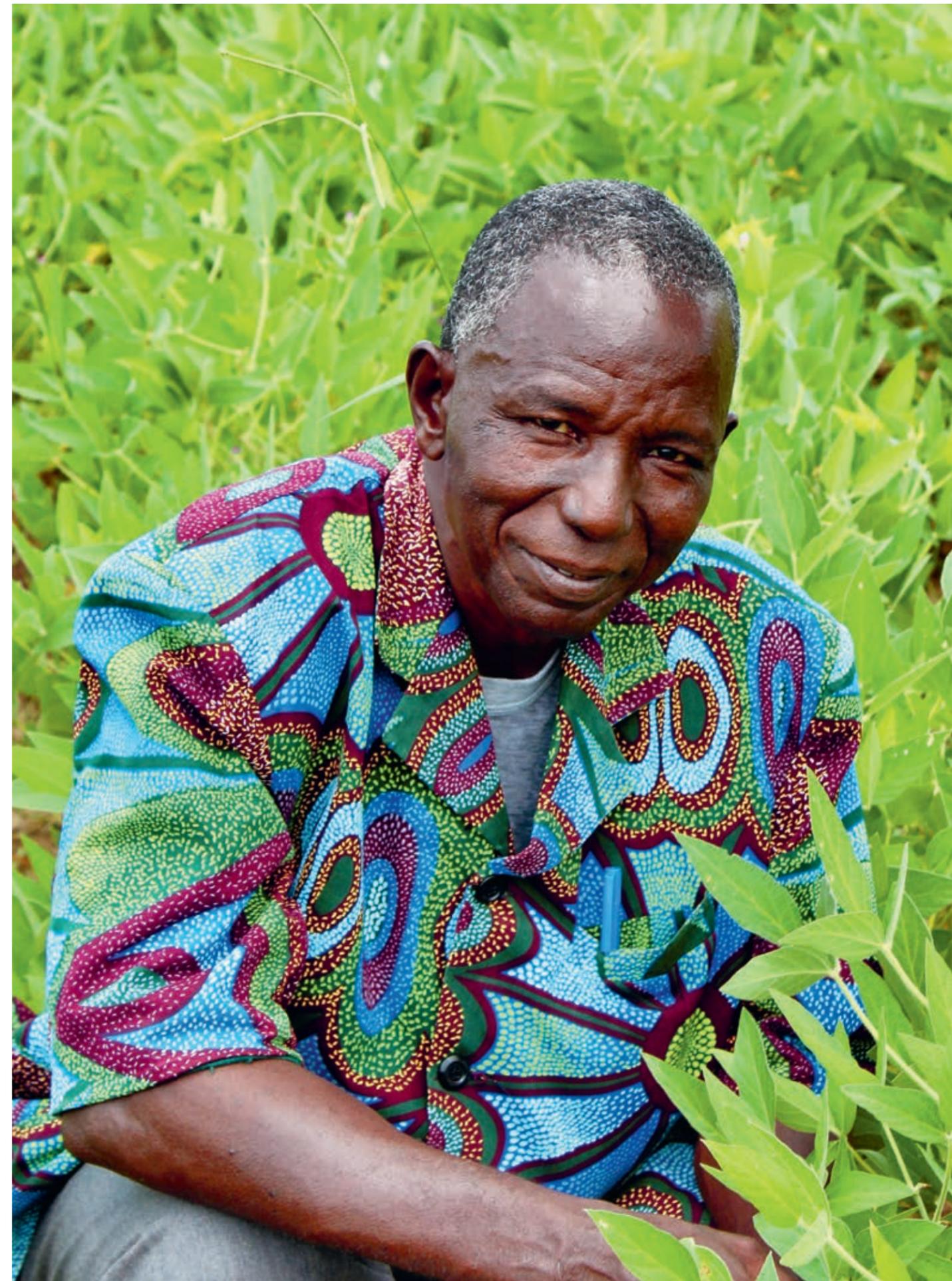
*Marco Brini, CEO, EnvEve*



**Data mountains and other challenges**

Artificial intelligence and machine learning will play a major role in future agriculture. Already, more and more digital technologies are serving farmers and food companies. Users are generating huge amounts of information. Their organizations face a common question: What should we do with all these data? The Syngenta Foundation also sees some other challenges. One is that organizations need to make customers' online journeys as productive as possible. There is a competitive advantage in reducing clients' need to connect with several partners separately. Another challenge for food providers is that digital innovations ultimately shift control to the consumer. Rather than signifying a loss of power, however, farmers can view the digital revolution as an opportunity for visibility, empowerment and direct engagement with customers.

*Mike Robinson, Chief Science Advisor, Syngenta Foundation*



# Seeing what works, and doing it better

Insurance moves ahead in Myanmar and Cambodia

**Our insurance team is increasingly stepping outside traditional SFSA focus countries. We are now looking for the best smallholder solutions in Myanmar and Cambodia. Crucial support comes from Switzerland.**

Myanmar (formerly Burma) is one of the nations most at risk from climate change. The country is already vulnerable to extreme weather events such as drought, floods, cyclones and heatwaves. With climate change, these will increase in severity and frequency.

SFSA aims to help reduce the impact of these events on farmers, and strengthen their resilience. In Myanmar, we have conducted insurance feasibility studies and 'dry runs'. Backing for these activities has come from the Swiss Capacity Building Facility (SCBF).

Dry runs test insurance products on a small scale before wider launch. In Myanmar, SFSA and partners developed offers for hybrid and commercial rice, groundnuts, sesame and pulses. We tested these in two afflicted areas. Agriculture in the Central Dry Zone suffers from frequent droughts, but also experiences floods. Farmers in the Delta Zone tackle flooding, cyclones and salty soils.

The feasibility study examined the 'enabling environment' and distribution channels. We wanted to know what would aid the development of commercially viable insurance, and who could best help make it available.

Myanmar currently has a cap on interest rates. Banks are therefore particularly reluctant to make loans to clients they regard as risky – such as smallholders. Lending-linked insurance could be one way to improve farmers' access to credit. The banks and the country's numerous micro-finance institutions could be an ideal distribution channel, as they stand to benefit from greater security. Our study also identified other pos-

sible channels. They include cooperatives, processors, input suppliers and mobile money providers.

The Burmese insurance sector is still in its infancy. However, the Ministry of Planning and Finance has created regulations on agricultural insurance and is now bringing these into effect. The SCBF has therefore decided to back our efforts to provide financial education and scale up micro-insurance over the coming two years. This support lets us test products further, and increase their availability to smallholders across the country. It also enables capacity-building in the insurance value chain, and education of smallholders so that they understand insurance is an advantage, not just a cost.

## Adapting products for Cambodia

Our insurance team began working in South-East Asia in 2014, and has developed several products suitable for more than one setting. For example, similarities in climate, risks and smallholder practices often make products from elsewhere useful for Cambodia as well. We and a number of international partners are keen to replicate our insurance solutions there. In August 2017, we therefore began 'pre-feasibility' activities. We aimed to understand the country's agricultural insurance set-up, and determine the potential to develop and distribute products there. Our investigation also identified relevant local partners. In December 2017, SCBF agreed to support further activities with two grants. The first enables a feasibility study and a two-season dry run with existing products tailored to local farmers, and corresponding distribution activities. The second grant covers a financial education program similar to that in Myanmar.

# Shifting the $\Delta$ along the delta

In Bangladesh, insurance is a key to smallholder resilience

**Ask people to name countries notoriously hit by flooding, and they will probably mention Bangladesh. With a Syngenta Foundation team already active there, the country was a natural choice for our insurance work. An important new phase is now beginning.**

Much of Bangladesh is a river delta – one of the largest in the world. This fact of geography brings with it both benefits and dangers. This is particularly true in a country whose economy depends so heavily on farming and related activities. In good times, Bangladeshi smallholders benefit from plentiful water. They are, however, particularly vulnerable to frequent natural disasters such as floods, cyclones and tidal surges. In some parts of the country, agriculture is also hit from time to time by drought.

