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GUIDE TO THE AGRICULTURAL SCALABILITY ASSESSMENT TOOL

FOR ASSESSING AND IMPROVING THE SCALING POTENTIAL OF AGRICULTURAL TECHNOLOGIES

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E3 Analytics and Evaluation Project

DISCLAIMER

CONTENTS

ACRONYMS

ARP	Office of Agricultural Research and Policy (USAID/BFS)
ASAM	Agricultural Scalability Assessment Matrix
ASAT	Agricultural Scalability Assessment Toolkit
ASDT	Agriculture Scaling Decision Tree
BFS	Bureau for Food Security (USAID)
CGIAR	Consortium of International Agronomic Research Centers
CP	Commercial Partner
FAO	Food and Agriculture Organization (United Nations)
FTF	Feed the Future
GNI	Gross National Income
IFAD	International Fund for Agricultural Development
KII	Key Informant Interview
MPI	Markets and Partnership Initiatives (USAID/BFS)
MSI	Management Systems International
NGO	Non-Governmental Organization
PI	Principal Investigator
POC	Point of Contact
SAT	Scalability Assessment Tool
USAID	United States Agency for International Development
USDA	United States Department of Agriculture

INTRODUCTION

Background

USAID's Bureau for Food Security (BFS) and country missions have been implementing the Feed the Future (FTF) food security initiative since 2010. In many cases, small-scale innovations developed and introduced by FTF have since scaled up or are in the process of doing so. However, some innovations that could have gone to scale have not done so, have not reached their full-scale potential, or are not fully sustainable at scale.

At the same time, the BFS has funded research by the Consortium of International Agronomic Research Centers (CGIAR) and innovation laboratories at major U.S. agricultural universities. This research has produced hundreds of innovations with varying potential to transform agriculture in developing countries, as well as more that are moving through the research pipeline. The Agency needs to be able to decide which innovations have the greatest potential for both successful scaling **and** significantly improving food security and reducing malnutrition across FTF countries and elsewhere.

To this end, BFS asked the E3 Analytics and Evaluation Project, led by Management Systems International (MSI), to develop a toolkit to assess the scalability of agricultural innovations. The resulting Agricultural Scalability Assessment Toolkit (ASAT) draws on 15 years of experience by MSI and its team lead for this research, Dr. Richard Kohl, in scaling innovations and programs in the developing world, as well as on the literature on scaling and diffusion of innovation. This work includes extensive experience assisting FTF project design and strengthening scaling strategies, and five case studies the MSI team conducted of successful scaling up of agricultural innovations through commercial pathways in developing countries.

Purpose of the Agricultural Sustainability Assessment Toolkit

The ASAT is designed to provide a qualitative appraisal of an innovation's scalability. While innovations do have intrinsic features that may make them more or less scalable in general, most of the factors affecting scaling potential can only be assessed relative to a specific socio-economic context and the characteristics of target adopters. The ASAT provides information on the strengths and weaknesses of the innovation relative to scalability, the most promising scaling up pathways (i.e., commercial, public, or public-private partnerships), and information on the extent to which target contexts -- locations and populations – and their market and public-sector capacity currently facilitate scaling.

The ASAT is not meant to be **the** decision-making toolkit. Instead, the toolkit is intended to identify constraints to and opportunities for scaling. These will serve to inform decisions about whether, and where, to invest in the scaling up of specific innovations, or for further investment in research and development. The ASAT can also inform design efforts to improve the scalability of an innovation, improve and strengthen market and public-sector systems to facilitate scaling, or both. The ASAT's greatest value is not the scoring per se, but in the assessments behind the scoring and the conversations provoked in making and justifying an assessment. It is strongly recommended that the ASAT be applied by a team comprised of at least three people: a researcher with knowledge of the relevant sector, a markets expert, and someone with considerable knowledge of the country(ies) or region(s) targeted for scaling.

The ASAT is specific to agriculture, although with some changes it could be applied to other sectors. It is designed as a generic tool for all types of agricultural innovations, from improved seeds and agricultural equipment to vaccines, phytosanitary products, and good agricultural practices. As such, it is designed at a level of generality to be applicable to the broad variety of agricultural innovations. It should

be able to help introduce consistency in scaling decisions across various agricultural innovations, and, in a sense, serves as a form of due diligence. At the same time, should BFS or other users choose, it can be modified for different innovations, such as new seed varieties or breeds.

ASAT Components

The ASAT consists of two components, or tools: an Agriculture Scaling Decision Tree (ASDT) and an Agricultural Scalability Assessment Matrix (ASAM). A dashboard also summarizes the results of the tools and provides recommendations based on that analysis. The ASDT is used to help select the appropriate scaling up pathway for an intervention (i.e., private, public, or donor driven). It should be applied first, since scoring via the ASAM is contingent on the choice of pathway.

When referring to potential scaling up pathways, it is important to keep in mind that in almost all cases, the scaling up of agricultural innovations is a multi-stakeholder partnership. Even when one sector plays the predominant role in scaling, other actors (e.g., USAID and other donors, private and public sectors, non-governmental organizations [NGOs]) are almost always involved even if minimally, such as in sanctioning and legitimizing scaling. "Public" or "private" scaling here refers to the type of organization(s) that are driving the scaling effort and doing much or most of the work.

A second caveat here is that the relative importance of different sectors may change over time. In the early stages of creating demand and strengthening market institutions, a donor may play the predominant role. Once the market is established and risk is reduced, the private or public sector may then drive scaling.

The ASDT prioritizes commercial scaling as the preferred choice, along with public-private partnerships. In other words, it prioritizes any pathway that is likely to achieve something approaching potential scale, retain impact, and is financially and institutionally sustainable. This favors pathways that primarily leverage domestic 'resources' in the broadest sense of the word (i.e., pathways that are profitable for adopters and value chain actors, and/or where there is public fiscal support and institutional capacity already available). For a largely commercially driven scaling pathway to be viable, one or more upstream or downstream private sector actors must have the means (e.g., financial resources, organizational infrastructure technical knowledge) and incentives (e.g., profitability or 'the business case', taking into account risk) to scale the innovation. Upstream actors are importers, producers, or distributors of the innovation who assess they could make enough money off the innovation at scale to justify assuming the costs of scale. Downstream actors are usually processors, buyers, and especially exporters.

The preference for private sector scaling is based on two assumptions. First, in many developing countries – especially low-income and the least developed countries – the public sector lacks the resources, incentives, and ability to scale, let alone to do so sustainably. Second, donors have neither the mandate nor resources to support scaling beyond five to ten years, let alone sustainably on an ongoing basis. If scaling is profitable for private sector actors, in contrast, it is likely to be sustainable and to eventually achieve something approaching maximum potential scale.

For the sake of simplicity and ease of use, the ASDT considers four primary tasks involved in scaling to determine the preferred pathway. These are the resources, incentives, and ability to: (1) produce and distribute the innovation (upstream activities); (2) drive scaling overall; (3) create demand among target or potential adopters; and (4) provide training and technical support to adopters to be able to implement and apply the innovation correctly. The ASDT does not use the strengths or weakness of private or public organizations (e.g. the value chain), or the lack of what Hartmann and Linn call 'space' for scaling up. Instead, weaknesses in the value chain or other organizations are likely to be revealed by

the ASDT and ASAM. The presumption is that should such constraints be identified, or space lacking, in most cases donor intervention will be required to address them.

