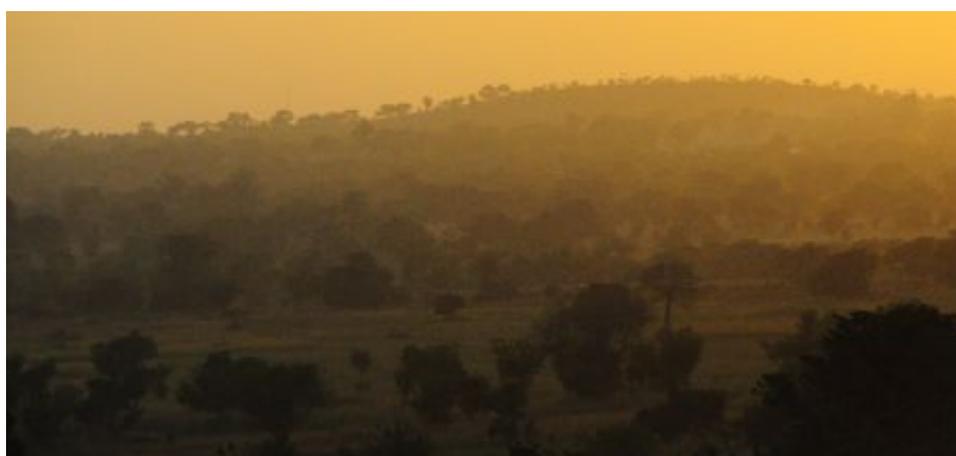


# Crowd-Sourced Lessons About Scaling Seed Systems



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## Background

Large investments from both public and private sectors are currently flowing into sub-Saharan African agriculture. During the first year of the New Alliance, commitments of \$3.7 billion were made from companies and governments in Africa and around the world.<sup>1</sup> Under the Comprehensive Africa Agriculture Development Programme (CAADP), African governments agreed to increase public investment in agriculture to a minimum of 10% of their budgets and new commitments are being developed.<sup>2</sup> Complementary investments in the energy sector, essential to agricultural growth, currently include \$7 billion from the United States, backed by another \$9 billion in private sector commitments.<sup>3</sup> The World Bank has estimated food and beverage markets in Africa will grow three-fold by 2030 to reach \$1 trillion.<sup>4</sup> African agriculture is set to scale in unprecedented ways.

Bringing Africa's agriculture and food systems to scale, transforming them, will require addressing the barriers the sector faces that limit scaling up. Mechanization is limited, with the majority of cultivated land still farmed by hand hoe; transportation challenges abound; fertilizer use is the lowest in the world; markets are fractured; and seventy percent of Africans are not connected to an electricity grid.<sup>5</sup> These are the constraints that limit smallholder farmers from engaging in the agricultural sector more fully. It is widely recognized that successful and sustainable scaling up of the sector must integrate smallholder farmers as producers and goals to reduce poverty, improve nutrition and connect smallholder farmers to markets are integral components of many current investments.

In parallel to the wave of rising investments in Africa, there is a burgeoning global conversation among donors about scale. Several excellent reports have examined the idea of 'scaling up' in international development, considering definitions and important foundations for why this concept deserves our attention.<sup>6</sup> We argue, however, that there is still room amidst the growing volume of voices discussing scale for a more practical discussion of "how." *How do we scale?* When it comes down to structuring new programs, policies, philanthropic portfolios or partnerships, what should we be thinking about, if we want to catalyze scale?

Here we focus particularly on investments supporting the *scaling of seed systems*. While there is a tremendous breadth of scholarship examining smallholder engagement in agricultural value chains, access to seed, and seed systems, much of the work has not considered issues of large-scale transformation of seed systems. Another gap is the literature on public-private partnerships, smallholder farmers and in general the dynamic line between public and private sectors that changes over time as a seed system becomes more established. This is a notable absence, given the large proportion of investments involving combinations of governments, companies, and non-profits. However, there does exist a good foundation of past analysis on development of seed systems in developing countries; some of this, even from many years ago is still relevant today for practical decision-making.

We set out to provide a discussion of potential scaling strategies within seed systems. We pulled examples from around the world, drawing on the foundation of well-known scholarship in seed systems as well as including lesser-known illustrations of tools that may be important to scaling strategies. Our intention is that decision-makers who are structuring programs catalyzed by this wave of investment in African agriculture and seeking impacts on the lives of smallholder farmers will benefit from shared knowledge and practical analyses of implementation strategies and challenges.

## The Project

This project, funded by the Syngenta Foundation for Sustainable Agriculture and USAID, is designed to offer a high-level but practical analysis. As a small team of analysts, our goal is to frame key issues in the implementation of scaling tools and support decision-making processes in future investments.

The project includes several resources:

- 1. Crowd-Sourced Lessons in Scaling**

*This document provides, beginning on p. 4, a set of crowd-sourced lessons in scaling. They are written to be short and easily digestible, but hopefully thought-provoking. They are the result of the initial stage of our project, as we cast our net wide and sought to understand some of the more practical aspects of scaling seed systems.*

- 2. Stories from the Field**

*Eight vignettes have been written and more are on their way. These stories highlight examples of programs, policies, and interventions from around the world that illustrate potentially important tools for scaling.*

- 3. Chapters**

*Our more in-depth body of work will be sent out in mid-September 2013. We include an outline of topics on p. 3.*

- 4. Annotated Bibliography**

*There is a vast literature documenting how seed systems need to change if they are to function well. Some of this directly speaks to the challenges of scale. We include a sampling of these references that have been helpful in our analysis.*

- 5. Website**

*The Crowd-Sourced Lessons, vignettes and annotated bibliography are available online at the project website: [www.scaling-seed.org](http://www.scaling-seed.org)*

# Outline of Future Chapters

## **1 INTRODUCTION**

### **1.1 The Project**

*Description of our goals for this project and our outputs.*

### **1.2 Defining Success**

*Consideration of how we define success for the purpose of this project. We include other's definitions of 'scaling up,' but try to look more practically at defining scale. We consider measurement of success more deeply in Chapter 8.*