Smallholders typically have limited savings and little access to social safety-nets. Crop damage caused by adverse weather makes them even poorer, and thus even less resilient to future disasters. Insurance helps farmers break out of this downward spiral.

The Swiss Agency for Development and Cooperation (SDC) recognizes the potential of index insurance in such a setting. Together with our Foundation, in 2016 the SDC therefore helped fund the Bangladesh Agricultural and Disaster Insurance Programme (BADIP). This support enabled development of insurance products, their 'dry run' testing and a feasibility study, building on work already promoted by the Swiss Capacity Building Facility (SCBF).

BADIP investigations pointed both to the wide range of climate-related risks and their consequences. Adverse weather often limits plant germination, pollination, growth and maturity, or destroys large amounts of crops. Rice, maize and potato growers are particularly badly hit. We and our partners therefore worked on insurance products to address four main problems. These are unseasonal rainfall for boro rice and maize, excess rainfall for aman rice, high temperature or drought for boro

rice and maize, and the potato disease Late Blight.

Suitable insurance cover is, however, only part of the equation. Smallholders worldwide frequently know little about any kind of insurance, or the related benefits. Distribution of insurance in rural areas is a further challenge. Inadequate data infrastructure can also impede implementation. Realizing that Bangladesh faces all three issues, SDC is launching a four-year initiative called BADIP Phase 1. SFSA focuses on its crop insurance component. The program delivers insurance through distribution channel partners. We expect it to improve the resilience of some 230,000 smallholders.



BADIP Phase 1

<b>Impact</b>	Farmers strengthen their resilience to weather shocks
<b>Outcome</b>	Farmers have access to weather index insurance (WII)
<b>Output</b>	Farmers are aware of the benefits of using WII Market players adopt WII products and business model
<b>Activities</b>	Crop insurance product development, market players' capacity development at distribution level, weather data infrastructure, business model development, 'insurance literacy' events for farmers

# New program tackles risk three ways

Can insurance help make farming more attractive to Indonesians?

**Indonesian smallholders face many challenges. Some can be mitigated by insurance. But as we've learned, risk management requires a broader approach.**

In the recent past, farming was part of Indonesia's national identity. Nowadays, however, many Indonesians view the profession as unappealing. As weather extremes increase, achieving good farm yields is becoming even more of a lottery for smallholders than it has always been. The high risk involved deters most financial institutions from supporting agricultural investments.

In early 2016, SFSA began insurance work in Indonesia. Our initial idea was to provide only agricultural weather index insurance combined with loans. However, this approach had two disadvantages. On the one hand, the arrangement was not attractive enough: It was hard for the smallholders to realize the importance of insurance in the loan package. The second drawback was that the arrangement did not help increase farm production.

Together with our partners, we therefore developed a new solution called 'Dana PANDAN'. The abbreviation stands for 'Secure and Sustainable Farming Fund'. This model combines weather index insurance, agricultural extension and support from a microfinance institution (MFI). The support comes in the form of a cash loan and good-quality farm inputs.

All these elements help smallholders manage risk. With the farm inputs, Dana PANDAN tackles the threat of pests and disease. The extension advice helps smallholders to farm in the most appropriate way for their local conditions. Insurance shifts the burden of weather risk from farmers' shoulders. Knowing that clients are covered also increases the MFI's security and willingness to lend.

Having a good offer is not enough on its own, however. Weather insurance also requires careful explanation, and needs to be welcomed by all stakeholders. In February 2017, for example, we therefore ran a workshop for the Financial Services Authority. Together with our partner ACA Insurance, we used this event to share our experiences of weather insurance development and use.



In October 2017, Dana PANDAN reached a major milestone when the first farmer signed up to the program in West Java. SFSA simultaneously devoted considerable efforts to preparing for scale-up. These included training sessions for our Indonesian insurance team of 18 professionals. Through their work, they now hope to contribute to making farming a more attractive profession again.



# Enabling smallholders to reap soybean benefits

Better varieties move towards the African market

**Soybean could provide numerous opportunities to smallholder farmers. Lack of good seed and varieties prevents many African farmers from benefiting. However, improvements are now on their way.**

Soybeans and other legume crops offer several advantages for smallholders in Sub-Saharan Africa. Firstly, their ability to fix atmospheric nitrogen can improve soil health and reduce the need for synthetic fertilizer. Secondly, growing legumes as a rotation crop slows the spread of cereal pests and diseases, for example in predominantly corn-growing areas. Thirdly, demand for soybeans from local processors and consumers is soaring. This demand is currently mostly met by imports.

Unfortunately, however, African smallholders often lack access to suitable legume varieties and clean seed. They also have problems finding good *inoculum*, the microbes needed to support the fixation of atmospheric nitrogen.

Our Foundation helps farmers meet these challenges and benefit from the opportunities. We have partnered with USAID's Soybean Innovation Lab\* to identify and test soybean varieties for tropical conditions in Kenya and Mali. Together with the International Institute of Tropical Agriculture (IITA\*\*) and the African Agricultural Technology Foundation (AATF#), USAID and we have recently expanded activities to Malawi.

The program's scientists working in Kenya and Mali have identified promising soybean from Latin America and Africa. These varieties have begun national registration trials. What is crucial, however, is that the varieties that receive registration also become widely available to

smallholders. We are pleased to report that local seed multipliers have already declared interest in licensing varieties from the respective breeders.

As soybean seed is easily perishable, investment in production requires good knowledge of demand. Farmers also need to know the likely demand and prices for their crop, ideally before planting. To ease producers' and smallholders' investment decisions, we have recently entered a partnership with TechnoServe. Together, we aim to improve understanding of the East African soybean sector and identify triggers of demand along the value chain.



\* <http://soybeaninnovationlab.illinois.edu>  
 \*\* [www.iita.org](http://www.iita.org)  
 # <https://aatf-africa.org/>

# A 'hot potato' we're happy to pick up

Public-private partners produce new varieties for the tropics

**Traditionally, potatoes have been a crop for cooler regions. There are good reasons to extend their scope. New varieties now in Vietnam look promising.**

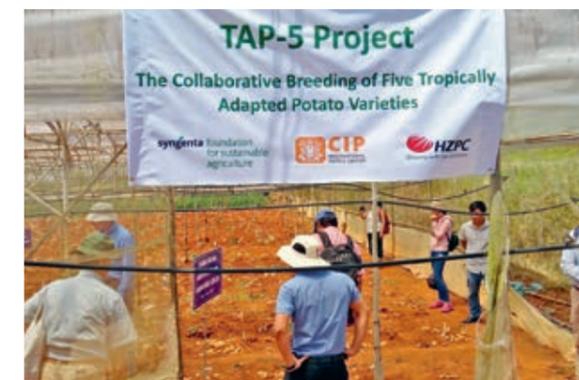
To start producing tubers, potato normally requires temperatures below 15°C. In the tropics, production has so far thus been limited to highland areas. Despite this, there is great potential for growing potatoes in Vietnam and the tropical regions of South-East Asia and China.

"Potatoes are a good rotation crop for rice, and high yields make them an attractive source of earnings for farmers with limited landholdings", explains Mike Robinson, our Foundation's Chief Science Advisor. "Breeding for tropically adapted varieties could help smallholders in warmer areas benefit from this income opportunity." Optimum adaptation to the tropics requires good tolerance not only to heat, but also to viruses. Tropical varieties additionally need to develop tubers early, and mature quickly.

To address this challenge, we engaged in a public-private partnership with the International Potato Center (CIP) and the Dutch company HZPC. Together, we initiated large-scale potato breeding and screening activities in lowland tropical environments. CIP provided female plant progenitors; HZPC contributed male pollen.

Working from CIP headquarters in Peru, scientists have so far performed more than 200 crosses. These have resulted in thousands of hybrid lines. In 2016, the first seed batches went to Vietnam for planting. Of the two test locations, one was just five meters above sea level, the other at 1500 meters.