Once a pathway has been identified with the aid of the ASDT, the next step is to apply the ASAM. The ASAM focuses on the factors that would indicate that a commercial pathway is viable. It identifies critical information gaps and provides a more granular analysis of the strengths and weaknesses of the innovation. While designed for commercial pathways, the resulting assessment can inform scaling through other pathways, such as whether the public sector enabling environment is supportive of scaling (this is different from whether the public sector is able to drive scaling).

The ASAM has six sections (groups A-F) and 39 criteria (see Table 1). Each section focuses on one major issue essential for scaling and the criteria for that issue. The tool provides quantitative scores for each of the 39 criteria and unweighted totals for the 6 sections. It does *not* provide an overall score, which would be misleading. For example, poor scores on just a few criteria may indicate scaling challenges even if the overall score was high; this is often true of innovations that have some or all of the characteristics of public goods. Perhaps more importantly, an overall score conceals the wide variation in individual and section scores that provide vital information for making informed decisions about scaling and the user must assess the tradeoffs involved in terms of impact and effort required.

The ASAT can inform decisions regarding scaling an innovation at each stage of research, testing, piloting, planning, and implementation. The tool can be used to integrate scaling up considerations, assess progress, decide whether scaling up makes sense, and modify current approaches to innovation design, testing, and scaling, based on new evidence. A partial list of other uses includes: (1) identifying areas where scalability of an innovation could be improved so they can be included in the objectives of phase II or phase III research; (2) creating the foundation for a scaling strategy for a new procurement; (3) designing a scaling strategy prior to implementation; and (4) monitoring the scaling process during implementation. Hence, the ASAT can be used several times during a project, from research and design through implementation. In fact, it is recommended that the ASAT be used iteratively at each stage from research to scaling strategy to implementation, to track progress through each phase.

General Considerations for Scoring

The ASDT's scores are binary. For example, either there is or is not a private sector actor(s) with the resources and incentives to drive scaling. Each of the four scaling tasks are considered sequentially. If the private sector cannot undertake that scaling task, the ASDT assumes that that sector cannot undertake subsequent tasks. The ASDT then assesses whether the public sector can perform that task (and subsequent tasks). If the public sector cannot, the ASDT assumes a public-private partnership, perhaps initially supported by a donor, at least to achieve scale over the medium term. For each of the four scaling tasks, the ASDT does contemplate a "maybe," if actions can be taken to shift a "no" to a "yes" (discussed below).

For the ASAM, after exploring both binary and 1-5 scoring options, the MSI team concluded that scoring from 1 to 3 achieved the best balance between economy of use and capturing needed information.[1] (Additional flexibility can be achieved, if desired, by scoring a 1.5 or 2.5, effectively a 1-5 approach). Each criterion in the tool has equal value in principle, and the importance of broader topics, i.e. each section, *de facto,* have been weighted by the number of criteria in each section. Part of the art of applying the ASAT is to identify which criterion represents binding or blocking constraints – red or yellow lights – for a particular innovation in a specific context.

[1] This conclusion was based on retrospective applications of the ASAM to known cases of scaling.

The ASAM is designed for ease of use and scoring. Nonetheless, hands-on experience with scaling and knowledge of the innovation and context is needed to comprehensively analyze the relative importance of all the variables (particularly the "facilitating factors").

TABLE 1: SUMMARY OF THE AGRICULTURAL SCALABILITY ASSESSMENT MATRIX: ISSUES FOR USAID AND DONOR CONSIDERATION

Group	Issues Covered by this Group	Research, Policy, and Project Design Issues
A	Importance of the issue the innovation addresses (i.e., objective and subjective development priorities)	• How important are the issues and target beneficiaries and locations to USG and USAID's policy priorities? • How important is the issue to national and local governments and to target beneficiaries? • To what extent is the issue a felt or expressed need of beneficiaries versus an objective need identified by experts?
B	Credibility and observability of the innovation with key stakeholders and adopters	• What are USAID's standards for sound evidence of impact and comparative effectiveness? How do they align with the perceptions of potential adopters and in-country organizations? • Who within the USAID research-to-project pipeline has the responsibility and resources for obtaining regulatory approvals if they are a prerequisite for scaling up? • How does USAID's choice of research partners affect an innovation's credibility?
C	Ease with which the innovation can be tried, purchased, adopted, and implemented effectively by producers (or the target adopter)	• How do USAID-supported researchers consider ease of adoption vis-à-vis complexity, existing practices, installed equipment, and technology? • How can the innovation be modified or simplified to ease adoption? • How willing is USAID to invest in training and extension support where domestic systems to provide those services are weak?
D	Potential benefits or business case for potential adopters	• What evidence do USAID-supported research and country projects produce on profitability, risk, and intangible benefits? Cost of adoption? • How can the innovation design be modified to improve financial and intangible benefits? Reduce the variability of benefits, i.e., make impact robust across accuracy of implementation? • What is the multi-dimensional cost (e.g., including needed additional inputs) of adopting the innovation for producers? • Does this full-package cost substantially increase the investment needed compared with existing technology that the innovation replaces? • How is the potential for counterfeiting and anti-fraud considered in innovation design?

Group	Issues Covered by this Group	Research, Policy, and Project Design Issues
E	Business case for value chain actors and strength of the overall market system *(this applies primarily to commercial pathways)*	• What evidence does USAID-supported research produce regarding the profitability of playing a role in scaling for relevant upstream and downstream value chain actors? • What would USAID projects need to do to strengthen value chains and market systems? What would USAID projects need to do to ensure that complementary services are in place? that the innovation and complementary services are accessible to small farmers and are in marginal areas? • What are USAID or USAID-supported projects willing to do to motivate and build capacity of private sector actors to scale innovations successfully? • What are USAID or USAID-supported projects doing to boost demand or create a market for any (increased) output resulting from scaling (if needed)?
F	Public sector enabling environment is in place that supports commercial scaling *(this applies primarily to commercial pathways)*	• What will/do USAID projects do to ensure public policy, budgets**,** and programming are supportive of scaling of the innovation? • If public sector-driven scaling is appropriate, what are USAID or USAID-supported projects willing to do to motivate and build capacity of public sector actors to scale innovations successfully? • What will/do USAID projects do to ensure that complementary public infrastructure and services are in place?

Limitations of the ASAT

Although the ASAT is intended to guide and inform decision-making, it should not be relied upon solely for decisions on whether to invest resources in research and testing or scaling. These should be informed by practitioner insights, market and subject matter experts, and USAID's policy priorities and perspectives. The developers of the ASAT strongly recommend that it be viewed as a tool for facilitating discussion of the scalability of an innovation among relevant "experts" and stakeholders.

As noted above, it is strongly recommended that the ASAT be applied by a team of at least three people: a researcher with knowledge of the relevant sector, a markets expert, and someone with considerable knowledge of the country(ies) or region(s) targeted for scaling. This is to focus on the underlying justification for scoring as opposed to the scores themselves, as well as to create broad buy-in to the outcome. The subjective nature of scoring is another reason why the tool should be used collectively by a team or small committee.