### **1.3 Adoption**

*Adoption of new varieties and agricultural technologies is key to the definition of success in scaling. Here we provide a brief overview of the relevant adoption literature.*

### **1.4 Our history of scaling seed**

*A review of the DIIVA study and other evidence, giving some context to our limited success in getting improved varieties and agricultural technologies to smallholder farmers at scale.*

## **2 LANDSCAPE**

### **2.1 Implications of Crop Characteristics**

*This section is centered around a table with physiological characteristics of a number of crops (seeding rate, multiplication rate, bulk rate, etc.). We use the table to draw business implications from the crop differences and discuss how these can be used in decision-making for scale.*

### **2.2 Seed Markets**

*Discussion and background on the market dynamics that make seed a challenging business. This includes long production lags, counter-cyclical demand response, cobweb model, etc. We include business planning implications.*

### **2.3 Stages of Seed Systems**

*Here we discuss the changing roles of public and private sectors as seed systems develop. We will discuss the issue of avoiding crowding out as well as models that cut across public and private sector roles.*

### **2.4 The Changing Private Sector in Africa**

*This section provides a snapshot of the private sector in the seed industry in select countries in sub-Saharan Africa. While this will be out of date almost immediately, we think it's important background for decision-makers to have as good a picture as possible.*

### **2.5 Opportunities for Scaling Impact in Integrated Seed Systems**

*The term 'integrated seed system,' is gaining recognition. Here we introduce the issues of scale as they cut across the entire seed system – formal, informal, and the interactions between. Chapter 6 treats these issues in more depth.*

### **2.6 Enabling Environment**

*The legal and regulatory framework in a country is essential for scale. Much has been written on how the enabling environment supports, or impedes, a healthy seed system. We use this section to introduce major concepts that are considered in more depth in Chapter 7.*

## **3 FARMER DEMAND**

*Sustainable scaling requires that farmers not only have access to new varieties, but also that those varieties hold value for the farmer. This chapter talks about demand-driven scaling issues that have widespread implications - from investments in market information through to plant breeding research agendas.*

## **4 FOUNDATION SEED**

*Foundation seed is the first and one of the most challenging hurdles to scaling. Much has been written about foundation seed, but we will seek to add value by presenting practical business issues that must be considered in investing in scaling foundation seed in these countries. We will present key constraints, as well as potential implementable solutions that we have gathered in research and interviews.*

- 5 ACCESS to FINANCE**  
*Access to finance is one of most important scaling 'levers' to get right. After the donors funding has ended, if the scaling investments are to be successful, issues of financial investment will be critical for sustainability over time. We consider both access to finance from the farmer perspective as well as from companies, producers' groups and other stakeholders in the seed value chain.*
- 6 INTEGRATED SEED SYSTEMS**  
*While much of our work considers scaling in the formal seed system, scaling strategies cannot have real impact without finding a smart way of thinking through both formal and informal seed systems. In this chapter we frame the major practical issues of integrated seed systems. We also consider scaling strategies within the informal, and other strategies related to the interface between formal and informal.*
- 7 ENABLING ENVIRONMENT**  
*Legal and policy issues are present in every section of this work. But we have reserved a chapter devoted to the larger decision-making issues to ensure that priorities for longer-term change are also discussed.*
- 8 METRICS**  
*Designing metrics for scale is critical to support all of the material presented in the above chapters. We discuss outcome-based measures, cost-effectiveness of metrics, potential changing opportunities for collecting data, and incentive structures that are built on metrics.*
- 9 CONCLUSIONS**  
*A synthesis of the most relevant lessons and recommendations for seed scaling practitioners.*



## Crowd-sources lessons learned: what are experts & practitioners saying about scale?

We interviewed fifty people and read thousands of pages written by experts in search for answers to one question: *how do we scale seed systems and agricultural technologies to impact smallholder farmers?* Expertise stretched across a wide range of crops and geographies. We included those with long-running knowledge on seed systems in Africa, South Asia, and Latin America. We found deep acumen from both public and private sectors. In our interviews, we asked experts to think practically about how to achieve scale, and tell us what they would prioritize if they were held responsible for a rapid scale up that resulted in many more hectares of smallholder farmers' land planted in improved varieties.

Not everyone agreed about how to scale, or even a definition of scaling. This document, therefore, gathers wide-ranging views. It is not a set of recommendations from a team of consultants, but rather a collection of crowd-sourced views, and a glimpse into a global conversation on scale. We begin with the advice we heard most commonly and then categorize the other lessons into six topics: demand, delivery channels, foundation seed, access to finance, metrics, and enabling environment.



Farmers, whether large-scale or small-scale, know good traits when they see them. Although it sounds obvious, the assumption that smallholder farmers make rational decisions about adoption based on the value of a variety may be the single most important key to scaling a seed system and it was certainly the most common thread of our 'lessons learned.' We heard a lot about making the scale 'sustainable' so it will last over time. Putting the farmer first, and fully understanding their customers' needs, is central in making sure that the right seed is getting to the right markets which will in turn foster sustainability.

Heterogeneity in seed systems is critical to scaling strategies. Over different countries, regions and crops, the characteristics of seed systems are influenced by agro-climatic conditions, political and cultural factors, market access, policy frameworks, industry dynamics, donor involvement and institutional capacities. There are common constraints, and opportunities for learning, but interventions have to be customized for context. Scaling inherently has to strike a balance between designing for heterogeneity and coming up with approaches that work across larger markets.

Many of the interventions discussed were about kick-starting scale. We heard about incentives to drive change and barriers that could be reduced to catalyze scale. Once that initial spark has come, though, real scaling will be stopped dead in its tracks if there are not sufficient numbers of trained people available. Scale rests on the shoulders of technicians, salespeople, machinists, warehouse managers, processors, accountants, agronomists, entrepreneurs and more.

