FEED THE FUTURE
The U.S. Government's Global Hunger & Food Security Initiative

Global Food Security Strategy Technical Guidance
Scaling for Widespread Adoption of Improved Technologies and Practices

This is one of 18 technical guidance documents for implementing the U.S. Government's Global Food Security Strategy. The entire set of documents can be found at www.feedthefuture.gov and www.agrilinks.org.

Introduction

Achieving the U.S. Government's Global Food Security Strategy (GFSS)[1] goals of reducing hunger, malnutrition, and poverty at the population level requires a suite of efforts, which include supporting country leadership, strengthening systems, forming strong partnerships, leveraging resources, strengthening the enabling environment, and programming for widespread adoption of improved technologies and practices (e.g., improved seed varieties and breeds; animal health services; water management practices; processing equipment; insurance; and household feeding, care, and sanitation practices).

Adoption of improved technologies and practices (i.e., innovations) by a small number of potential adopters (e.g., 1,000 people) will not accomplish development goals. For development interventions to yield maximum impact, programming requires a facilitative approach[2] for widespread adoption of improved technologies and practices at the population level (e.g., hundreds of thousands to millions, depending on the innovation and context). Programs need to strategically reach beyond direct beneficiaries through diffusion of adoption, which extends beyond a targeted group.

A great deal is known on diffusion of adoption for innovations such as hybrid maize, cell phones, and the Internet in the developed country context.[3,4] Widespread adoption of improved technologies and practices that supported the Green Revolution in Asia and Latin America is also well studied, and success is largely linked to strong government investment and political will, strong government commitment to implementing an evidence-based policy agenda, disseminating technologies through robust extension systems, and making decentralized resources available to fuel this work, in addition to irrigation to help manage risk.[5,6] Requisite legal, regulatory, and institutional reforms are invaluable for successful scaling and are supported by Feed the Future (e.g., see *GFSS Technical Guidance for Policy*[7]), however, in some cases require an extended timeframe. This guidance aims to offer programming suggestions that are relevant across a range of national support levels. The guidance outlines programing considerations that can be driven by local actors with shorter-term changes in capacity building and the enabling environment, in order to work toward widespread adoption in the timeframe of a project.

Terminology and Context

Scaling is a term that is used in numerous ways by development professionals. People refer to scaling a program,[8] scaling for visibility and action on an issue,[9] and scaling a model. Here, we are specifically discussing scaling the adoption of technologies and practices, with an emphasis on diffusion of adoption.[10] Programming for widespread adoption can be supported by scaling for other goals as part of the process.

Scaling for widespread adoption of proven technologies and practices: The process of sustainably increasing the adoption of a credible technology or practice, or a package of technologies and practices, with quality to retain or improve upon the demonstrated positive impact of the technology or practice and achieve widespread use by stakeholders.

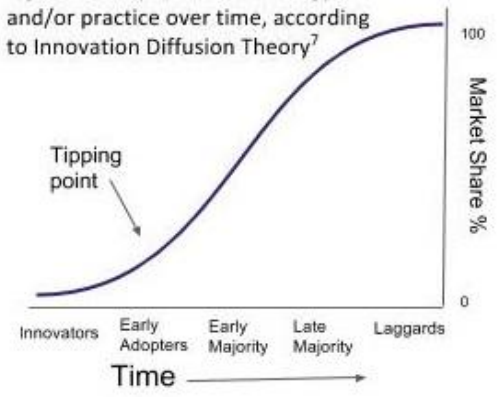
Quality is important both for single practices and technologies, as well as for packages of technologies and practices. As an example, an improved maize variety may require specific plant spacing and fertilizer additions by the farmer. In some cases, farmer alteration of the components of the package can improve upon the recommendation. In other instances, alteration may result in loss of the yield and profit potential of the improved seed variety, either immediately or over time (e.g., through loss of environmental sustainability).

Diffusion is the process by which adoption of an innovation spreads over time among the members of a population.

For projects to reach indirect beneficiaries, they need to consider how to reach the **tipping point.**[11] The tipping point for adoption is reached after a certain percentage of a potential user population adopts the technology or practices. After the tipping point, the rate of adoption increases exponentially and requires less support (Figure 1). Time for reaching the tipping point is context specific but commonly takes years.[12]

Innovators and early adopters—the groups that are first to adopt—are often characterized by a willingness to take risk and may possess a relatively higher level of financial security and social status. Individuals, however, have malleable perceptions of innovations that inform their decisions[13] and the categories are not strict.