The quality of the assessment and, particularly, its subjective elements will be determined by both the information available and the knowledge of those conducting the assessment. Assessors should have sufficient knowledge of the innovation, the potential or actual adopters, the market ecosystem and value chain, and the policy enabling environment. In most cases, the accuracy of any assessment of a specific innovation will improve as the innovation moves through the "scaling pipeline" and more information becomes available on these issues.

Finally, it is not possible to rigorously validate the accuracy of the ASAT scoring. This would require some external, objective measure of scalability with which to compare the ASAT scores, and such a measure does not exist. Even *ex post* scoring using successful and unsuccessful cases of scaling is problematic. Success depends on the quality of the scaling strategy, the implementation of the scaling strategy, and unpredictable events. As USAID and other donors gain more actual experience with scaling up innovations, the experience can and should be used to fine-tune and improve the criteria, scoring, and retrospective learning about how to improve the application of the ASAT.

Intended Audience

The intended users of the ASAT are:

- BFS staff in Washington, DC. For example, staff in BFS' Office of Agricultural Research and Policy (ARP) can use the ASAT to identify and specify scaling considerations when deciding which research to support or reinvest in, or when providing feedback to improve the scalability of research proposals.[2] Staff from USAID/BFS' Office of Markets, Partnerships, and Innovation (MPI) can use the ASAT to inform decisions on which innovations to support in multi-country scaling efforts, or which are better suited to scaling through public- versus private-sector pathways. Ideally, in both cases, staff from MPI and ARP would participate in each other's applications of the ASAT, and possibly those of other BFS staff, such as country support officers or relevant regional or mission staff.
- Relevant staff in USAID country missions. Agency officers working in country missions can employ the ASAT to assess which current projects, or components of projects, have the most scaling potential. They can also utilize it to integrate scaling considerations into project design. Finally, the ASAT can be used to monitor progress in scaling up over time, and to negotiate

[2] This could include designing a modified version of the ASAT specifically for ARP staff to apply to innovations as they move from basic to applied research and implementable innovations.

modifications in work plans, cooperative agreements, and contracts.

- Other donors working in agriculture and rural development.
- USAID's research partners. Researchers in CGIAR institutions and innovation laboratories can use the tool to integrate scalability into their work or proposed research and ensure that research produces information that will help facilitate successful scaling up. This will be particularly appropriate as innovations move from phase II to phase III.
- Implementing partners will be able to use the ASAT to guide their proposals in response to requests for applications and requests for proposals, and to monitor and evaluate their progress in implementing scaling-up activities.

Design Team Composition

The research and design team that prepared the ASAT and this guide was led by Dr. Richard Kohl of MSI, an economist and internationally recognized expert on scaling up. For the past five years, Dr. Kohl has been working with BFS and missions to improve scaling up strategies for FTF programs and innovations. Additional writing and research support was provided by Colm Foy, Jeremy Gans, Amanda Kitanga, and Antoinette Melnyk of MSI. The team is also grateful to Wanda Ollis, who provided invaluable suggestions on the criteria and scoring mechanism.

SCORING GUIDANCE AND INSTRUCTIONS

Scoring the ASAT requires the assessor(s) to first collect relevant material about the innovation as indicated by the scoring criteria, such as what it takes to adopt and implement it, its effects on production and incomes, and its business case for both buyers and sellers. Equally important is information on the country context – current technologies the innovation would replace or displace, the strength and coverage of the relevant value chain institutions (production, distribution and sales, marketing and processing), the strength and availability of training and technical support through public or private extension services, and the strengths and weaknesses of the public sector enabling environment for agriculture.

Once this information is collected, the assessment team should then use the ASDT. The decision tree allows the team to determine the best overall pathway for scaling up (i.e., public, private, or donor-driven) as well as the general roles the other stakeholders can play in the scaling process. After determining the pathway, the team should apply the ASAM to the innovation in the context of that pathway.

Data Collection

Applying the ASAT requires a significant amount of quantitative and, especially, qualitative data. (At the research and proof-of-concept stage of development, some of this information may not be easily available. This reinforces the case for using the ASAT at several stages of development as progress is made). It is assumed in this guide that in most cases, the assessment team will not have the opportunity to conduct field visits and interview actual or potential adopters. The primary sources of data and other inputs are key informant interviews (KIIs) with the innovation's research team, its in-country collaborators, and collaborators from the private sector. Information gathered from sources within target counties is particularly valuable, especially about the actual experiences of adopters who have tried the innovation in field trials or small-scale pilots. Open-ended interviews can add nuance and allow for a range of secondary questions tailored to specific projects and innovations. Annex B provides

sample questions that could be used in KIIs with primary researchers, in-country research partners, and private sector partners.

The following information is needed to use the ASDT and ASAM:

- **The Innovation:** Components, how it works, complementary technologies needed to reproduce impact, related agricultural practices, and cost of adoption.
- **Likely Adopters:** Their location, technologies they currently use, financial resources and constraints, land and labor resources, access to inputs and markets, formal education, and relevant agricultural experience.
- **Existing Practices:** Relevant agricultural crop and livestock practices, capital equipment and crop calendar of potential adopters, and social norms, particularly, the gender division of tasks and labor, both relevant to the innovation and in the smallholder household generally.
- **Agronomic and Financial Impact (or the Business Case) of the Innovation:** Impact on production or use of inputs (cost savings), and the financial risk and return of adoption. Particularly important are the sources of variation in impact (e.g. weather, pests, use of complementary inputs, or correct implementation of agricultural practices).
- **Alternative Technologies:** Substitute technologies being used to address this issue; new alternative technologies recently released or under development, and the productive potential, financial risks, and returns of both existing and new alternatives.
- **Regulatory Environment:** Requirements for formal regulatory approval and registration of the innovation, existence and enforcement of anti-fraud policies, the politics of who may support or oppose this innovation.
- **Public Sector Enabling Environment:** Relevant agricultural policies, budgetary priorities and public resources, applicable subsidies, and the strength, knowledge and coverage of the Ministry of Agriculture (or sub-national government units) in providing extension services and other support.
- **Market System and Value Chain Linkages:** Strength and number of upstream and downstream actors in the value chain, any vested interests, technical knowledge relevant to producing and distributing the innovation, volume of throughput capacity, and their willingness and ability to drive scaling in the areas and populations targeted for scaling up.

In addition to interviews, data to inform the ASAT scoring can be gathered through literature reviews and reviews of statistical data (and associated calculations). Where possible, multiple approaches should triangulate key questions and cross-check subjective information. The primary source for most of this information will be KIIs, which should be held with at least three stakeholders:

1. The USAID contract or grants manager, contracting/agreement officers, or point of contact (POC) for the research or innovation development.
2. The research team lead, chief of party, or principal investigator (PI); or relevant team members (or both) for the innovation.
3. One of the in-country research partners, the commercial partner (CP) involved in testing and production (if one exists), and preferably both.

This information can be supplemented with a review of research or project documents that can be obtained from the POC, PI, in-country research partners, and, possibly USAID's Development Experience Clearinghouse. Most of the innovation laboratories and CGIAR institutions have general websites as well as project-specific websites.