## Most Commonly Heard Advice

Farmers first.

One size will never fit all.  
You need different strategies for different contexts.

Start training yesterday.  
Scaling is fueled by the availability of well-trained people.

Lack of engagement between public and private sectors is more apparent in Africa than South and Southeast Asia where relationships between the sectors are often collaborative and catalytic. Scaling strategies in Africa will involve long-term thinking about creative ways to increase interactions, build trust, and foster collaborations between public and private sectors. Most scaling success stories involve innovative mechanisms for building bridges between public and private sectors.

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Partnership is an easy word to say, but notoriously hard to do. It's difficult to find the right partners, structure partnerships, and manage them. Scaling across Africa's diverse markets to reach smallholder farmers, though, depends on partnerships. Brokering partnerships that have impact on smallholder farmers takes particular skills that are often not found among the partners themselves. Access to brokerage services could be a key catalyst to scale and an important tool for donors.

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Target public investments so they are complementary to functions already working in the private sector. We heard a lot about avoiding 'crowding out' and trying to 'crowd in' activities by the private sector that serve smallholder farmers. But we did not hear a lot of practical advice on how to do that well. Scaling strategies can build on a mapping of where the private sector currently operates (markets, crops, services) and where we can use smart incentives to get them to expand operations. This is, by nature, a dynamic landscape; strategies need to build-in flexibility in operational decision-making and metrics to monitor in real-time.

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The most common message we heard from almost everyone was this: scaling strategies are very different across crops. There are common tools for scaling, common ways of thinking through strategies and key points where cross-crop efficiencies are necessary. But everything from markets to distribution to production differs across crops. Scaling strategies that work for one crop will not for others. We need to develop them crop-by-crop.

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Bad roads and expensive transportation costs are critical barriers to scale. These barriers make input distribution costly and also make it harder to stimulate demand for new varieties because of limitations getting crops to market. While those costs are major determinants in scaling strategies, we also heard creative solutions to tackle them.

Implementing strategies specifically to improve trust between public and private sectors will foster scale.

Invest in better partnership brokering.

Targeting public sector funding to 'crowd in' the private sector is a big challenge.

Scaling requires multiple crop models.

Infrastructure constraints demand extra-creative solutions.



## Lessons for Scaling: Demand

A farmer's demand is the result of making trade-offs among a wide range of traits. A wide range of traits valued by farmers are focused on yield, others are focused on post-harvest processes, either on-farm or off-farm, including traits related to storage, processing characteristics, shelf-life, transportability. Still others relate to consumers' demand for the product, including taste, color, aroma, and texture when prepared for eating. While yield remains a central focus in public breeding programs and regulatory requirements, we will better support scale if we integrate the reality of more complex demand profiles for crops.

Assessing value in seed for a farmer includes characteristics of processing, storage, taste and more.

Farmers balance a multitude of risks and they often prefer a variety that has dependable and consistent traits. Even when a variety has a high average yield, variance in the yield over time can be the determining factor. This is so well-known that it is almost an adage, yet we still heard from many that scale in seed systems will require selection focus and strategies dependent on the variability of varieties' traits in addition to averages.

Variability of trait performance is under-appreciated in scaling adoption.

We heard over and over about 'pull' - that scaling requires either leveraging or creating an opportunity for the farmer to make money from the new variety. The decision to adopt something new and risky declines dramatically the further farmers are from markets. There are many other considerations, but as a first cut, scaling strategies should start by selecting varieties and geographies where: (a) reasonable return on investment for farmers when they adopt can already be documented, and (b) low-cost opportunities exist for stimulating new markets for the particular variety of focus.

Trickle-down theories have merit. Start with varieties and markets where the value of adoption can be documented.

Demand for seed can take a range of forms and better differentiation can help to identify new market opportunities. Some farmers want an improved seed package (new varieties, certified seed); some are seeking mainly new genetic material (a great variety they then multiply themselves) and some may prioritize mainly the gains that come from clean planting materials (e.g. for cassava in east Africa). Tailoring the product and delivery strategy to these differentiated types of demand will improve our ability to serve expanded markets.

Differentiating customer demand for types of seed could bring important pay-offs

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More generally, scaling any product requires market segmentation. Think about mobile phone handsets and billing plans. The mobile market reaches far and wide because it consists of a large number of differentiated products, tailored to very different segments of the market. This isn't just about the choice of the variety and targeted geography. Market segmentation includes considerations of pricing, packaging, business models, access to complementary products and services, and more.

Get better at market segmentation.

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In agricultural development, scaling strategies will fail if they are built only on the dual assumptions that adoption is driven by more information and reducing barriers (e.g. providing credit). Underneath both of these pillars of adoption, at its core, lies the question of value. Scaling adoption requires a realistic look at whether the technology has value to the farmer. The next two hurdles for scaling strategies are: (1) how do you demonstrate value to the farmer cost-effectively and (2) how do you work toward eliminating some of the most constraining barriers to adoption.

Demand is not just about making information accessible or bringing down the barriers to adoption.



Scaling strategies need to be tailored differently based on how easy it is to demonstrate value. A livestock vaccine is notoriously slow to scale because the value is only seen when your neighbor's flock or herd is wiped out by a disease. Marketing irrigation technologies is easier because farmers can see the results immediately. Getting farmers to trust improved varieties of a tree crop where the value won't be seen for several years is different than fostering adoption of new varieties of a field crop. Diverse time scales and business models for demonstrating value translate to different costs for scaling that need to be integrated in strategies.

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All over the world, but especially in Africa, women's decision-making frameworks around technology adoption are central to scaling. Any scaling strategy needs to include practical information about women's use of the technology, how they are farming their land, their irrigation access, whether they are selling their crops or feeding their family with them, who markets the crops, whether they are the input buyers themselves or depend on men for transactions, their access to cash as opposed to barter and much more. We have a rich history of technology adoption literature about women and technology that has not been translated widely enough into business practices and strategic adoption programming in the field.