Figure 1. Adoption of technology and/or practice over time, according to Innovation Diffusion Theory[7]



Delivery pathways are the means through which technologies and information on best practices are made available for potential adoption and are composed of a range of actors. Diffusion of adoption and getting beyond the tipping point can only happen if innovations are accessible to indirect beneficiaries. In commercial pathways, private sector actors include the manufacturer and delivery actors (e.g., wholesaler and retailer) that make an innovation available to end users (e.g., small-scale producers, processors). Public-sector pathways may use a government program (e.g., extension, community health workers) to produce and deliver an innovation. Public-private pathways can be valuable for moving publicly-funded research products to the private sector for broader distribution. Community-based and civil society pathways may primarily depend on local groups, such as farmers' organizations, savings and loans groups, care groups, and faith-based organizations to support the dissemination of innovations, especially behavior change practices.

Context as related to GFSS

Technologies and practices that support achievement of GFSS Intermediate Results (IRs) are context specific. Some illustrative examples are provided in Table 1.

Table 1. Illustrative list of improved technologies or practices that support IRs when appropriate to the environment, developed with input from end users, and adopted at scale

Increased sustainable productivity (IR 4):[14] Improved seeds, fertilizer, and practices for increased yield and fodder production; storage and drying to reduce post-harvest loss; animal health services; integrated pest management; services for market price information; water management practices; high quality feed for fish
Improved proactive risk reduction, mitigation, and management (IR 5):[15,16] Insurance for risk transfer; financial services, integration of improved weather information
Increased consumption of nutritious and safe diets (IR 7):[17] Growing iron-fortified beans and orange-fleshed sweet potato; post-harvest loss innovations that increase year round availability of nutritious foods
Increased use of direct nutrition interventions and services (IR 8):[15] Micro-nutrient supplementation, improved breastfeeding practices
More hygienic household and community environments (IR 9):[15] Hand washing; separation of small animals from play areas; best practices in irrigation and post-harvest handling
Improved climate risk, land, marine, and other natural resource management (CC IR 2): Cover crops; weather forecasts; seeds and practices for agro-forestry
Increased gender equality and female empowerment (CC IR 3):[18] Processing equipment and mechanization that is accessible by women and relevant for their agricultural activities
Increased youth empowerment and livelihoods (CC IR 4):[19] Mechanization and service provider businesses linked to mechanization.

Improved technologies and practices that are informed by end users and support IRs can come from many sources, including host country institutions, the private sector, and donors. **To fully realize the impacts of research investments, research products must be transferred to delivery pathway actors that promote and enable adoption by end users.**[20] Delivery pathways are critical to getting research investments "off the shelf" and making them available to the people they were designed for. Participatory processes that identify delivery pathways at the start of a design of a project or activity and consider capacities for scaling along the delivery pathway are needed to effectively transfer a research product.[21]

Designing Interventions

A number of factors should be considered to assess if an innovation is likely to scale and to determine the most effective program interventions to promote adoption at scale. The incentives and motivations of end users and delivery pathway actors are critical and depend on the enabling environment[22] (e.g., policy, finance, taxes, subsidies, institutional capacity) and a range of social factors (e.g., cultural norms, labor constraints). Environmental and health impacts are also key concerns. Not all innovations can be scaled, and others are not worth scaling if they are not sustainable.[23]

Three iterative steps are useful for designing interventions for scaling adoption of a technology and/or practice:

- Consider the characteristics of the technology and/or practice that facilitate adoption
- Identify the appropriate delivery pathway category and actor(s)
- Analyze the drivers and enabling environment to determine strategies to facilitate scaling[24]
    - This includes assessing the capacity of the actors along the delivery pathways (See *GFSS Technical Guidance for Capacity Development*[25])

Characteristics of innovations that facilitate scaling

Research has identified characteristics of innovations that increase the likelihood that the diffusion of adoption of an innovation will scale.[26] These are applicable across delivery pathways:

- Relative Advantage: The extent to which an innovation is perceived as more useful than what it supersedes. Perceived advantage may be due to cost or time savings, or reduced environmental impact. Relative advantages differ among groups, and perspectives of youth and women should be considered.
- Compatibility: A measure of how well an innovation is perceived as being consistent with existing values, past experiences and needs of potential adopters. Again, perceptions among youth and women are important considerations.
- Complexity: The degree to which an innovation is easy to understand and use.
- Trialability: The degree to which an innovation may be tested with minimal risk.
- Observability: The degree to which the results of an innovation are visible and repeatable.