"In early 2017, the partnership harvested tubers of selected genotypes in Vietnam, and took the best ones forward to the next stage of multiplication and testing", Robinson reports. "The potatoes we're concentrating



on here are Atlantic and Granola. Atlantic is a good variety for processing, Granola is popular for home consumption."

The private sector's role in this initiative goes beyond providing male parent lines. HZPC also offers training to CIP and Vietnamese collaborators. This covers topics such as the development process, selection, genomics and building traits such as virus resistance into commercial varieties. CIP helps build the capacity of local partners to breed and produce tropical potatoes. It has also helped develop a data analysis platform, implemented with local partners.

Companies outside the partnership have already declared interest. "Our approach could make a major contribution to future production of potatoes in the tropics", hopes Mike Robinson.

# Breeding new hope into a little-known crop

First improved tef variety reaches Ethiopian smallholders

**'Orphan' crops suffer from lack of scientific attention. Our support has enabled tef to profit from modern breeding. Farmers are starting to benefit; further improvements should follow.**

The small-grained cereal tef is a staple crop for more than 60 million people in the Horn of Africa. It is hardly eaten elsewhere, however, despite being gluten-free and rich in minerals. Lack of an international market means that outside Ethiopia, breeders have so far largely neglected the crop. As a result, yields remain far below their potential. A major problem is tef's tendency to "lodging", falling over because of tall weak stalks.

To improve Ethiopian smallholders' harvests, we established a partnership with the University of Bern in 2006. The aim was to deploy modern molecular breeding technologies to develop improved varieties of tef, just as is routinely done for more lucrative relatives such as corn and rice. Work includes the use of mutational approaches, sequence data and targeting, but not genetic modification.

The partnership was the first to sequence the entire tef genome, published in 2014<sup>1</sup>. In 2017, scientists in Switzerland and Ethiopia reached a further milestone: *Tesfa* became the program's first variety available to farmers<sup>2</sup>. *Tesfa* means "Hope" in the Ethiopian language Amharic. It has shorter, more stable stalks than conventional tef plants. *Tesfa* can therefore withstand the windy conditions of the Ethiopian uplands. Stronger stalks also enable farmers to apply fertilizer that benefits grain growth rather than merely increasing the risk of lodging.



Project leader Zerihun Tadele and his team intend to release further varieties in the coming years. As well as lodging-resistance, these will incorporate traits such as tolerance to drought and salty soils. To ensure that farmers gain access to the seeds, we have recently started a second partnership with the Ethiopian Institute for Agricultural Research. One aim is to facilitate local validation and dissemination of new varieties. Another is to improve the efficiency of tef farming through the use of pelleting and seed treatment. Pelleting makes it possible to sow the crop's tiny seeds mechanically; prior treatment protects them against soil-borne pests and diseases.

In August 2017, we extended our support for the Tef Improvement Project for a further eleven years. As Rector Christian Leumann noted at the signing ceremony, a research project spanning more than 20 years is exceptional for the University of Bern. "We are particularly interested in partnerships which enable long-term successful research of relevance to society", he said. "Thanks to the Syngenta Foundation's support, the University can make a sustainable contribution to improving a crop and its adaptation to a changing environment."

<sup>1</sup> BMC Genomics (2014) 15:58, <sup>2</sup> Euphytica (2018) 214:31

# Small pieces, great potential

Developing cassava that's attractive for farmers and suppliers

**Cassava is a vital calorie crop for much of Africa. However, conventional reproduction methods keep yields far below their potential. With partners in Brazil and Uganda, we're working to change this.**

Whether you look at production volumes or the contribution to people's diets, cassava is one of Africa's staple crops. It is sturdy, highly adaptable to different environmental conditions, and grows well in poor soils.

Traditionally, cassava is multiplied by cutting the plant's stems into stakes about 24 cm long. This 'vegetative propagation' leads to a much lower multiplication rate than for most seed-bearing plants. For example: Corn's multiplication rate is 1:300, compared with only 1:8 for cassava.

Such low output makes it hard to develop sustainable supply channels for good planting material. At present, supplying cassava is also usually not financially attractive for the private sector. Lack of involvement by seed companies hampers the dissemination of improved varieties and disease-free planting material. This in turn greatly limits farmer productivity, which could be increased to a yield of up to 20 tons per hectare.

In 2015, Brazil's national Agricultural Research Corporation EMBRAPA\* and we set out to improve this situation. Our joint aim was to develop a cassava seed stake processing and treatment system for Africa. Called MandiPlus, the system involves coating every seed piece with a combination of protectants and stimulants. This technology enables producers to cut much shorter seed stakes, and thus significantly increase the multiplication rates.

"MandiPlus opens up opportunities for improving the supply of high-quality cassava planting material and new varieties", comments Eder Jorge de Oliveira, researcher at EMBRAPA. "In addition, applying seed treatment protects the stakes against fungal and viral diseases as



well as insects. As a further beneficial effect of the treatment, there is a boost in germination and vigour of the plants. Greater availability of better cassava could make a huge difference to the food security of millions of smallholder families across large parts of Africa."

Our partnership with EMBRAPA has been joined by Uganda's National Crops Resources Research Institute. Together, we are validating the suitability of MandiPlus for African smallholders. "Our overall aim is to incorporate the technology into existing formal delivery channels for certified cassava planting material in East Africa", explains Mike Robinson, Chief Science Advisor at the Syngenta Foundation. This collaboration started in November 2016, with support from the Bill & Melinda Gates Foundation.

"Initial results have been promising", adds Robinson. "Our field trials show that Ugandan seed stakes could be about half their traditional size. With the multiplication rate therefore doubling, we are working on business models to ensure that farmers can use the technology, and that companies have sufficient incentives to supply it."

\* www.embrapa.br/en

# Half as long, but healthy and strong

A new planting system could lift yields of a crucial African staple

**A lynchpin of our cassava initiative is 'south-south' cooperation between Brazil and Uganda. Eder Jorge de Oliveira of Brazil's EMBRAPA\* plays a central role. He is currently optimizing a planting technology for Africa. We asked him about his motivation, challenges and the project's potential.**

**Syngenta Foundation:** *What interests you so much about cassava?*

**E.J. de Oliveira:** It is one of the world's most important calorie sources. Cassava is a staple food for about 800 million people. So the crop has huge social value. It also has several important industrial applications. Companies use cassava to make bioethanol, starch, medicines, cosmetics and biopolymers. The plant's multiple uses encourage research institutions in Brazil to develop new technologies for the cassava value chain.

There is also another side to the fascination of cassava. It can be grown under environmental conditions in which many other crops fail. Those conditions will probably become more prevalent as a result of climate change. Cassava might therefore be a good substitute for other starchy crops used in food and industrial products. However, unlike for the other major crops such as corn, potatoes, wheat and rice, there are few global institutions devoted to cassava research, development and innovation. EMBRAPA is one of them. Our mission is to "add some shine" to cassava, through studies that generate valuable new technologies and products.

*You've developed a technology called MandiPlus. This is modelled on one that Syngenta launched for sugarcane. What gave you the idea to adapt this approach?*

Syngenta designed the Plene® system to increase efficiency by reducing planting costs and boosting yield. It uses small, uniform sugarcane cuttings, rather than the conventional 30-40 cm seed pieces. The cuttings

are protected by seed treatments to optimize early plant development and health.

Cassava shares a number of difficulties with sugarcane. Usually, propagation is vegetative, which makes it hard to multiply the planting material. Depending on the cultivar, cassava producers only get four to ten 20 cm cuttings per plant each year. To plant just one hectare, a farmer needs three to four cubic meters of stems, equivalent to 700-800kg. The costs of transport and labor are correspondingly high. A further problem is that the stems are susceptible to pests and diseases. Over time, these accumulate and considerably reduce crop yields.

EMBRAPA and the Syngenta Foundation had these similarities between cassava and sugarcane in mind when starting the MandiPlus project in 2015. We wanted to develop a technology similar to Plene®. The aim was to provide smallholders with shorter cassava stems of high genetic and phytosanitary quality, treated with suitable protective chemicals.