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We sometimes treat adoption as though we are looking for the one-time conversion to a new technology. Once a farmer tries hybrid maize, for example, we count it as a success and think she will never go back. In fact, we have good evidence that farmers switch in and out of growing hybrid varieties over time. Smallholder farmers, like all farmers, take bets season by season on what will bring them value. Those bets are based on a complex, but easily framed, set of factors. Scaling strategies that recognize the dynamics of adoption will succeed over time.

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We have long recognized in technology adoption that scaling strategies have to be tailored to account for complementary products and services. Multi-packs of seed and fertilizer sold together are one example. Complementary products and services, including financial services, drive not only the product form, but also the business models used for scaling, the selection of which technologies to scale, and the geographies for targeting scaling. They need to be integrated in scaling strategies from the very beginning.

Strategies for demonstrating value are tailored to both the product and the market.

Engineer adoption strategies around women's roles.

For seeds, adoption is not a one-way switch. Farmers decide every season.

Adapt scaling strategies to the availability of complementary products and services.



## Lessons for Scaling: Production & Delivery

Sustainable scale requires understanding where the flows of commerce can be amplified, extended, or created. There are scaling opportunities to build commercial incentives for seed producers, processors, traders, and farmers that will foster long-term changes in farmers' adoption of improved varieties. These opportunities exist in informal as well as formal markets. Scaling strategies that focus only on creating new commercial channels and formal markets are missing opportunities.

Always think about what happens after donor money has gone.

We heard from many that free seed distribution is a barrier to scaling seed systems in a sustainable way. Some noted the uncertainty and disruption to businesses. Others noted that giving away free seed fails to respect farmers' decision-making acumen and their own determination of value in seed. A few advised that free seed in small amounts can be instrumental in priming future commercial channels. But even in small amounts, most advised charging a small fee. Adopting an 'apply or explain' rule would allow donors and governments to advise against free seed distribution unless an explanation of expected costs and benefits within a broader commercial context warranted an exception.

Adopt the 'apply or explain' rule for justifying free seed distribution.

Products and their distribution channels are co-determined. The decision to sell seed in small packs, for example, creates different opportunities and constraints when planning distribution channels than if multi-kilo packs are being sold. Some products can't travel long distances, like plantlets, and the distribution channel has to be short. Products with larger profit margins may sustain more intermediaries, whereas products that have slimmer margins may need more direct distribution.

Products and their distribution channels are co-determined.

In scaling distribution channels there is a choice between a limited set of types of business models. At the very high level these include: direct from producer, sale to intermediaries, franchises, businesses-in-a-box, partnering with NGOs and others. Many producers use more than one model of distribution channel. Distribution channel models in developing country markets have to be designed with strategic attention to costs and incentive structures for intermediaries. Mature markets offer some insight, but they may depend on efficiencies (like good warehousing or easily enforceable contracts) that are not available.

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Multiple studies have noted that farmers' willingness to purchase agricultural inputs drops off considerably after a particular distance from the supply point. Distribution models can use that empirical work to measure potential markets. Maps of how long it takes a farmer to travel to a distribution point of sale will imply potential communities served. Kick-starting distribution channels for scaling in places where market density is high may prime the pump for harder to reach areas and allow for initial learnings to be applied in subsequent expansions.

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Scaling distribution strategies are always integrated with strategies for demonstration of the product. Often the distributor also plays a marketing role, illustrating new available products. Whether this involves demonstration plots, selling very small sample packs, showing videos, or organizing farmers to connect with each other, a distributor is not just a distributor and this impacts plans for scaling.

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Distributors can be the face of the product. The trustworthiness of a local trader or agro-dealer is paramount. Strategies that scale distribution well are designed with incentives to foster trustworthiness in the intermediaries. The way in which new intermediaries are selected as well as how their behavior is rewarded or penalized over time are crucial components of scale.

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Distribution strategies for scaling should contain reverse flows of information. The products go in one direction, but information about the market goes back from the ground up. Structuring distribution channels to integrate flows of information beyond the obvious sales numbers will inform future expansions and operational decisions. Data gathered at the point of sale, for instance, about how far the farmer has traveled will inform future scale.

Evaluate different possible models for scaling distribution based on specific criteria.

Get the product as close to the farmer as possible.

Demonstration and distribution strategies are integrated in the expansion of markets.

Distribution strategies have to incentivize trustworthy behavior in intermediaries.

Distribution strategies have to incentivize trustworthy behavior in intermediaries.

The costs of storage and seed conditioning need to be fully integrated into strategies for scaling. In many small-scale projects, growers are assumed to also carry out storage and seed conditioning functions. For larger quantities of seed, the grower will need access to these facilities (either through service provision or through investment themselves in the equipment required).

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Don't forget seed conditioning and storage needs.

Scaling the adoption of improved varieties of seed in the informal sector requires us to re-think models that work in the formal sector. Incentives for production and distribution of seed in the informal sector have parallels to the formal. Reputation and branding, for example are important drivers across the whole seed system, but in informal seed systems there are different channels for information and marketing, leading to different interventions. Also, the value that farmers find in certified seed vs. high quality seed, and how we address this issue, is of critical importance to fostering scale in integrated seed systems.

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Scaling in the informal sector requires re-examination of formal sector methods.

Many consider the informal market as inhibiting growth in the commercial sector. The agricultural development community, to some extent, remains divided into proponents of the growth of commercial formal systems and those championing farmer seed systems and informal markets. However recently there is promising work indicating models for integration, and compelling arguments that scaling must involve an integrated system. This requires scaling strategies that are tailored to account for the dynamics between formal and informal systems.

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Integrate commercial strategies across formal and informal seed markets.

To achieve scale, improved varieties will ideally move quickly and widely to an intended body of customers. Leveraging informal systems (in sync with formal) may offer opportunities to widen geographic and social reach. Specific strategies will vary greatly by crop and context. Strategies should be informed by on-the-ground experience and should build in features ensuring quality and seller accountability.