A variation on these characteristics is summarized in a Scalability Checklist,[27] which can be a useful tool when designing projects and activities.

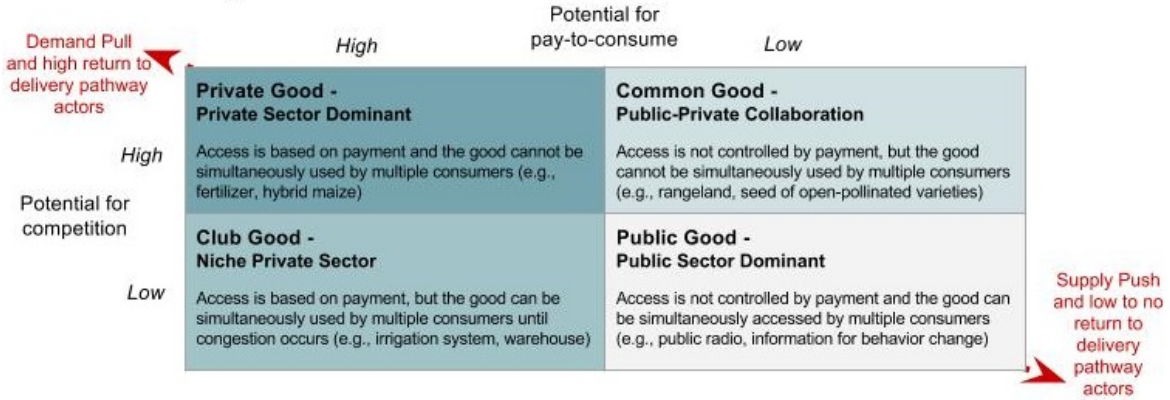
A number of these characteristics have been supported and refined through case study reviews on the scaling of agricultural technologies and/or practices through **commercial pathways** in developing countries:[28]

- Savings on production cost, labor, and time can be equally as important as increased yields.
- Reducing risk for the end user can be more important than return.
- Technologies and/or practices are easier to scale when they are easier to adopt and easier to deliver and service. This includes a few dimensions. Adoption is easier when there are fewer components in the innovation package. Adoption is also facilitated when a technology and/or practice package is either a replacement or an upgrade for an older technology/practice, or if it makes use of existing technology or infrastructure.
- Individual technologies and/or practices and packages must have strong and obvious benefits and address a perceived need. Adoption is easier when benefits are immediate and tangible.

Delivery pathways

A modified categories-of-goods framework can be useful for identifying the appropriate type of delivery pathway for technologies and practices (Figure 2).[29,30] If a technology and/or service can be defined as a private good, because it is profitable to the private sector, then donor funds may be most effective if they are used to reduce or remove initial business constraints. If a technology or service can be classified as a public good, then interventions to scale adoption may require strategic assessment of the public sector delivery options to ensure that broader social benefits outweigh project costs, as well as to confirm that there are clear exit points for donor support.

Figure 2. Categories of goods, with delivery pathways added. A good can fall between categories and it can move between categories over time.



Project efforts should facilitate the removal of main constraints along a delivery pathway (e.g., capacity of actors, improvement of communication channels, or other enabling conditions). For example, implementing partners should not directly deliver improved varieties of seeds to smallholder producers but should address constraints in the seed system and facilitate improvements such that other private or public sector actors will continue to make seeds available to producers without donor support.

Developing a strategy that facilitates scaling

*For **commercial delivery pathways**,* the following considerations have received strong support for programming for successful scaling:[31]

- Identify private sector partners as early as possible.
- Establish that there is a solid business case for most actors in the value chain and potential consumers' willingness to pay.
- Use an adaptive approach that incorporates metrics appropriate for commercial monitoring.
- Support market actors to use a targeted marketing to increase demand.
- Use subsidies and incentives *judiciously* early in the process to mitigate risk for both private sector partners and adopters and have a planned exit strategy.
- Address gaps and weaknesses in the value chain and market system.
    - Access to credit, access to markets, meeting specific buyer demands, and land tenure are key constraints to consider from the smallholder producer perspective and can differ by sex, age, and scale of production.[32]
- Ensure public sector support, even if the government has limited involvement in implementation.