Finally, reviewing relevant documents about the size of the overall sector (production, area planted or harvested, and/or number of livestock) and agricultural or livestock-management practices is helpful. Studies of various sectors and practices can be found on some CGIAR websites (see Annex C).

Scoring the ASDT

The ASDT is a decision tree that identifies promising pathways for scaling up an agricultural innovation. The three common pathways are defined by who drives the scaling process *and* continues to deliver the technology, product, or service at scale on an ongoing basis (i.e., sustainably). The pathways are: (1) private sector-led scaling, (2) public sector-led scaling, and (3) public-private partnership-driven scaling, As noted above, almost all efforts to scale agricultural innovations are multi-stakeholder partnerships. Hence, the ASDT seeks to answer the question of who has the capacity and incentives to drive and lead the scaling process. Note that the same pathway may not be appropriate for all countries, given wide variation in the strength of the public and private sectors.

The ASDT prioritizes a commercially-driven scaling pathway, then a public-sector pathway, and, finally, a public-private partnership pathway with possible donor support. Exclusive donor-driven scaling takes place when none of the other pathways is initially viable. It can occur for a limited time while a market is created, or the organizational capacity of value chain actors is strengthened but is unlikely to be sustainable. Creating the foundations for this transition makes one of the other pathways viable, at which point a "handoff" or "exit" strategy can be implemented. In rare cases when sustainability is not an issue, such as when once scale is reached there is no ongoing role for an actor to play, donor-driven scaling can potentially go to full scale.[3] In most cases, donor-driven full scaling will encounter significant costs and challenges to achieve and maintain sustainability.

The two principal criteria for choosing the private-sector pathway are whether: (1) most, if not all, of the necessary private (or public) value-chain elements are in place; and (2) there is a strong business case for at least one actor absorbing the costs and risks involved in driving scaling up. There are many situations (innovations and contexts) in which private actors should *not* drive scaling, or where value-chain actors are weak or missing, or both. In some of these situations, a USAID or donor project can both create a business case and strengthen the value chain. The former often involves absorbing the initial costs of building awareness, creating a critical mass of demand, providing training and technical support to early adopters, and introducing financial innovations to improve producers' ability to pay. Strengthening the value chain can often mean putting in place a reliable source of supply of the innovation, such as seed producers, certification, and distribution, *and* downstream market linkages to ensure a market for the expected production increase. A donor project may also work to improve the scalability of the innovation package itself, such as through simplification, bundling it with other products or services, or converting it to a service.[4]

In other situations, creating a viable business case may not be feasible, at least not in the medium run. This is often the case with innovations that are characteristic of public or quasi-public goods.[5] One

[3] The most common examples of this are from outside agriculture (e.g., a vaccination campaign to eradicate polio). Examples from agriculture might include the introduction of new agricultural practices that require no ongoing support (e.g., the transition from broadcast to line/row planting).

4 An important, but often overlooked, intervention that can improve scalability is redefining what the innovation itself is (i.e., what is in the bundle of components of the innovation package). This is often referred to as bundling or unbundling. For example, production and delivery of improved open pollinated variety seeds for staple cereals are not profitable for producers or distributors because of the low margins and low value to weight ratio. However, if, maize seeds were bundled with improved poultry breeds and higher value-added products like vaccines and medicines, for example, this package might make sense for all actors.

[5] Public goods are innovations or technologies in which the benefits, especially positive externalities or social benefits, are

example is the provision of animal vaccines. When the social cost of outbreaks is greater than the private cost, it may not make sense for non-commercial farmers to vaccinate. The scaling strategy may be publicly funded vaccinations for the whole country, or a vaccine stockpile only to be used in cases of outbreaks or to contain outbreaks to a specific area.

In deciding which scaling pathway is most appropriate, one should first determine the goals for scaling up the innovation, particularly the context in which scaling will occur. Such goals include the location(s) where adoption is expected to occur, the target adopters and their demographic characteristics, the number of expected adopters relative to the total potential, and the expected impact on those adopters (especially in relation to impact measured at the research or pilot stage). Location usually depends on where sufficient quantities of relevant crops or livestock are produced, the needs and demand of adopters, and the agroecological conditions under which the innovation can prove useful. Sometimes it can make more sense to begin scaling in a location or with adopters who are not the primary target, e.g. larger farmers versus smallholders, to create a market and sufficient scale to make it profitable for private actors and a demonstration effect.

Similarly, where the potential for adoption encompasses multiple countries, it is recommended that scaling be done sequentially or in phases, with the explicit strategy of creating a demonstration effect and a base for production. This means beginning in countries with stronger market systems and good public-sector infrastructure,[6] then pursuing a regional hub-and-spoke strategy. For many agricultural innovations developed by FTF innovation labs or CGIAR partners, scaling up should be initiated in countries that have participated in the research, and with whom partnerships exist. This means research projects should take into account future scaling as one criterion in the selection of their in-country research partners. Such criteria would include:

- The name recognition, status, and political influence to legitimize the innovation;
- The organizational capacity to fill some of the necessary tasks in scaling; and
- A location in a country where there are many potential adopters and suitable agroecological conditions.

The choice of location allows those applying the ASDT to understand the country context(s) for scaling. Once this is known, deciding (tentatively) on an appropriate pathway, or the relative pros and cons of different scaling pathways, requires an initial scoring of the ASDT. A private-sector pathway is viable only when there is a viable business case for adopters, and upstream and downstream actors with capacity and technical knowledge are present. The viability of a public-sector pathway depends on alignment with public policy goals and priorities, budgetary resources, a public-sector organization with the mandate and political will[7] to scale up, and the capacity to produce, deliver, and support adoption of

strong enough to support the public cost and are insufficient to attract private-sector actors. In other words, where private actors who produce, sell, or buy the good realize little, if any, of the social benefits, and the private benefits do not justify the cost of production or purchase. The technical definition of public goods is that they are non-excludable (i.e., even if someone does not buy the good, they can still benefit from it as when there is a 'free-rider' problem) and non-rivalrous (i.e., the use of the good by one consumer does not use it up or prevent someone else from using it at the same time). The classic example of a public good is national defense. In agriculture, vaccines are good examples of public goods. Because large-scale adoption of a vaccine by a human or animal population creates herd immunity, those who have not vaccinated themselves or their livestock still benefit and cannot be excluded from the benefit. Technically, a vaccine does not meet the non-rivalrous criterion – if one uses a dose of vaccine, it is finished; no one else can use it. However, herd immunity benefits others since it nearly eliminates the spread of disease, i.e. creates a free-rider problem.

[6] Certain countries in certain regions tend to be leaders or early adopters, such as Kenya in East Africa, Ghana in Anglophone West Africa, Senegal in Francophone West Africa, and Ethiopia in the Horn of Africa (the Northern, more arid part of East Africa).

[7] Political will can be created through advocacy, or, in the case of the private sector, marketing. This means devoting time and resources to identifying: (1) the target organizations (stakeholders) that would drive, finance, and implement scaling; (2) their

the innovation at scale. Another way to consider the ASDT, then, is to identify organizations or actors in the desired location(s) with the capacity and incentives to drive and sustain scale. If neither the private nor public sectors are capable of driving scaling up, at least initially, the ASDT can identify the weaknesses or missing links in fulfilling those roles, and, by implication, what might be done to address them in the context of a public-private partnership, possibly initiated by a donor project.