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Confining strategies to formal markets will miss enormous opportunities for scale.

Experts we talked to repeatedly noted just how much business models for scaling are impacted by the type of crop. So much so that in our more in-depth work still to come we have included a table showing the vast differences in multiplication rates, sowing rates, isolation distance, bulk, perishability, and demands for agronomic management across a number of crops. We use the table to discuss the business implications that follow and the importance of crop-specific strategies.

Constraints and opportunities for scaling differ wildly across crops.

We heard from experts that teaching farmers to produce seed at the local level is inherently difficult to scale. Programs that foster decentralized seed production are designed with high levels of coordination and supervision that are not sustainable or scalable. Local production is necessary, however, to scale access to some crops (e.g. vegetatively propagated crops). Models for local seed production may need to be re-invented with scaling objectives in mind.

Decentralized production is costly.

Local agro-dealers and distributors know their markets through direct experience. Their livelihoods depend on knowing what to stock and when to stock it. Distribution channels that are better able to cater to inventory management needs at the local level in a cost-effective way may be able to serve more farmers.

Trust the inventory management skills of local distributors.

Supply chains in other industries with higher profit margins (like cut flowers) have led the way in sensor technologies to record temperature and humidity from farm to customer. Smart-phone enabled inventory management systems are available, as are mobile-web interfaces to manage out-growers. Scaling production and distribution in seeds can benefit from technological leapfrogging if new systems are adapted.

Adopt and adapt supply chain technology.





# Lessons for Scaling: Foundation Seed

Foundation seed is the first significant link towards moving modern varieties and ensuring commercial seed enterprise development. It is also the first major bottleneck (e.g. the smaller quantities of breeder seed can often be managed and provide less of a hurdle). At present, the amount of foundation seed multiplied by NARS is often directly correlated with the amount of outside funding received. Processes need to be developed which allow for durable and diversified production of foundation seed.

If the foundation seed system doesn't function, the entire seed system doesn't function.

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Foundation seed production of public varieties is more likely to scale if multiple models are allowed. One public sector supplier of foundation seed cannot respond in a cost-effective and flexible way to meet the demands of a dynamic and growing seed industry. Production at companies, farmers' groups, NGOs, research institutes and within other government organizations can work in parallel.

Private and public production of foundation seed can work in parallel.

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Strategies to scale production of foundation seed and make its supply more responsive to the demands of the market will need to focus on models to address capital constraints. Large capital expenses such as warehouses, irrigation systems and other the equipment necessary for producing foundation seed are a barrier to entry beyond any existing regulatory barriers. These investments likely do not provide a worthwhile return on investment for small and medium seed companies.

Capital investments are barriers to entry for potential foundation seed producers.

Mechanisms for access to finance for capital investments, facilitation of joint ownership of capital, or structuring rental models could be part of scaling strategies.

Some experts recommended pursuing more contracting with small to medium seed companies to produce foundation seed. Incentives, partnerships and contracts could be used to quickly scale capacity at seed companies for growing foundation seed while at the same time leveraging their existing know-how. Some noted that in India larger companies not only produce foundation seed for themselves, but also sell it to smaller ones.

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Further to the capital investment barriers, additional differences should be noted in the risk profile for foundation seed production compared to certified seed production. The value of breeder and foundation seed is higher than for certified seed. The financial impact of a failed crop will be higher. Optimal choice of agro-ecology for production, attention to optimal storage and transportation will be critical. Insurance or other financial mechanisms may need to be tailored to address particular risks.

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In some countries the markets for foundation seed are small and diverse. If a foundation seed production facility (whether public or private) could serve more than one country's market, the financial model may begin to look more sustainable. However, this would require management of issues that currently hinder transportation of seed across borders as well as political economy constraints.

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Independent of the strategy or strategies chosen for foundation seed production, a state-of-the-art IT coordination platform is a worthwhile investment for scaling. Information about producers, production, allocations of foundation seed to customers, storage inventory, unfulfilled demand, accuracy of estimated demand, geo-referencing of production and demand, and much more can be gathered. This will either enable more decentralized foundation seed production or make centralized production more efficient.

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Foundation seed production strategies should differ by crop. Policies governing production of foundation seed, subsidies and other incentives relating to foundation seed should be crop-specific. The incentives for engaging various organizations in foundation seed production differ enormously from crop to crop. Additionally, physical characteristics of different crops (like weight, bulk rate, sowing rate and more) will drive foundation seed models as much as they drive other strategies in the seed system.

Contracting small and medium companies to produce foundation seed requires investment.

Risk profile of foundation seed production is different than certified seed production.

Cross-border issues are important determinants for production of foundation seed.

Designing and facilitating a good coordination platform will catalyze scale.

Foundation seed models also differ across crops.

Small-scale pilots working at a local level to improve the informal seed system may supply farmers with foundation seed as part of the project. If those programs are going to scale, farmers will need to be able to access high quality seed on their own. In general, we need to think strategically about access channels to high quality seed at the interface between formal and informal seed systems.

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Foundation seed production challenges have been solved in diverse ways around the world. India offers crop-specific subsidies on foundation seed production, assistance for seed certification and testing, and subsidizes the transportation of seed. The models will not translate directly, but components can be evaluated.

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Foundation seed producers have a tough job in forecasting demand for seed. Orders for seed need to be placed a long time ahead to give time for production. The production lag leads to natural mismatches in supply and demand at any point. Strategies that are able to mitigate the costs and risks associated with this mismatch will foster scale.

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Access to foundation seed is the driving force for scaling up subsequent seed multiplication initiatives. Seed producers of all types need advance warning to implement effective business plans. Communications strategies are needed to improve links between foundation seed producers and a range of seed producers.

Structure ways to get high quality seed into the informal seed system.

Look to other countries and examine the range of models and incentives put in place.

Plan for inherent difficulties in forecasting demand.

Improve communications around foundation seed production.