*For other delivery pathways, such as **public-private**, **public sector**, and **community-based**,* factors for successful scaling can vary widely. General points for consideration include:

- Establish that actors within the delivery pathways have a clear motivation and the required capacity.
- Use an adaptive approach based on feedback from the stakeholders.
- Create a targeted strategy to stimulate end user awareness and demand through marketing, promotion, and behavior change efforts.
- Assess the need for demand creation and ensure the strategy to create it is informed by incentives and constraints of the potential adopters.
- Find a champion, or a promoter, of the innovation.
- Knowledge and awareness are important for adoption but often are insufficient for behavior change. Understanding the key elements of behavior change models[33] or conducting barrier analysis[34] can improve adoption.
- Identify cost recovery options to offset public funding and have a project exit strategy.

Programming in Practice

Purdue Improved Crop Storage (PICS) bags in Kenya[35]

Background: PICS bags are hermetic storage bags that cut off oxygen supply to insects to reduce grain loss. PICS bags were originally developed for cowpea in West Africa and were then determined to deliver similar results for other grains, including maize. Purdue University needed financing to help introduce PICS bag into the Kenyan maize market, where post-harvest loss due to insect damage ranges from 5-40 percent. In the spring of 2013, Purdue received a Feed the Future Partnering for Innovation award to pilot commercialization of PICS bags.[36] In 2014, the Feed the Future Kenya Agricultural Value Chain Enterprises (KAVES) project joined with Bell Industries and other manufacturers and distributors to

improve the marketing and availability of the technology. Since then, Bell Industries has sold more than a million PICS bags, helping 270,000 smallholder farmers reduce post-harvest losses.

Characteristics of innovations that facilitate scaling: PICS bags are an upgrade to existing technology (i.e., **compatibility** and **limited complexity**) and have strong and obvious benefits that are **observable**. Demand can be successfully created through "open the bag" ceremonies that clearly show the bags are nearly 100 percent effective.[37] The bags retail for the equivalent of $2.35 US dollars (i.e., **trialability**) and can be used for up to three seasons. The bags increase profit by increasing the quantity of grain that can be sold and also by allowing storage until grain has a higher market value (i.e., **relative advantage**). In addition to profit, PICS bags have appeal to health-conscious farmers because they eliminate post-harvest pesticides (i.e., **relative advantage**).

Delivery pathways and strategies: PICS were a public research investment with an initial public-private pathway. They have transitioned into a private good with a clear commercial pathway. The technology offers a solid business case for stakeholders along the value chain, including the manufacturer, national wholesaler, retailers, and smallholder maize and other grain producers.[38] The success of PICS bags in Kenya has resulted in competition and crowding in of other hermetic storage technology.

Nutrition and hygiene behavior change through peer-based video messaging

Background: In Niger, 44 percent of children under the age of five are stunted. Behavior change is paramount to prevention of stunting, and the promotion of practices that support high-impact nutrition and hygiene behaviors require contextualized social and behavior change communication strategies.[39] The Strengthening Partnerships, Results, and Innovations in Nutrition Globally (SPRING) project and Digital Green created a community-led video approach to promote the uptake of high-impact nutrition and hygiene behaviors to improve nutrition in the African Sahel.[40] In Niger, they started with a pilot of 20 villages, expanded to 115 during the second phase, and then reached 246 villages in the final phase. The approach shows strong diffusion of adoption among individuals within a village with potential to diffuse among other villages.

Characteristics of innovations that facilitate scaling: The videos allowed project efforts to reach beyond direct beneficiaries and prompt adoption throughout a community. Video messages were effective at increasing adoption of new practices because people saw their peers engaged in promoted behaviors (i.e., **compatibility)** that were fairly simple, such as hand washing, having a responsible person present during child feeding and having a separate plate for the child (i.e., limited **complexity**). Messages often demonstrate the **relative advantage** of the practice through testimonies in the video (i.e., **observability**). Recommended practices could be tried with minimal risk (i.e., **trialability**).

Delivery pathways and strategies: Video messaging was the means to create behavior change and information was delivered as a public good with a public pathway. Pilots are underway to test engaging entrepreneurs in video messaging for nutrition.[41] Digital Green incorporates culture by making videos in local languages and casting community members as local "stars." Community groups are involved in production and dissemination. Viewing events have a facilitated Q&A session and an active storyboarding component that incorporates feedback from and engages the audience. Events are organized to include both women and those who have influence on women's decisions, addressing a social norm that women have limited decision making power.

For questions and comments, please contact: ftfguidance@usaid.gov.

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