*What sort of challenges have you faced along the way?*

Our team initially thought that it would be fairly simple to adapt the sugarcane system. We quickly noticed, however, that cassava reacts differently to the chemicals used there. So we had to evaluate alternatives that would protect against pathogens and pests without harming the seed pieces. After two years of research, we were able to start MandiPlus field tests. They have demonstrated the enormous potential of this technology. Farmers can use seed pieces half the usual size without any losses in the crop's early establishment or subsequent vigor.

Having proved the concept, one current challenge is to scale up the MandiPlus technology. This involves prototyping large-scale seed cutting and treatment, as well as organizing the equipment for widespread planting.



*You are also currently transferring MandiPlus to Uganda. In which areas will this have the most impact?*

Ugandan farmers face a major challenge with cassava viruses. We have an excellent partnership with the National Crops Resources Research Institute (NaCRRI\*\*). The highly committed scientists there are now busy running pilot trials. They've worked on cassava projects before, with the Bill & Melinda Gates Foundation.

Together with NaCRRI and the Syngenta Foundation, we're aiming for positive impacts in three main areas. We want to increase the supply of high-quality planting material, helping Uganda's farmers to tackle the heavy cassava virus pressure as well as drought. We also intend to accelerate use of the new material by increasing the quantity available and developing efficient sales channels. Thirdly, the partnership aims to help farmers rapidly multiply cassava varieties of their choice, using only a few stems.

*What has been the most important outcome so far?*

MandiPlus improves plant vigor and provides early protection against pathogens. Using cassava pieces that are only 8 cm long roughly halves the amount of planting material needed per field. If we can incorporate this technology into the national seed system, it will be possible to generate large volumes of propagation material faster and more cheaply than in the past.

*Where do you see the most potential in future?*

I believe that the MandiPlus project can contribute to the development of an optimized system for high-quality cassava seed production. The problems we are tackling with this system – such as low multiplication rates and the accumulation of pathogens – are common to all producing regions. So in future our work could benefit smallholders and consumers in many African countries.

*Finally, a more personal question: What is your favorite cassava dish?*

That's a tricky one: Brazil has lots of delicious cassava recipes! The three I like the most are fries, served as a snack or side dish, cassava bread with cheese, traditionally baked into small balls, or cassava and cheese fritters. They're a perfect accompaniment to a cold beer.

**Dr. Eder Jorge de Oliveira** was born in Brazil in 1977. He obtained his degree and PhD in Agronomy at the Universities of Lavras, Viçosa and São Paulo. Since 2006 he has been working as a researcher in the EMBRAPA Cassava and Fruits team. His main focus is on cassava, passion fruit and papaya. He is also a professor for the postgraduate programs on plant genetic resources and agricultural sciences at the Federal University of Recôncavo da Bahia.

\* [www.embrapa.br/en](http://www.embrapa.br/en), \*\* [www.nacri.go.ug](http://www.nacri.go.ug)

# Less thirsty corn makes farmers more resilient

## Introducing African drought tolerance to Asian corn

**Drought is a major challenge for many Asian farmers. Corn from a Foundation partnership offers a new alternative. Production in India is set to increase rapidly.**

Receding groundwater levels and climate change are challenging farmers in many parts of South and South-East Asia. These issues can have major consequences on economic development and public finances. For example: When drought causes crop losses, governments often spend large sums to ensure both immediate food supply and subsequent production.

Preventive measures are also important. The adoption of appropriately 'climate-smart' crops and technologies helps reduce harvest losses. Production systems and farmer communities become more resilient as a result. Especially in drought-prone areas, one such climate-smart crop is water-efficient corn. Varieties that require less water enable smallholders to maintain yields better during drought, and generally reduce their use of irrigation resources.

With this in mind, our Foundation initiated a program in 2014 to incorporate drought-tolerance traits from African varieties into Asian corn. "We brought together a novel public-private partnership for crop breeding", says Chief Science Advisor Mike Robinson. "It aims to develop new hybrid varieties with greater productivity in normal weather than conventionally used land races, while also offering acceptable yields during dry spells."

### **A novel PPP brings smallholder benefits**

Partners in this 'AAA Maize' program include the international wheat and corn improvement center CIMMYT and Syngenta. CIMMYT provided drought-tolerance traits from its African germplasm collection; Syngenta contributed the hybrid parents, molecular screening facilities and know-how. Together, the partners developed several promising lines.

Crucially, they also set out to keep the seed readily affordable for smallholders. Preparations therefore included cost-efficient seed production. Two Indian seed companies, Nu-Genes and Sayaji, signed licensing agreements in 2017. They will ensure local seed production and availability in eight relatively dry Indian states. Both companies piloted production in 2017. The initial two tons of seed served the needs of 1200 farmers. The target for 2018 is 40 tons, with production expected to reach about 1200 tons by 2021. Further activities are planned in suitable parts of Vietnam and Indonesia.

"With AAA Maize, smallholders can grow up to six tons per hectare under drought conditions", notes Mike Robinson. "That is about double the normal amount. And at less than \$2 per kilo, the seed price is much lower than usual. So we believe that these new varieties offer smallholders a great opportunity. They can sustainably intensify their production, and improve the resilience of their livelihoods to the effects of climate change."

The promising results so far have encouraged the partners to go a step further. "We're now developing varieties with traits for disease-tolerance as well", Robinson explains. "Worldwide, resilience of production systems and food supply chains has become a matter of priority. Initiatives such as AAA Maize help rural communities cope better with the challenges ahead."



# When scientists focus on smallholders and markets

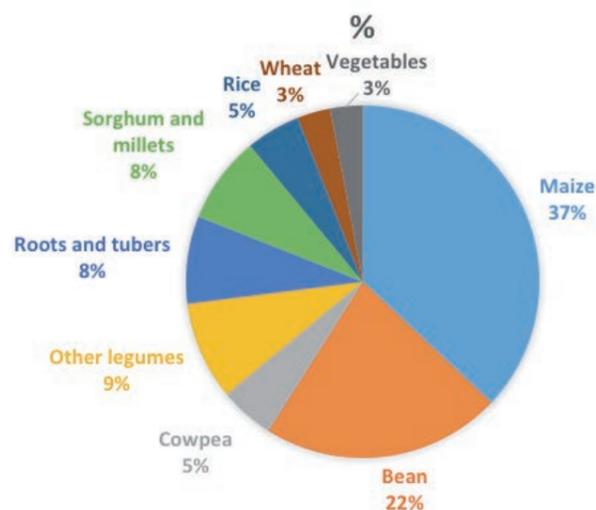
Market-led approaches drive change in African variety development

**Successful products meet customers' needs. Our Demand-Led Breeding initiative helps African scientists target their work for smallholders and their markets. The program has been both innovative and productive over the past three years; its next phase focuses on the harder challenges ahead in implementing demand-led breeding in Africa.**

When breeding new crop varieties for developing countries, scientists must bear both the needs of smallholders and their customers closely in mind. Traditionally, public breeding programs in Africa have often lacked a focus on smallholder access to markets and crop value chains. Farmers have been understandably reluctant to adopt the scientists' offers if they do not meet market demands. Together with African and Australian partners, we aim to improve this situation. The result should be faster and more widespread use of improved varieties by smallholders. This would increase farmer incomes, market development and food security.

The partnership<sup>1</sup> with our Foundation unites plant breeders from numerous African universities, national agricultural research institutes, and international and Australian organizations. Together, we have developed an innovative education module to train the next generation of African plant breeders on "The Business of Plant Breeding". The material is now available as a text book and is being disseminated across Africa. The associated training program features best practices in 'demand-led' variety design and development, from both the public and private sectors. This state-of-the-art training is now running at premier plant breeding education institutions across Sub-Saharan Africa. Scientific networks for particular crops are providing strong support.