## Lessons for Scaling: Access to Finance

Individuals and organizations up and down the seed value chain have needs for different finance solutions. Access to savings, insurance and credit for farmers is a key area. But access to finance for companies, producers' groups and other stakeholders will be just as critical. Creating strategies for scale involves starting with the well-known basics of agricultural finance needs and mapping the gaps across countries and crops.

Access to finance is a constraint to scale at all levels of the seed value chain.

We heard from many that more attention to facilitating out-grower schemes is needed for scale. Contracting organizations and individuals contracted to multiply seed, oversee multiplication, clean and store seed and other functions can provide flexibility. When these services are distributed over existing capacity they can allow for an efficient starting platform for growth. But we also heard about side-selling, where contracted farmers don't respect forward contracts when a better price is available in the market. Scaling will involve developing contract and financial tools can be implemented to incentivize smallholder farmers to stick to their forward contracts.

Financial mechanisms and contract terms are needed to scale use of out-growers

Product-specific credit got a bad rap with Bt cotton seed in India. Generally, it is a tool that can bridge gaps and therefore enable scaling. For example, a creditor has a lower risk of repayment if a tested new variety is used and may be more willing to loan to a new population. Similarly, credit may make it possible for a smallholder to purchase a new variety. There is an understandable reluctance to implement product-specific credit, but if it's carefully done, it can be a powerful tool.

Product-specific credit can be a powerful tool for scaling.

Beyond the traditional set of financial services, there has been interesting work in the field of 'innovative financial mechanisms.' While these need exploring for their particular use in agriculture, they can often require high set up costs and transaction costs. For example, coordinating the creation of and administering a new investment fund requires significant commitments. Navigating the world of carbon credits, similarly involves high transaction costs. Scaling strategies that assess the role of alternative financial mechanisms need to consider their full costs and risks compared to other options.

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Alternative financial mechanisms can involve high transaction costs.

'Smart subsidies' are important for scale. For example, we heard requests for marketing subsidies that would enable companies to reach out to develop new markets of smallholder farmers. When they are time-limited, highly focused, and have evidence-based enforceability these subsidies can be excellent scaling tools. But they are dangerously easy to get wrong.

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Smart subsidies can work and we need them to scale.

Many public sector organizations have revenue-generating components. Across most government agencies, fees charged for some services can complement the core budget. Similarly, many public organizations seek licensing royalties for their varieties. In a more innovative example, some CGIAR centers run plant-breeding consortia with membership fees collected from companies. In general it's hard to know, though, which models of self-financing work because true costs are rarely calculated. There are also best practices to gather that ensure public interest remains central in decision-making. Understanding which of these are profitable and replicable models will be an important investment for scaling.

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Explore public sector self-financing options with caution.

Traditional microfinance models do not cater to rural and agricultural finance needs. Farmers need longer-term loans that are often larger than the typical microfinance loans. Collateral substitution models (like group lending) also need adjusting to fit with rural farming economies. Similarly, the returns for microfinance institutions will be different in these markets. Understanding the potential for broader application of microfinance in agriculture will be key to scaling.

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Microfinance can be adapted to agriculture.

Financing decisions in input markets determine markets for seed. We have seen in Africa widespread adoption of hybrids built on the back of input subsidies and the subsequent plummeting of hybrid sales when those subsidies were removed. These interdependencies are central to scaling strategies, but there are no easy answers.

Financing in input markets determines the market for seed.

The ways in which seed companies access new varieties are critical to their business model and will change the types of financing they may access. Private equity investments, for instance, look for high growth. Licensing or partnership agreements with larger companies that have research and development capacity will signal increased likelihood of growth over time. Similar impacts may occur for seed companies that have licenses to publicly-bred varieties offering some exclusivity. Seed companies accessing generally available varieties may compete on price in the market, instead of genetics. This implies a differently valued company, and different access to finance.

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Much has been written about access to agricultural finance. Scaling a seed system will require sifting through the generalities and framing the potential solutions in terms of potential impact, cost of implementation, and feasibility (including time frame) for implementation. Policy changes are key, but represent harder to implement, longer-run options. Engage the agricultural finance experts in a structured discussion focused on the practicalities of implementation.

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Improving access to public sector breeding programs' supply of new varieties and the potential for limited exclusivity is critical for scale, but scaling strategies should also look toward facilitating capacity for companies' access to innovative genetics more broadly. A focus solely on public varieties in scaling seed systems does not put the smallholder farmer first. Financing research and development (R & D) is a scaling conundrum unto itself. Models of R & D growth in other countries' seed industries should be evaluated. Before companies have the large and long-term investments available for R & D there are other, interim strategies that are typically used. These have included licensing, mergers, acquisitions and, frankly, misappropriation of innovations in genetics. Scaling strategies for financing seed companies should not ignore their needs for accessing innovative genetics without the capacity for R & D themselves.

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Advances in insurance services for smallholder farmers are one of the potentially large catalysts to scale. Commercial viability of these models is changing over time based on new mobile technology as well as better availability of data. Additional technological advances are changing mainstream, large-scale agricultural insurance. This will impact how insurance and re-insurance companies engage with smallholder farmer markets.

Access to genetics changes the value of a company and its access to finance.

Translate the excellent work on agricultural finance to focus on practical implementation.

Seed companies' access to innovative genetics will be paramount over time.

Insurance models will change with availability of data.

Solutions for improving access to finance are specific to the type of stakeholder, but also to the kind of financing needed. For example, particular leaps in scale for the seed system will require, at different points, solutions to liquidity, risk, and capital investment constraints. Scaling strategies should identify the places where scale specifically depends on removing constraints in access to finance and map them to the types of finance required.

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Development of new businesses at scale is often catalyzed by incubators and accelerators. Growth of new seed companies can similarly be fostered with these tools. Usually business management training, services and investment capital are included. These work particularly well when they are run by investors and less well when they are run by governments. Scaling strategies in seed need to look first at the costs of fostering startups (including high failure rate) compared to financial incentives to expand the markets of larger seed companies, or engage seed companies from emerging markets like Brazil and India. If startups have a comparative advantage over other strategies, incubators and accelerator functions should be developed with private sector investors.