The ASDT is meant to be a simple tool. It examines only the four tasks for scaling noted below, plus a prior condition – whether the adopter is willing and able to purchase the innovation. Once this condition is met, commercial scaling becomes potentially viable, and the other four tasks can be considered in turn. (If this condition is unmet, the viability of public sector scaling should be explored). The four tasks for determining the preferred scaling pathway are:

1. Production, distribution, and sales of the innovation (all upstream activities).
2. Driving scaling: Being responsible for the overall organization and coordination of the tasks, even though other actors or stakeholders may themselves perform or assist in performing some of those tasks.
3. Creating demand: Providing education, outreach, information dissemination, marketing, and demonstrations to inform potential adopters of the agronomic benefits, business case, and other reasons to adopt the innovation.
4. Providing training and technical support to adopters as they learn to use and implement the innovation.

Table 2 reproduces these tasks, along with the criteria to assess whether the private or public sector can fulfill each task. Annex D provides a diagrammatic version. Each criterion should be scored *NO* or *YES*. If the initial assessment is *NO* and there is a possibility that certain actions could change it to a *YES*, then *MAYBE* should be chosen.

institutional incentives; and (3) other actors or evidence that would convince them to play their expected roles. This latter point implies that early scaling efforts must create the foundations for scaling up *and* generate effective evidence for an advocacy or marketing campaign.

TABLE 2: CRITERIA FOR SCORING THE ASDT

Task	Criteria for Commercial Sector Performing Task	Criteria for Public Sector Performing Task
Production (importing), distribution, and sales of the innovation	For the commercial sector to produce, distribute, and sell the innovation as part of scaling, four conditions must be met. 1. There should be one or more actors at each upstream link with the resources, equipment, infrastructure, and capacity to fulfill that role. 2. Each private actor must be able to make a profit to justify engagement (i.e., a strong business case). Risk must be considered where demand is not certain or persistent. 3. Private actors must have the financial resources to make any necessary investments to (a) increase production volumes; (b) install new or upgrade existing production technology and equipment, and (c) train workers in the new technology and equipment. 4. Private actors must have affordable access to inputs in sufficient volume (e.g., breeder or foundation seed). If one or more of these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint.	For the public sector to produce, distribute, and sell the innovation as part of scaling, four conditions must be met. 1. A public-sector organization (e.g., ministry, agency, parastatal) must exist, and must have the mandate, portfolio, and bureaucratic incentives to fulfill that role. 2. The organization must have the equipment, infrastructure, and capacity to produce, distribute, and sell at sufficient volume (or at least the first two, sale may be viable through private outlets depending on pricing). 3. The public actor must have, or be able to get, a sufficient budgetary allocation for the investment and operating costs to perform these roles or be able to keep the proceeds from production and sales to finance its operations (assuming these would cover costs). The lack of financing can adversely affect bureaucratic incentives, especially when the wholesale or retail price is subsidized. 4. The public actor must have the incentives to respond to market demand (e.g., produce the right kinds of breeder, foundation, and certified seed, if necessary). If one or more of these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint.
Driving, managing and coordinating the overall scaling process	The business case for the private sector is sufficient to justify intangible investments in managing and driving the scaling process that will eventually be recuperated once a large-scale market is developed. A key consideration for private organizations is not only profitability and the size of the potential market, but also market share. If these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint, particularly through risk mitigation, subsidies, co-investment, or other incentives.	A public-sector organization (e.g., ministry, agency, parastatal) exists with the mandate, portfolio, bureaucratic incentives, and technical capacity to fulfill that role. If a mixed-model, or public-private partnership, is considered (i.e., private sector may play some roles, such as in distribution and sales, or ultimately assume full responsibility once scale is reached), public sector technical capacity must include an understanding of private sector operations and commercialization generally. If one or more of these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint.

Task	Criteria for Commercial Sector Performing Task	Criteria for Public Sector Performing Task
Creating demand	Private sector actors will be willing to engage in education, awareness building, advertising, marketing, demonstration sites, etc., if they believe they can realize returns on their investment in the future and have sufficient market share (as above). If these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint, either by creating some initial demand and evidence that there is a market, or through risk mitigation, subsidies, co-investment or other incentives.	A public-sector organization exists with the mandate, portfolio, bureaucratic incentives, and technical capacity to create awareness. Public sector technical capacity should (a) include an understanding of advertising and marketing, and (b) make a business case beyond the technical and agronomic merits of the innovation. These are less relevant in the case of a public good. If these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint, particularly through training and capacity building or support for alternative delivery or complementary mechanisms.
Providing training and technical support	Based on an estimate of the training and support needed for correct implementation and utilization– in other words, what is involved in ensuring this– will private sector actors be willing if these costs can be covered by the absolute value of profit margins (i.e., dollars, not percentages)?[8] This tends to be the case with higher-priced point items, such as agricultural machinery. Sometimes, a business case can also be made for high volume/low margin items, especially if repeat purchases (e.g., of hybrid seeds) can be expected over several years. If these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint, particularly through training and capacity building, or support for alternative delivery mechanisms (e.g., radio, cell phones, tablets, etc.).	The public sector's extension system, or its equivalent, has the financial and human resources, geographic coverage, and technical expertise to provide training and technical support. In many cases, key questions can be the number of extension officers, their training, pay, access to transportation and fuel, and accountability. If these criteria are not met, make a note of it along with how a USAID/donor project might address this constraint, particularly through training and capacity building or support for alternative delivery mechanisms (e.g., radio, cell phones, tablets, etc.).

[8] The following should be taken into account: financial cost per adopter or group of adopters, the period of time, whether it can be delivered to existing groups, and how sophisticated the provider is (e.g., can agro-dealers do it?).

The four scaling tasks are, to a great extent, logically dependent on one another, at least for the viability of commercially-driven scaling. In other words, if the adopter is not willing and able to buy the innovation (the absence of a market), the private sector would have no incentive to drive scaling, create demand, or provide training and technical support. (The assumption is that creating demand and providing training and technical support are needed. Few innovations do not require training or support for adopters to utilize the innovation correctly and acquire the full benefits and impact).

Before considering the four scaling tasks, the ASDT requires the user to assess *whether the key pre-condition for commercial scaling up is met* (i.e., whether potential adopters are willing to pay for the innovation – a business case for the producer). This should be evaluated according to the following criteria:

- The adopter can expect to make good *financial* returns on the adoption.
- The adopter has the *financial means* to afford the innovation, or has access to financing on terms that still permit a good financial return. Financial means is defined has having access to the necessary cash or liquidity, or can be expected to generate and sell a marketable surplus that would pay for the innovation.
- The risk or variability of those returns are low so that even less-skilled farmers, or farmers with less productive land or other assets, will realize profits in most years.
- The risk or variability of those returns is low with regard to normal variations in the weather, pests, and disease. These should be taken into account in light of climate change and the increasing incidence of adverse weather (droughts or floods).