By early 2018, over 300 participants have benefited from 15 professional development workshops on crop improvement and seed distribution. Of these, 215 were African professional breeders and postgraduate students. These 'Demand-Led Breeding' (DLB) alumni work in 28 different countries on a total of 23 crops. The training takes place at leading educational institutions: the West African Centre for Crop Improvement (University of Ghana), African Centre for Crop Improvement (ACCI, University of South Africa), and in Kenya both at BecA (Biosciences Hub Eastern and Central Africa) and the University of Nairobi. Makerere University in Uganda is a further member of the team integrating DLB principles across countries in eastern Africa.



African DLB alumni crop focus



Zimbabwe Plant Breeders Association training workshop (ACCI, 21 February 2018). Lead trainer: Professor Shimelis Hussein

"Emerging markets and consumer preferences are the positive driving force for rural economic development in Sub-Saharan Africa", says Professor Shimelis Hussein. "Our next generation of plant breeders must be equipped to respond to market needs." Hussein instigated DLB training at ACCI. His Ghanaian counterpart, Professor Eric Danquah, agrees: "Demand-led breeding is a game-changer for the region, especially as our program is run by Africans for Africans. We have incorporated the training module into our PhD program for West African breeders".

The Pan-Africa Beans Research Alliance\*, coordinated by CIAT\*\*, has embraced DLB by bringing its extensive experience in targeted bean breeding to the program. The Alliance has connected more than 40 of its public sector breeders with legume seed companies, officials responsible for new variety release, and other key members of the bean value chain. Links of this sort are vital: They ensure that new varieties provide what farmers, companies and consumers want. Other professional networks have also realized the benefits of this approach. The Zimbabwe Plant Breeders Association, for example, requested training for its members, which took place in 2018.

The work of our partnership has also attracted widespread attention. The 2017 International Tropical Agriculture Conference in Australia invited us to organize a session on market-driven approaches to plant breeding. The six speakers included our African partners. The conference also hosted the launch of "The Business of Plant Breeding: Market-led Approaches to

Variety Design in Africa" (see page 51). This textbook aims to increase international support and recognition for African breeding educators and practitioners.

"The first part of our initiative, aiming to excite breeders to adopt new practices in variety development, is well on track", says Vivienne Anthony, our Foundation's Senior Scientific Advisor. She co-leads the program with Gabrielle Persley from the University of Queensland. "Now comes the real measure of success: seeing if specially developed varieties achieve strong demand from smallholders, consumers and seed distributors."

The next phase of our three-year program focuses on strengthening connections between African breeders and seed organizations. The DLB team works closely here with our Seeds2B program (see page 12). "We'll also be supporting breeders with the challenges of implementing demand-led approaches in their home institutions", emphasizes Vivienne Anthony. "The third thrust will be policy and advocacy to accelerate smallholders' access to and adoption of the best new varieties."

1. This is part of the Food Security Alliance partnership with the Australian Centre for International Agricultural Research (ACIAR) and the Crawford Fund, with administration support provided by the University of Queensland.

\* [www.pabra-africa.org](http://www.pabra-africa.org)  
 \*\* [www.ciat.cgiar.org](http://www.ciat.cgiar.org)

# Where's the best place to grow it?

CONSUS helps companies buy crops sustainably

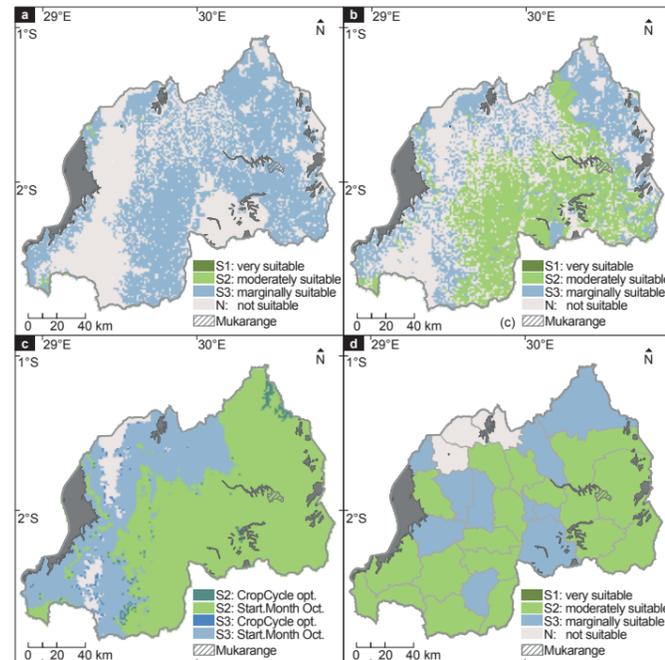
**Food companies want to buy crops sustainably, but face a number of challenges. A new digital tool helps them make better choices. These can also benefit smallholders.**

Pressure on land and other resources threatens food companies' ability to buy the goods they need. Inappropriate land use jeopardizes the sustainability of agricultural production. One response is to involve more smallholders. Doing so can both help companies secure supplies and demonstrate their sense of responsibility.

Smallholders who choose to enter formal markets typically gain opportunities such as access to new markets, technology and know-how. For the companies, however, establishing new supply chains can bring a number of challenges. Sophisticated analysis is crucial to identify the potential, limitations, prerequisites and impacts of their decisions.

To support such decision-making processes, we have been working with the *Geography of Food* research group at the University of Applied Sciences in Zürich, Switzerland (ZHAW). Together, we developed CONSUS. The name is an abbreviation for 'Connecting for Sustainable Sourcing'.

CONSUS is a geographic information system (GIS)-based tool. Purchasing companies can use it to judge where best to grow or buy agricultural goods. "CONSUS is suitable for any crop, as well as multiple regions and criteria", explains Isabel Jaisli from ZHAW. "It considers six major suitability factors: climate, soil, landscape, infrastructure, existing production systems and business."



To test the tool, the partners studied soybean in Rwanda. The result is a detailed map (see above) of where it is best to grow this crop in the region analyzed. "CONSUS identifies the limiting factors for optimum production", Jaisli comments. "Depending on the circumstances, those can then be addressed".

ZHAW has recently partnered with companies to assess the sourcing of crops such as hazelnut, cocoa and coffee. An online version of the tool is planned, to make it easily accessible to farmers all over the world. A CONSUS paper appeared in February 2018: [www.sciencedirect.com/science/article/pii/S0168169917307615](http://www.sciencedirect.com/science/article/pii/S0168169917307615).

# Cultivating a currency called carbon

Smart investment in climate change adaptation and mitigation helps smallholders win both fast and longer-term

**Climate change is rightly seen as a worldwide threat. It is also an opportunity. We're showing how smallholders can benefit from the carbon economy.**

Smallholders face unprecedented challenges from weather extremes and climate change. The resilience of farming systems has become a major focus of agricultural development. Several agricultural approaches can reduce erosion, and increase the fertility and capacity of soil to store water. These approaches include agroforestry and conservation agriculture, the combination of reduced tilling, residue management and crop rotations. However, the benefits of such methods usually only appear over time. They typically do not quickly reduce farmers' costs or raise productivity. Smallholders need immediate benefits to cover the additional labor and other costs involved.

A potential solution are 'smart financing' schemes. These are designed to facilitate farmers' uptake of sustainable technologies and production protocols. One example is the use of carbon credit payments. In 2007, we were amongst the first investors in the World Bank's BioCarbon Fund, an initiative to monetize carbon emission reductions at farm level. The Fund invested in projects in Kenya and Zambia. Both focused on climate-smart agricultural practices that increase the resilience of farming systems to climate change and reduce their carbon emissions. First results from Kenya indicate a positive long-term effect of these approaches. The corn yields of



participating farmers have more than doubled, in addition to the payments for emission reductions. This increased productivity is essential to encourage farmer adoption of SALM practices despite some financial uncertainties related to carbon markets.