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Agriculture has well known, but particular, finance needs. Income, for instance, is more 'lumpy' than other industries and production times are long. Some financial service providers are not currently serving agribusiness, but could be incentivized to expand to those markets if scaling incentives are implemented. That starts with a careful look at what's keeping those financial service providers out of these markets currently. Reducing those barriers may be a target for scale. As an example, consider the lack of provision of credit to smallholder farmers. There are many reasons for this, including lack of collateral, lower bar for strategic default and more. But a key constraint is the information asymmetry. Local lenders know which farmers are likely to repay; larger financial institutes do not. M-banking, however, is offering new possibilities for parallels to the 'credit histories' that scaled credit in other contexts.

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In addition to addressing access to credit and insurance for companies, scaling entails staying on top of the rise in investment in African agribusiness and working to apply more of it to benefit smallholder farmers. Private equity (PE) investment, with its characteristic added benefit of management expertise and hands-on leadership support, for instance, would be a boon to many small and medium seed companies. There may be bridges to build between PE firms and the management of smaller seed companies.

Focus on needs for liquidity, risk, and capital investments.

If you need incubators and accelerators, engage the private sector.

Understand the needs of the suppliers of financial services.

Create opportunities that benefit smallholders in current investments in African agribusiness.



# Lessons for Scaling: Metrics

Metrics that will support scaling seed systems are in some ways just like those found elsewhere in business, but in other ways they have to be translated. Markets comprising low-income rural customers, complexities between grantees and donors and interactions across public and private entities require different uses of metrics.

Advanced-market business metrics are a good place to start.

The standard four categories of metrics should be implemented across the seed value chain: customer measures; financial measures; process measures; learning and innovation measures. These metrics should be developed by mapping the concerns of each stakeholder in the system as well as the ultimate 'public good' goals.

Measure more than 'impact.'

Evidence of repeat custom is a more powerful indicator of sustainable scale than sales data can provide. Returning customers mean the value of the sale to the customer has been confirmed and they are back to do it again. But for many types of products, like open pollinated varieties or more durable agricultural technologies, repeat sales data may need to be balanced by other measures.

Repeat custom is a powerful metric, but limited to a small subset of products.

Checking on inventory or pricing in a small sample of agro-dealers can be done cheaply. The results are useful and when the agro-dealer knows he's being queried it can change behavior. The results are not robust and wouldn't support a serious change in operations, but sampling can give insight and indicate a direction for more rigorous measurement.

Integrate cheap, fast sampling metrics. But calibrate the response accordingly.

Measuring the 'number of farmers reached' does not indicate that the farmer found the product valuable and planted it in her field. Metrics like this can lead to 'dumping' of products and are not indicators useful for building sustainable scale in the seed system.

Impact metrics should reflect demand, not supply.

Customer satisfaction metrics are as appropriate among smallholder farmers as they are in more mature markets. There is now a growing field of market information and many survey firms capable of reaching smallholder farmers with mobile phones. Metrics based on customer satisfaction with the product will be important to building scale over time.

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Customer satisfaction among smallholder farmers is important.

Plan metrics hand-in-hand with decision-making structures. Think how the metric will be used.

Classic marketing metrics are a good place to start, but they need to be adapted.

Randomized control trials have a limited role to play in scaling seed systems.

Explore donors' tolerance for respecting confidentiality in metrics.

Use disaggregation in metrics for complex markets.

Planning a metrics strategy for scale requires also planning the channels of decision-making for each set of metrics. Operational metrics, for instance, may be reviewed by seed company managers to support decisions to improve efficiency, reallocate resources, or change the way things are being done. Impact metrics, on the other hand, may be made available more broadly to grantees and partners to illustrate progress.

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For getting better seed to more smallholder farmers, traditional marketing metrics from advanced economies have limited value. Metrics like the popular 'customer acquisition cost' and 'customer lifetime value' are not likely to map directly, but they can be the basis of smart metrics in seed

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Scaling is unlikely to depend on the use of randomized controlled trials (RCTs). In international development, we are indebted to this method for bringing deep insight into critical areas. But scaling requires cost-effective metrics, and RCTs are expensive. Scaling also requires flexible decision-making in a dynamic system, and RCTs have a long time scale.

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A metrics strategy for scale requires grantees to be held to clear and measurable goals. But we need a conversation about whether grantees also need to be able to collect confidential metrics about operations. In public-private partnerships this is worked out in the partnership agreement. But public sector organizations may put in place a sub-optimal metrics strategy if they know all metrics will be viewed publicly, or by their donors. We heard different views on this, but some noted that good metrics strategies supporting scale in seed systems must create accountability while leaving different stakeholders the flexibility to collect the data they need.

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Disaggregation in metrics across market segments is particularly important when seeking to reach smallholder farmers with new varieties. We know the decision-making frameworks of women and men, for example, are very different. Understanding these at the product level is important.

Bringing measurement down in cost is critical to metrics in scaling seed systems. This will require investing in the application of some new technologies. For collecting data in rural developing country markets, the interfaces between technologies will be critical: between mobile and web; between smart-phone and cheap handset; between remote sensing and image recognition; between mobile and voice recognition; between mesh networks and web; between wireless sensors and smartphones. The list goes on. But investments in innovations like these will transform our ability to scale by giving us the metrics we need to drive it.

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Invest in applying new technology to improve how we measure in rural markets.

Never institute a metrics program without collecting data on the metrics process itself. Information is costly and there is always a decision to be made about whether the cost is worth the benefit. If you know how much time and money is being spent collecting each type of data, you can assess whether there's a better way. Measuring at scale has different thresholds of acceptable cost and benefit than smaller programming.

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Measure how much it costs to collect the data.

Companies understand the value of making decisions based on limited information, and they will seek cost-effective measurement structures. Donors often do not understand this and require public sector partners to spend resources ineffectively on metrics that don't matter. Scale will require a tightening up of the use of metrics in the public sector.