Many of these questions can be answered by using a crop (or livestock) budget, gross margin analysis, or the equivalent. It requires knowledge of the average expected impact of the innovation on production and/or costs, labor and other inputs, prices for the innovation and other inputs, as well as output prices. However, as the ASDT highlights, causes of risk (e.g., variance in impact), are important. Often research projects do not produce these data but ideally to assess scalability these data need to be available.

If there is a business case for the producer, the user should assess the first task in terms of its viability for the commercial sector. If the assessment is *YES*, the user would then assess the viability of the second task for the commercial sector, and so on. If the answer is *NO*, the user should assess whether any of the potential interventions listed above would shift the score to a *YES*. If so, consider the next task. If the initial or ultimate score for the commercial sector is a *NO*, the user should move over to the public side of the table for that task *and all subsequent tasks*.

The ASDT assesses the private sector's ability to engage in going to scale at a moment in time. It may be that significant training, capacity building, and co-investment of private sector actors may change this assessment after some time (usually, a minimum of three years). At that point, the private sector may be able to take over some or all roles in scaling, deliver the innovation once scale has been reached (sustainability), or both.

On the public-sector side of the table, the same exercise is conducted, starting with the task that was not considered viable for the commercial sector. If the assessment is *YES*, the user would then evaluate the viability of the next task for the public sector, and so on. If the answer is *NO*, the user should judge whether donor subsidies and/or capacity building would shift the score to a *YES*. **Unlike with the private sector, the sequence is not logically dependent on each other.** Even if the public sector cannot guarantee supply, it may be able to help create demand. Therefore, whether the assessment is *YES* or *NO*, the user can proceed to the next task. If the initial or ultimate score for the public sector is *NO*, neither the private nor public sectors can perform that or *any subsequent tasks*. Hopefully, by going

through the tasks, it will be the case that the public and private sectors can each do some tasks, so that a public-private partnership is a viable scaling pathway. In many cases, a short-term donor project that can help strengthen the partners and create mechanisms to solve coordination problems can be vital to the success of a public-private partnership approach. In the final analysis, if at least initially neither the private nor public sector is capable or willing to take on at least one task, then a donor project capable of performing those task(s) would drive scaling until a transition or 'hand-off' can take place. A good example of this is when a donor project is willing to absorb the initial costs of creating demand and demonstrating to private sector that there is a large and profitable enough market to justify their investment.

The assessment team should go through each of the four tasks in Table 2 iteratively. For each task, in addition to asking whether the criteria for the private or public sector performing this task can be met, the team should ask:

- Who is likely to be able to perform what role in completing these tasks in the process of going to scale at this time?
- For which roles are actors willing to fulfill them weak or missing at this time?
- Who might perform what role in completing these tasks in the process of going to scale after some institutional strengthening, capacity building and training? Would the incentive or willingness of various actors to play that role change if there were subsidies or other forms of risk mitigation? (A version of this question relevant to the respective sectors is contained in three white interior circles in the Annex D diagram.)
- What institutional strengthening, capacity building, and training would be required to enable existing organizations to fulfill these roles in the future?
- If the innovation were bundled with other products or services, or converted into a service? If the innovation were simplified, or the cost-benefits to adopters improved? *These questions are equally as important as the previous one, but for sake of simplicity and presentation are not included in the diagram in Annex D.*
- Who might perform what role in completing these tasks after a market is established (what size) and a business case improved or demonstrated? Once significant scale is reached? Is any institutional strengthening, capacity building, and training needed to prepare them for this role?

Table 3 provides a more detailed version of the four questions for determining who could do which task.

TABLE 3: DETAILED QUESTIONS FOR DETERMINING THE APPROPRIATE SCALING PATHWAY

Tasks	Role of the			
	Private	Public	PPP	Donor
1. Who has the resources[1], technical knowledge, and incentives[2] to take overall responsibility for **driving the scaling up process** and **coordinating** among various actors?				
2. In its current form, **are target adopters (producers) likely to be willing and able[3] to pay** for the innovation and any associated additional inputs or investments? I.e. is there likely to be a market for the innovation given the business case for adopters?				
3. Who has the resources, technical knowledge and incentives **to simplify, modify or adapt the innovation, or bundle with other products and services**, to improve the ease of adoption and cost/benefits i.e. improve scalability?				
4. If necessary for this innovation who has the resources, technical knowledge and incentives **to drive financial innovation or mobilize and make available affordable financing** for adopters? Provide subsidies or price discounts for initial adopters?				
5. Who has the resources, technical knowledge and incentives to **produce, import or otherwise ensure supply of any upstream inputs for the innovation**? To increase the quantity produced as scaling proceeds? Be responsive to changes in market demand if there is a product mix?				
6. Who has the resources, technical knowledge and incentives to produce, import or otherwise ensure supply of **the innovation itself**? To increase the quantity produced as scaling proceeds? Be responsive to changes in market demand if there is a product mix?				
7. Who has the resources, technical knowledge and incentives to produce, import or otherwise ensure supply of any **complementary inputs or services** (e.g., phytosanitary, financial, veterinary)? To increase the quantity produced as scaling proceeds?				
8. Who has the resources, technical knowledge, incentives and geographic coverage to **distribute, market and/or sell**[4] the innovation and any necessary complementary inputs or services? How does the existing coverage of the distribution network compare with achieving close to 100 percent scale of the target locations and populations? To increase the quantity produced as scaling proceeds?				
9. Who has the resources, technical knowledge and incentives to **create demand for the innovation?** At what stage of scaling could fulfilling this role shift?				
10. Who has the resources, technical knowledge, incentives and geographic coverage to **provide training, technical assistance and extensions support** in the proper use of the innovation?				
11. Who has the resources, technical knowledge, incentives and linkages **to process, market and sell** any expected increase in (or different kind of) output resulting from widespread adoption of the innovation?				
12. Who has the resources, technical knowledge, incentives and linkages **to develop a market and education consumers** for any different kind of output resulting from widespread adoption of the innovation?				

[1] *Resources include human, financial, infrastructure and equipment.*

[2] *Incentives refer broadly to the business case for the private sector (risk and return), the policy priorities and bureaucratic motivation for a public-sector agency, and the vision, mission, and policy priorities for an NGO.*

[3] *"Able to pay" means the innovation's price point would be affordable for adopters given their resources, or some form of financing available.*

[4] *Distributing, marketing, and selling are combined here but each could be provided by different actors.*

For commercial scaling, four interventions could change a *NO* to a *YES*, which are noted in Table 4.

TABLE 4: INTERVENTIONS TO IMPROVE POSSIBILITY OF PRIVATE SECTOR SCALING

Subsidies	Public sector or donor-provided subsidies that change the incentives, business case, or cost-benefit analysis for the producer to purchase the innovation or for the private-sector actor.
From product to service	Transforming the innovation into a service (e.g., selling tractor services instead of tractors). This would change the price point for ultimate users to create an affordable product and make commercial scaling viable.
Bundling with other products or services	Bundling the innovation with other products to economize on transaction costs. This may change the private sector calculus. An example is a soil moisture detection meter. The potential volume, price point, and margin of the meter would not justify creating demand (marketing costs) and teaching adopters how to use it as a stand-alone product. However, if it were bundled as part of a drip-irrigation kit, the kit's provider might promote, sell, and teach farmers to use the meter as part of its overall effort supporting the kit.
Modifying or simplifying design	Modifying the innovation (such as using cheaper parts or inputs) to reduce costs (or increase benefits). For example, many farmers would not invest in a four-wheeled tractor because of its high price and the small size of their landholdings. However, a two-wheeled tractor would be financially feasible and have a strong business case.