As well as our financial contribution to the BioCarbon Fund, we also helped develop the first-ever methodology for emission reductions from Sustainable Agricultural Land Management (SALM). Several projects now use SALM to quantify carbon emission reductions through improved agricultural practices and technologies. Emission reductions from the Fund's Kenyan and Zambian projects have recently been successfully validated and released for sale. They can now be traded on voluntary carbon markets and, for instance, bought by companies to offset their carbon footprint.

# The long march to safer food

## SFSA highlights progress and gaps in the Chinese market

**China has significantly reformed its legal and regulatory system in order to improve food safety. Measures apply along the domestic and export value chains. Our Policy team is studying progress and suggesting further needs.**

In 2015, the National People's Congress amended the 2009 Food Safety Law. This legislation covers production and distribution of food and additives, food sales and restaurant services, packaging, food tools and equipment, storage and transportation, as well as the relevant safety management. The amended law gives the China Food and Drug Administration a more prominent safety role, including in licensing restrictions and enforcement. It also defines the regulatory structure. Implementation of the new national food safety standards has meanwhile begun, but further action and assessment are required for transparent enforcement.

The Syngenta Foundation and the New Markets Lab are jointly studying the legal and regulatory environment for China's food quality and safety. Our focus is on implementation. The program includes a study of the Food Safety Law revision and corresponding regulations, as well as reform of food safety standards. Our in-depth assessment examines possible implementation challenges for the private sector. We have run a series of case studies focusing on the value chains for horticulture, medicinal herbs and potatoes.

In 2017, we also examined international best practices in food safety implementation, drawing from public and private sector experiences. This assessment covers food standards, inspection, certification, storage, packaging, traceability and recall systems. The analysis is mostly focused on fruit and vegetables. These often highly perishable crops play a central role in food security and nutritious diets, as well in the development of farm income opportunities. Our table summarizes the paper's findings and resulting recommendations for China.



### E-commerce

China is among the most advanced countries in the move from conventional retailing to e-commerce. This includes the food and beverage sector. Already, an estimated 10 to 30 percent of imported food and drink products are bought online. Transactions run on a variety of business models. These include Business-to-Consumer (B2C), Consumer-to-Consumer (C2C), digital platforms (e.g. JD.com and Tmall), specialty online stores and hybrids of traditional and online components (e.g. Alibaba's grocery chain Hema Supermarket). There are additional cross-border C2C and B2C platforms. Partnerships between e-commerce platforms and traditional counterparts are also flourishing, such as the one between Walmart and JD.com.

The forthcoming Chinese E-Commerce Law is expected to intersect with existing online food safety regulations. The Syngenta Foundation and the New Markets Lab recommend an inclusive legal and regulatory framework with clearly defined obligations. We also suggest that local officials or third parties should provide SMEs with relevant training.

Regulatory Issue	Global good practice	Chinese context
<b>Standards</b>	<ul style="list-style-type: none"> <li>Private governance in standard setting and enforcement, especially for large retailers</li> <li>Institutionalized private standards at different levels (public-private and private with public institutionalization)</li> <li>Suitable public-private partnerships</li> <li>Structured arrangements with farmers (e.g. contract farming) to promote standards throughout value chains</li> </ul>	<ul style="list-style-type: none"> <li>Continuous release of new standards</li> <li>Consolidation and revision of existing standards</li> <li>Growing alignment with international standards</li> <li>Contract farming model more prevalent in certain value chains (e.g. fruit and vegetables)</li> </ul>
<b>Inspection</b>	<ul style="list-style-type: none"> <li>Optimization of limited public capacity for inspection via public-private partnerships (e.g., authorization of private inspectors) and information-sharing</li> </ul>	<ul style="list-style-type: none"> <li>Government-led inspection and self-inspection required; private sector inspection limited (e.g. testing labs)</li> <li>Insufficient local capacity to conduct inspections</li> <li>Insufficient awareness of need for self-inspection among SMEs and some retailers</li> </ul>
<b>Certification</b>	<ul style="list-style-type: none"> <li>When certification plays an enabling role, programs are streamlined and promote confidence in market stakeholders and government capacity</li> </ul>	<ul style="list-style-type: none"> <li>Proactive benchmarking against international standards; equivalence, harmonization, and international cooperation promoted</li> <li>Waning consumer confidence due to poor supervision and reports of counterfeit labels</li> </ul>
<b>Storage</b>	<ul style="list-style-type: none"> <li>Training on relevant standards through industry associations</li> <li>Public sector infrastructure investment</li> <li>Promotion of technology to reduce cost of cold storage</li> <li>Active use of international platforms that facilitate dialogue among diverse stakeholders and help tailor storage infrastructure to market needs</li> </ul>	<ul style="list-style-type: none"> <li>Rising demand but insufficient supply for cold chain infrastructure</li> <li>Mandate to construct a national cold chain system</li> </ul>
<b>Packaging</b>	<ul style="list-style-type: none"> <li>Enhanced private standard setting; training through industry associations; and certification (e.g. SQF Food Safety Code for Manufacture of Food Packaging)</li> </ul>	<ul style="list-style-type: none"> <li>Food packaging materials are "food-related products" and therefore subject to additional inspection and risk assessment</li> </ul>
<b>Traceability</b>	<ul style="list-style-type: none"> <li>Comprehensive guidance and handbooks (e.g. Japanese government guidelines)</li> <li>SMEs assisted through structural reforms and specialized market services (e.g. Syngenta Foundation's Farmforce)</li> <li>Standards benchmarked against international standards (e.g. GS1)</li> <li>Development and diffusion of information technology (e.g. blockchain)</li> <li>Institutionalization and scaling-up of successful private examples (e.g. GrapeNet Initiative)</li> </ul>	<ul style="list-style-type: none"> <li>Private and public traceability systems required</li> <li>Mandate to establish a national system by 2020</li> <li>Government pilot projects in different sectors</li> <li>Innovations by private companies and local governments</li> <li>SMEs lack awareness, understanding and resources to comply with requirements</li> </ul>
<b>Recall</b>	<ul style="list-style-type: none"> <li>Public-private collaboration during design and implementation of recalls</li> <li>Automated or rehearsed communication for recall with a variety of tools such as applications and email lists</li> <li>Global platforms used to expedite international food recalls</li> </ul>	<ul style="list-style-type: none"> <li>Mandate to construct a national recall system</li> <li>Various actors required to conduct food recalls and report to authorities</li> <li>Recall requirements classified by risk levels</li> </ul>

Table: China and the international food safety framework

# Subsidies come at a heavy price

## Governments could be smarter about farm support

**India has a long tradition of farm subsidies. Our research suggests that the government could spend this money more productively. Changes would also avoid some unfortunate side-effects of current policy.**

India's population continues to grow rapidly, and many families' incomes are rising. The resulting increase in demand for food, feed and fiber poses a major challenge to Indian agriculture. Farmers need to grow more crops on limited land and with often dwindling water resources.

The 'Green Revolution' 50 years ago significantly increased Indian food production. However, yields of almost all the nation's main crops are lower than in many other countries. India needs to raise agricultural productivity, sustainably and cost effectively. Fertilizers, along with better seeds and water management, will play a critical role.

With this in mind, SFSA and the Indian Council for Research on International Economic Relations (ICRIER) launched a study in 2015 on 'Supporting Indian Farms the Smart Way'. The study aimed to measure agricultural subsidies and suggest how these can best be used. The topic is highly complex. We believe, however, that adoption of appropriate policy can greatly increase farm productivity.

### Fertilizers: too cheap for too long?

Chemical fertilizers have played an important role in increasing India's agricultural production. A series of governments have promoted their use through price policies. The subsidy regime started in 1977 with price support for urea, a key ingredient. This scheme followed in the wake of rapidly increasing global prices for urea and gas, and therefore higher costs for India's fertilizer industry.

Over the last 35 years, India's fertilizer subsidy bill has increased almost 144 times at current prices. In 2014-

15, it reached 729.7 billion rupees, more than 11 billion dollars. The only other sectors receiving central government support of this magnitude are food and petroleum. Optimization of fertilizer subsidy use is therefore well worth the effort.