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Metrics for public sector partners should be as streamlined as those for private partners.

Challenge the economists to work on a set of proxy metrics that balance the dual criteria of accuracy and low-cost of collection. Instead of household income surveys, what are the proxies we can observe with a change in income? In a rural village, how closely does the purchase of a school uniform or buying a new roof correlate to a rise in income? Donors need better information about the 'cost of accuracy' in metrics so they can find an acceptable balance.

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Encourage more work on proxies and put the good ones into use.

Metrics drive behavior. Intermediaries and stakeholders in the seed system will vary their strategies according to how you measure them. If their continuing employment, their renewal of a grant, or their fulfillment of terms in a contract are based on particular metrics, they will of course gear their efforts to meet those numbers. This can lead to unintended consequences and the strategic choice of metrics involves thinking through the likely behavioral changes. Seed sold, for instance, may be a better metric than seed supplied.

Metrics drive behavior. Think about how the system will change before you implement a metric.



## Lessons for Scaling: Enabling Environment

One function of legal and regulatory systems is to foster new commercial opportunity. But those charged with implementation usually have no direct private sector experience and have no incentives to try new approaches that might generate more commercial opportunity. Starting with opportunities and challenges in the seed market and then working through how legal and regulatory systems can respond will generate laws and regulations that support scaling up.

Designing public interventions after assessing market signals will foster scale.

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Lowering risk for the private sector is a crucial role for governments seeking to scale seed systems that reach smallholder farmers. Scaling seed systems requires the founding of new companies, the expansion of existing companies and the local engagement of foreign companies. For companies, reaching into rural markets comprised of smallholder farmers means taking on new risks. Dialogue with the private sector to understand these risks in detail will allow governments to design incentives and support for companies to serve new markets.

Governments' role in lowering risk for the private sector is central.

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Market size matters. Trying to grow a commercial sector that will better serve the needs of smallholder farmers is much harder in many African countries compared to countries like India or Brazil because the market sizes are so much smaller. In larger markets, seed companies can afford to engage at lower profit margins. Crossing borders to serve markets in multiple countries introduces additional risks for seed companies. Think about what happens if a truck is held up at the border and the seed bakes in high temperatures. Cross-border issues are a core consideration in scaling strategies.

Cross-border issues keep many African seed markets small and fractured.

Public sector organizations engaged in seed systems (including governments, international aid agencies, NGOs, universities and others) play critical roles in serving smallholder farmers. These roles do not disappear as seed systems become more mature; they change. Even in the most advanced market economies, public sector organizations are still pivotal in the functioning of the seed system. Scaling is not about replacing public with private, it is about targeting the role of the public sector and ensuring that targeting can change in response to a changing private sector.

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Public plant breeding organizations play central roles as seed systems develop. The best examples of public breeding programs supporting scale in reaching farmers with improved varieties, though, occur when the research agenda is closely tied to demand in the market. Adopting a more demand-driven approach will require changing the incentive structures for public breeding programs as well as investing in more cost-effective methods than are used presently to understand farmers' needs.

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Scaling cannot occur without smart legal and regulatory frameworks in place. But having laws on the books without resources for implementation leads to uneven enforcement and an uncertain climate for business. Implementing laws is not a static, paper exercise. It involves responsiveness, good decision-making capacity and the ability to shift course when things change. National governments can foster scale by re-thinking the needs for human capacity, technological capacity, and decision-making structures that support the implementation of policy frameworks.

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In many countries, seed regulations and the roles of government agencies are barriers to the scaling of the seed system. If the goal is to provide efficient, well-staffed services that are responsive to increasing needs as the system grows, governments may find the costs of being the sole provider to be unreasonably high. Scaling strategies should consider mechanisms to share seed regulatory functions across growers and third-party organizations.

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Licensing of plant varieties from CGIAR and NARS is approached with much more sophistication now than even a few years ago. Licensing tools are being used in some institutions that support the dual goals of stewardship of public genetic materials and impact to feed the hungry. Scaling the seed system, however, will require training among public institutions and donors about how licensing terms can support scaling goals. We have the tools, but they are not yet widely enough accepted.

Public sector roles remain critical, even in countries with advanced seed systems.

Public breeding programs need better connections to the market

National strategies for seed need leadership commitment, resources for implementation, and flexibility to respond to a changing landscape

Scaling seed regulatory functions involves finding lower-cost solutions.

Licensing plant varieties has come a long way, but scale will require more.



Send us your  
comments

## A work in progress

These lessons represent a collection of experts' views drawn from extensive interviews and reading. They are a sampling of topics that our team prioritized as important messages for upcoming discussions about scaling the delivery of seed and agricultural technologies to impact the lives of smallholder farmers.

These lessons are neither representative of all viewpoints nor comprehensive in their scope. Some lessons included here we felt were almost too obvious to write down, but we couldn't leave them out. Others we hope will spark conversations and lead to new thinking.

This work is, by design, a high-level snapshot and we recognize that there is much more detailed analysis needed. We also recognize that the real expertise lies among our readers. Therefore we welcome comments about additions, omissions and edits. We will endeavor to include feedback in future iterations of this document and our more in-depth report. Please submit any feedback to the Project Lead at the e-mail address given below.

## Our Team

- Sara Boettiger - Project Lead, Senior Advisor for Syngenta Foundation for Sustainable Agriculture, [sara.boettiger@syngenta.com](mailto:sara.boettiger@syngenta.com)
- Robert M. Goodman, Executive Dean, Rutgers University
- Stephanie Haile - Agribusiness Development Advisor, Fintrac
- Katrin Kuhlmann - President & Founder, New Markets Lab
- Lloyd Le Page - President & CEO, Heartland Global, Inc.
- Hilary Soldati, Doctoral Student, UC Berkeley
- Louise Sperling - Principal Scientist at CIAT - Consultant

## End Notes

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