For the public sector, it is also possible that a *NO* can be converted to a *YES*. Here, the potential intervention to affect this shift would be either donor-provided financial support, capacity building, or both. If either or both provide relevant public institutions with the resources and ability to scale up, this would change a *NO* to a *YES*.

The ASDT applies to the *scaling pathway* (i.e., for going to scale by incrementally increasing the number of adopters until a majority of potential adopters is achieved), not to sustainably producing or supplying the innovation at scale. Going to scale involves creating production capacity, creating demand, training and supporting adopters in learning how to use the innovation, as well as other tasks such as strengthening or filling gaps in the value chain. It may be the case that if a donor project takes on some or all these tasks (such as creating a market and a critical mass of existing adopters), the private sector might then be willing to take over the scaling process. The interesting question is how far along the scaling process needs to be before the business case for driving scaling becomes viable. **Because of this, it may be useful to apply the ASDT twice: under current circumstances, and again under some hypothetical conditions a few years later when a donor project may have created a market, provided technical training and extension support, etc**.

Using the ASAM: Explaining and Scoring Individual Criteria

Once the ASDT is completed, the next step is to score the innovation using the ASAM. The ASAM requires taking a 'view' on the most appropriate scaling pathways and goals (i.e., the results of the ASDT). In this sense, the two tools are sequential and interdependent.

This section provides guidance on how to apply the ASAM to each criterion. Along with each criterion is a rationale explaining what the criterion is supposed to measure, as well as an explanation of how to score it. Sources of data to aid in scoring are addressed in Annex C.

For some innovations, one or more criteria may not be applicable (i.e., Non-Applicable). In these instances, the assessor should note "NA" in the "Scoring" column and remove its impact from both the numerator and denominator for that section, i.e., sections A-F. This will ensure proper adjustment of the ASAM template.

Group A: Importance of the Issue the Innovation Addresses

Criterion A.1: Does the innovation sustainably address at least one important development objective, such as improving food security, resiliency, or nutrition, or reducing poverty or stunting?

***Rationale*:** If the scaled innovation will help address an issue aligned with USAID priorities.

Scoring: Scores relate to two issues: (1) alignment with Agency priorities, and (2) potential impact on those issues. Scoring depends on whether hard data on impact exist. (The numbers of potential adopters and locations are addressed in the criterion A2 and cross-cutting issues such as gender integration and youth are addressed in criterion A3).

Score 3	Alignment is very high, and impact is direct and "high" (e.g., on-farm production would at least double). Direct impact means there is a clear, causal effect on the targeted issue (e.g. better seeds produce more yield). A less direct impact would be that improved yields of a staple crop allow for diversification into cash or other crops, improving resiliency and the impact on poverty.
Score 2	Alignment is significant; impact is, to some extent, direct; and impact is more than half again or "large."
Score 1	Alignment is low, impact is mostly indirect, and impact is "small."

Increase the score if the innovation is likely to affect multiple objectives positively, is a high priority issue, or includes a particularly important demographic subgroup.

Criterion A.2: Does the innovation potentially benefit a high percentage of producers or a large absolute number of producers across multiple locations?

***Rationale*:** This determines the scale of impact. The scale of impact may be through adoptions by producers, or adoption by processors, service providers, or other value chain actors, which then has an impact on a high percentage of producers.

Scoring:

Score 3	Innovation would potentially benefit people in multiple countries, high percentages of the population, or millions of people.
Score 2	Impact is felt in two or more countries, by most of the agricultural population in a single country, or by at least 500,000 people.
Score 1	Scaling is limited to one country, and only affects a small percentage of producers in that country.

Sources of Information: FAOStat is the most widely used source of data on area planted or other base scale statistics, while national statistics may have data on the number of producers. Interviews with key informants may also yield this information.

Criterion A.3: Does the innovation address an important cross-cutting issue (e.g., gender, climate change, natural resources, etc.)?

***Rationale*:** Agriculture is increasingly vulnerable to climate change and adverse weather events, and some approaches to agriculture can have a negative impact on soils and forests. It has clear implications for health, which is affected by pollution, hazardous chemicals, and working conditions. Direct and indirect benefits in these areas can be reason to scale up an innovation, even if they are not the primary issue addressed by the innovation.

Scoring: Nutrition, per se, is covered in Criterion A1.

Score 3	Innovation directly, primarily, and significantly impacts the effects of climate change, environmental factors, gender, or adopters' health.
Score 2	These factors are directly targeted, but have smaller impacts, or where they are only one of several objectives of the innovation.
Score 1	Not an expected impact or is likely to be a very small one.

Sources of Information: KIIs with the PI, POC, and/or in-country research partner should reveal whether the innovation will support low-carbon emissions development and limit or reduce erosion, soil degradation, use of chemical pesticides, or have other harmful effects on the climate or environment.

Group B: Credibility and Observability of the Innovation with Key Stakeholders and Adopters

Criterion B.1: Does the innovation address a felt (subjective) need that is important to potential adopters (e.g., identified in previous or new needs assessments)?

***Rationale*:** Opinions by outside agricultural experts may not align with the felt needs of potential adopters. When a problem is not perceived as a real, subjective need by potential adopters, there is no demand for the solution, i.e. the innovation. This makes scaling difficult, as significant time, effort, and resources are required to build awareness of the need and create demand. It also makes horizontal and spontaneous adoption difficult, requiring some actor to drive scaling up for a longer period.

Scoring: Scoring this criterion is based on the source of the information and the degree of felt need expressed.

Score 3	There is evidence from surveys or other broad-based sources of a felt need that is *very important* to actual potential adopters.
Score 2	There is evidence of a felt need that is of *some importance* to many potential adopters from reliable, broad-based source; or evidence of a highly important felt need from anecdotal sources or inferential (i.e., adopters were happy to receive the innovation in field trials).
Score 1	There is little evidence.

***Sources of Information*:** Evidence would be based on on-the-ground needs assessments, surveys, document reviews, and interviews with potential adopters. Anecdotal or inferential information from interviews with the PI, POC, or IC.

Criterion B.2: Are impact estimates (benefits) of the innovation based on sound, credible, scientific evidence? Has the innovation been shown to be effective when used by actual adopters under real conditions?

***Rationale*:** Presumably most innovations are not considered for scaling unless they have significant impact, see criteria A1 and A2. However, it is important that evidence of impact be more than anecdotal or impressionistic, though that is valuable for other reasons (see B5). By meeting reliable scientific standards of evidence, *actual* positive impact encourages adoption and the likelihood of successful scaling up an innovation. Rigorous scientific evidence and actual testing in realistic on-farm settings are preferable.

Scoring:

Score 3	Tests have been done with actual farmers in country, *and* scientific in-country testing.
Score 2	Tests have been done in country with public or private research stations.
Score 1	Testing has only been done with U.S.-based or international sources outside the target countries (or not at all).