There is plenty of scope for improvement: Subsidies have helped increased yields, but have also led to a large rise in fertilizer imports. With the urea price kept abnormally low for a long time, farmers also had no incentive to ensure balanced use of nutrients. The result has been widespread soil degradation.

Our study with ICRIER has led to a number of proposals for rationalizing the fertiliser subsidy sector. These can be summarized as "three C's": cash, care and calculation. The suggestions are described in more detail in the box\*.

### Water and power: unwise incentives?

Water is a particularly stressed resource in India. Irrigation today accounts for 78 per cent of total water use. By 2050, it is estimated that this will fall to 68 percent: Some of farming's current share will have gone to other sectors like industry. However, agricultural production will still need to rise. Irrigation must therefore become considerably more efficient.

To enable this improvement, we recommend a number of changes. The first is pricing reform for both water and electricity. In many Indian states, charges for surface irrigation have essentially remained unchanged for decades. The vote-winning policy of supplying free power to the agricultural sector has also continued. Highly subsidized power makes pumps cheap to run. This has led to over-extraction of ground water. To curb wastage, the pricing situation needs to change.

As with fertilizers, we also recommend moving towards cash transfers in the water sector.

For surface irrigation, pricing should at least enable recovery of the working expenses of water supply. Cash can be transferred to farmers' accounts on a per hectare basis so that they can afford the increased water charges. The amount of cash transferred can be revised periodically. If increased water charges are levied, it must incentivise lower wastage of irrigation water. For electricity, India could follow the Chinese model. Incentives could be given as cash transfers for using less electricity than a pre-specified level. Alternatively, farmers could receive compensation payments per hectare. Before such changes, however, the government must ensure adequate electricity and water supplies. Farmers might be willing to pay more if the necessary supply were always available in the required quality and quantity.

In the fields, consistent daytime electricity supply is necessary to reduce the use of diesel to run pumps. To increase water use efficiency, the government should encourage drip and sprinkler irrigation. In dryer areas, it should also discourage the production of water-intensive crops, such as rice and sugarcane. In Punjab, for example, rice farming leads to faster depletion of already over-exploited groundwater. In Maharashtra, sugarcane irrigation takes water away from other crops, thus reducing their yields.

### Investments are 22 times better

Debate continues on the effects of investments and subsidies on agricultural growth and poverty reduction. Some experts argue, for example, that phasing out subsidies will drive productivity up and thus drive agricultural growth. In 2016, Ashok Gulati of ICRIER and Yuan Zhou, our Head of Research and Policy Analysis, re-examined the relationships between various incentives and increased farm income.

What did they find? In summary: Subsidies are not giving India good value for money. The ICRIER/SFSA modelling exercise looked at the numbers of people brought out of poverty by different interventions. Returns on investments in research and development, roads and education outweigh the benefits from input subsidies for power, fertilizer and irrigation. For example, a million rupees (about \$15,500) spent on fertilizer subsidy lifts eleven

people out of poverty. The same amount invested in agricultural R&D benefits 251 people. Similarly the return for agricultural GDP per rupee spent is 22 times higher in agricultural R&D compared to that for fertilizer subsidy.

These findings have important implications for the prioritization of government expenditure. Indian taxpayers, we believe, would do well to urge their politicians to invest in the areas mentioned. Similarly greater benefits from such expenditures over those for input subsidies are also likely to accrue in other countries at a comparable stage of development. Politicians should resist the temptation to hand out only subsidies that confer immediately tangible benefits, and take a longer-term view. That advice, of course, applies worldwide!

### \*Three keys to smarter fertilizer subsidies

Based on their study, ICRIER and SFSA suggest:

- 1) Switching to direct cash transfers. Farmers would receive about 6000-7500 rupees (\$90-120) per hectare. Stepwise liberalization of the fertilizer sector (especially urea) would then allow the market to determine prices.
- (2) A serious program of soil health improvement. If possible, cash transfers would depend on regular soil health checks and recommended fertilizer use.
- (3) Encouraging Indian investments in fertilizer production in the Arabian Gulf. Gas prices there are typically well under half of those in India. In parallel, we suggest encouraging better fertilizer application technologies, digitization of land records to pinpoint subsidy beneficiaries, and ensuring farmers' timely access to both fertilizers and subsidies.

These recommendations, if properly implemented, would promote efficiency in production and consumption, and help provide a more stable policy environment in the fertilizer sector.

# Providing readers with thought for food

Publications 2016-2018

**The Syngenta Foundation engages in policy analysis and public debate worldwide. Our aim is to improve the enabling environment for smallholder farming and related businesses. Publications make our findings and proposals available to a wide audience.**

The Foundation continues its thought leadership on topics such as food policy, seed policy, agricultural transformation, food security and sustainability. This section describes a few of our recent written contributions in these areas.

Our publications work is spearheaded by Yuan Zhou, Head of Research and Policy Analysis. In 2016, she and Professor John Staatz of Michigan State University (MSU) published a Food Policy paper on “Projected Demand and Supply for Various Foods in West Africa: Implications for Investments and Food Policy”. The authors develop scenarios for the evolution of demand between 2010 and 2040, and identify likely supply gaps. This enables them to derive implications for necessary investments and policies for different commodities and components of the West African agri-food system.

Staatz and Zhou’s analysis shows that imbalances between domestic production and demand will increase more quickly for foods with high income-elasticities of demand. Examples include meat, dairy products, seafood, fruits, vegetables and vegetable oils. Urban demand will grow two to four times faster than in rural areas, depending on the commodity. This will increase the pressure on already stressed urban food systems. “Substantial variations in supply-demand gaps across countries suggest that more fluid regional trade could help individual countries cope with these challenges”, comments Yuan Zhou. The paper is one of the major outputs from our SRAI project, in collaboration with MSU. In June 2017, our organizations also published a joint e-book entitled “Strengthening Regional Agricultural Integration in West Africa: Key Findings & Policy

Implications”. It summarizes the major findings and results from the two phases of SRAI.

Impact assessment is a key publication focus. Our Kisima Farm seed potato project in Central and Eastern Kenya led to three peer-reviewed journal articles. The project aimed to give smallholders greater access to improved seeds. One article examines determinants of these farmers’ use of certified seed potato, another investigates productivity and food security gains. The authors include our Foundation’s Ian Barker and Yuan Zhou, together with colleagues from the International Potato Center CIP.

#### **Technology, access and multiple stakeholders**

In 2016, our then Director Marco Ferroni wrote a chapter with Yuan Zhou on “Crop Yields and Food Security in an Increasingly Affluent World” for the book *The World in 2050*. Together, they discuss projected food demand to 2050, the crop yield growth required to meet it, and how such yields can be achieved. Their work highlights the importance of generalized sustainable intensification and sufficient crop yield growth, open markets and consumer acceptance of technology. It also underlines the vital role of agricultural transformations that provide both incentives for natural resource management and income prospects for farmers. Technological change and access to markets are crucial.

In October 2017, Ferroni and Zhou also published “The Private Sector and India’s Agricultural Transformation” in the *Global Journal of Emerging Market Economies*. Our Indian Advisor Emeritus, Partha DasGupta, authored a book on “Commercial agriculture by Indian smallholders – from farm prospects to firm realities”.

Shortly before joining the Foundation in September 2017, our current Director Simon Winter co-authored several Harvard Kennedy School papers on climate change and agriculture. “Multi-stakeholder Initiatives (MSI): Lessons



from agriculture” uses climate change and smallholder farming as a starting-point for more general insights into MSI as a tool for complex, large-scale issues. A second paper examines the role of MSI in promoting the resilience of African smallholder agriculture to climate change. It focuses on understanding how to facilitate system-level change. Winter et al. examine how different stakeholders understand the task, what they are already doing, and how they are incentivized to tackle the challenge. Their paper also points to areas in which system leaders can improve collaboration, through either existing or new MSI. A third publication looks at climate risks, smallholders and business associated with the Tanzanian corn sector.

From our R&D team, Dominik Klauser published a journal article looking at the challenges in monitoring and managing plant diseases in developing countries. Klauser highlights the need to strengthen the capacity of surveillance and management systems at a systemic level, rather than on an ad hoc basis. His R&D colleague Viv Anthony co-edited a book on “The Business of Plant Breeding-Market led approaches to new variety design”.

These and numerous further publications involving our staff and/or projects are accessible via [syngentafoundation.org/publications-presentations-books-papers](http://syngentafoundation.org/publications-presentations-books-papers).

# People: the Syngenta Foundation in August 2018

## Board\*

### Erik Fyrwald, Chairman

CEO of Syngenta, and a Director of Eli Lilly, CropLife International and the Swiss-American Chamber of Commerce

### Simon Winter, Executive Director

For biography, see page 9

### Mohamed Ait Kadi

President of Morocco's General Council of Agricultural Development, and a resident member of the King Hassan II Academy of Science and Technology

### John Atkin

Chief Operating Officer for Syngenta from 2000-2014, and a non-executive Director of the fresh produce company Driscoll's since 2011

### Margaret Catley-Carlson

Former President of the Canadian International Development Agency and the Population Council, and from 1989 to 1992 Canada's Deputy Minister of Health and Welfare

### Radha Singh

Agriculture Advisor to the Federation of Indian Chambers of Commerce and Industry. Former Agriculture Secretary with the Government of India, previous member of the ICRISAT board

### Rebecca Hubert Scherler

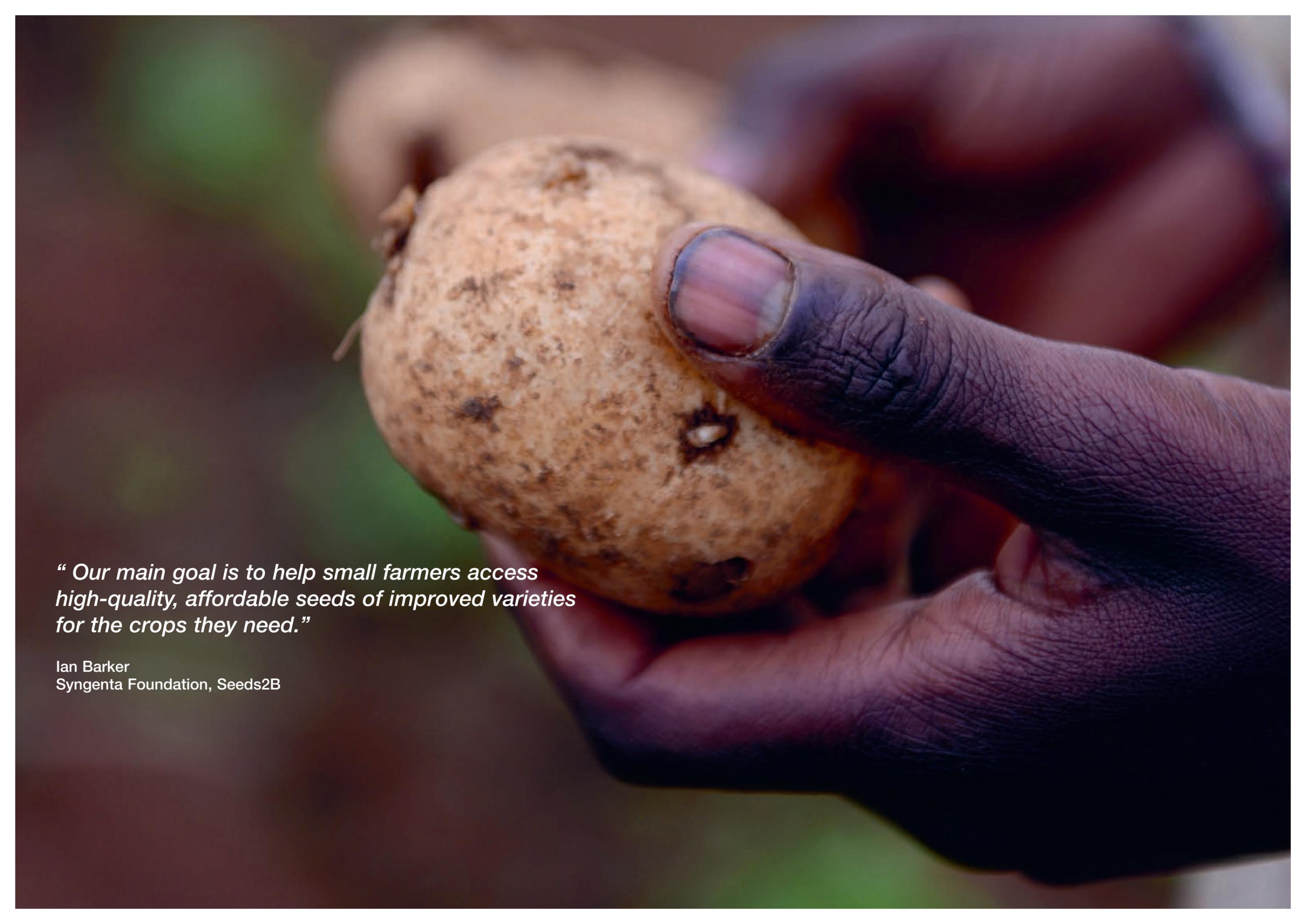
Secretary to the Foundation Board (see also under Team)

\* Mohamed Ait Kadi joined the Board in 2016, Simon Winter in 2017 and Erik Fyrwald in 2018.

## Headquarters Team & Country Leadership

Vivienne Anthony, Senior Scientific Advisor  
 Ian Barker, Head of Agricultural Partnerships  
 Robert Berlin, Head of Agriservices, Digital Delivery and Country Programs  
 Paul Castle, Head of Communications  
 Laura Ciliberto, Administrative Assistant  
 Mamadou Cissé, Communications Manager  
 Dao Xuan Cuong, Country Director Vietnam  
 Marisa De Faveri, Office Manager  
 Youssou Diagne, Regional Coordinator, West Africa Rice Program  
 Miriam Gutherz, Program Officer, Seeds  
 Murtiani Hendriwardani, Program Development Manager  
 Rebecca Hubert Scherler, Legal Counsel  
 Victoria Johnson-Chadwick, Investor Relations Manager  
 Dominik Klauser, Program Officer, R&D  
 Lena Köver, Financial Program Manager  
 Rachel Mansuy, Contracts Manager  
 Natalia Mezzenga, Finance & Operations Head  
 Oumar Niangado, Advisor West Africa  
 George Osure, Regional Director East Africa  
 Caroline Otto, Project Manager, R&D  
 Marnie Pannatier, Program Officer Agriservices and Research & Policy Analysis  
 Baskar Reddy, Executive Director of Syngenta Foundation India  
 Camille Renou, Seeds2B Lead, Africa  
 Mike Robinson, Chief Science Advisor  
 Olga Speckhardt, Head of Global Insurance Solutions  
 Teddy Tambu, Country Director Indonesia  
 Hervé Thieblemont, Regional Seed Business Development Manager Asia  
 Simon Winter, Executive Director  
 Farhad Zamil, Country Director Bangladesh  
 Yuan Zhou, Head of Research and Policy Analysis

Since our last Review, Mamadou Cissé, Miriam Gutherz, Murtiani Hendriwardani, Lena Köver, Caroline Otto and Marnie Pannatier have joined the team in Basel; Simon Winter became Executive Director, and in Asia, Hervé Thieblemont succeeded Clive Murray. Rouven Perez, Dominik Wingeier and Tamir Metzner worked as Swiss Social Service volunteers.



*“ Our main goal is to help small farmers access high-quality, affordable seeds of improved varieties for the crops they need.”*

Ian Barker  
Syngenta Foundation, Seeds2B

# Contacts and further information

For extensive further information on the  
Foundation's activities, please visit our website:  
[www.syngentafoundation.org](http://www.syngentafoundation.org)

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The Syngenta Foundation is also on YouTube and LinkedIn.