Sources of Information: KIIs with the PI, POC, or IC should yield information on what trials have been conducted, where, and under what conditions. Field testing with actual adopters in multiple agri-ecological zones in target areas without technical assistance or extension support is optimal.

Criterion B.3: Is the innovation's effectiveness considered superior to those of current solutions and emerging alternatives?

***Rationale*:** Most adopters are reluctant to change from existing technology unless there are good reasons to do so (e.g., more productive, more profitable, easier to use, cheaper, lower risk). Proof of effectiveness and superiority to existing solutions along these types of bases is an essential element in take up and scaling.

Scoring: Effectiveness may be difficult to measure in a single metric where effects are multi-dimensional, indirect or hard to isolate from other factors. This may be true for machinery, instruments, tools or processes, or vaccines, as ease of use and other intangibles are relevant. When these are present and important, score higher than would be implied by the primary impact metric alone. In-country evidence, preferably from actual users, is preferable to external evidence and should be scored higher.

Score 3	There have been comparative in-country tests, preferably with actual farmers, *AND* these show that the innovation is at least twice as effective (100 percent).
Score 2	Tested in country *and* these show that the innovation is half-again or more effective OR tested at U.S.-based or international sites and is shown to be at least twice as effective.
Score 1	Testing has been done only with U.S.-based or international sites, *AND* the innovation has been shown to be somewhat or less effective.

***Sources of Information*:** KIIs with the PI, POC, or IC should produce information on what trials have been conducted, where, and under what conditions.

Criterion B.4: Is the innovation supported by key or influential individuals and institutions?

***Rationale*:** Validation by famous or respected individuals and institutions confers status (the social position) and legitimation (seen as having expertise), allowing greater confidence in claims of impact and the likelihood of widespread take up (scaling). It also makes it easier to enroll key private, public, or civil society actors in partnerships to support or drive scaling.
Scoring: This criterion is scored according to (1) the perceived (in the eyes of potential adopters) status, reputation, and legitimacy of organizations or individuals who have supported the innovation; and (2) the nature and strength of that support. Explicit endorsements or recommendations are more valuable than mere approval or tacit endorsement (e.g. participation in research).

Score 3	There is *explicit recommendation or endorsement from influential* in-country stakeholders, beyond those persons involved with research and testing. Influential stakeholders should be local persons — present on the ground — and have known by or have contact with potential adopters.
Score 2	Endorsed by less influential stakeholders, or 'endorsement' from influential in-country stakeholders is tacit (e.g., participated in the research).
Score 1	Research and testing has only been done with U.S.-based or international sources, *AND* the endorsement is tacit (i.e., the institution led or conducted the research and testing).

Sources of Information: KIIs with the PI, POC, or IC should provide information on what trials were conducted, where, and under what conditions. Further, public sector and private associations may have supported or endorsed the innovation in policy papers and/or on their websites.

Criterion B.5: Is the innovation's impact tangible and easily observable to potential adopters? Is the impact easily associated with the intervention?

***Rationale*:** Users are more likely to adopt an innovation when they can '*see*' the results, the results are immediate or visible in a short-time frame (within a season), and the connection between innovation and impact is logical or intuitive, or both. (Where appropriate other direct sensory perception – smell, taste, touch, hear – is equally valuable if they convey impact). This is particularly important for scaling to take off spontaneously, from user to user, where it may no longer be accompanied by marketing or education efforts.

Scoring: Based on how visible the results are (positively), how intuitively obvious the logical connection between the innovation and the outcome is (positively), and the time it takes to see the results (the shorter the better).

Score 3	Causality is linear and intuitive, observable to the naked eye and the uneducated observer (e.g., comparative demonstration plots), and visible in one to two seasons.
Score 2	Causality is intuitive but can be complicated by extraneous factors, observable to the naked eye and the uneducated observer, but takes more than two seasons (over one year) to see the results.
Score 1	Causality is complicated or non-linear, not readily observable to the naked eye or uneducated observer (e.g., requires instrumentation), and/or the majority of impact (e.g., insurance, vaccines) occurs over several years.

***Sources of Information*:** KIIs with the PI, POC, or IC should yield information on anecdotal reactions from field trials.

Criterion B.6: Is the innovation likely to face opposition from vested interests in the private value chain or from public sector actors that could impede scaling?

***Rationale*:** Many innovations face opposition because existing stakeholders have an investment in existing products or solutions to an issue. "Investments" may be material (profits, sales) or political, or involve status or reputation. ("Stakeholders" include input producers, distributors, users, and even agricultural labor. Regulatory and public authorities who have supported or approved existing solutions can be particularly sensitive).

Scoring: Based on the strength and likelihood of opposition, i.e., its ability to block or impede scaling, and the time and resources required to address it.

Score 3	There is little likelihood of opposition (i.e., there are no vested interests). This is usually the case when there is no existing solution, or the existing solution is either not used or has been largely discredited.
Score 2	Some opposition or resistance is likely but can be overcome with effective advocacy and coalition building. This happens when the expected losses by existing vested interests are small (or they are able to take up the new innovation themselves). This is the same for indirect losses by politicians, researchers, et al. who have endorsed or benefitted from corruption or cronyism, or otherwise "participate" in those existing solutions.
Score 1	Vested interests experience large losses and displacement effects and have significant economic or political power, or both. This can also occur when innovation is disruptive (i.e., threatens principles or paradigms involved, such as the importance of using chemicals), even if the losses from the individual product or innovation itself is small.

***Sources of Information*:** KIIs with the PI, POC, or IC should produce information on existing stakeholders.

Group C: Ease with which the Innovation can be Tried, Purchased, Adopted, and Implemented Effectively by Producers or the Target Adopter

Criterion C.1: Is the innovation package simple (with few components), or does it replace a similar (potentially complicated) technology?

***Rationale*:** Ease of adoption and, therefore, potential for scaling tends to decrease as the level of complexity and technical sophistication of the innovation increases. When innovations are complex or sophisticated, adopters may have difficulty adopting the whole package; implementing it correctly and achieving full impact; and conducting what is likely to be extensive training and support (addressed separately in C2 next). All these are more likely and important when, as is often the case, target adopters are poorly educated, older, or technically unsophisticated.

Scoring: The number of components in the innovation package, the sophistication of the technology, the need to adopt other technologies or inputs, and the intricacy or complexity of the technology are all factors that will decrease ease of adoption. Scoring is not based solely on the intrinsic characteristics of the innovation itself, it also takes into account the relative sophistication, experience and education of potential adopters.

Score 3	Innovation has only one or two components (e.g., a seed, chemical, simple technique), and is easily understood and implemented correctly by a semi-literate adopter. The innovation does not require adoption of new complementary activities, inputs, or services (fencing, fertilizer, veterinary services, etc.). Or likely adopters are relatively sophisticated.
Score 2	Innovation has, at least, a few components, is more technologically sophisticated, and requires some training, practice, or repeated use to be implemented correctly.
Score 1	Innovation is complicated, technologically sophisticated, has multiple components and activities, and inevitably requires time, training, and support to implement correctly and achieve the benefits.

***Sources of Information*:** The PI, POC, or IC should have information on the components of the package.

Criterion C.2: Is the training and extension support for the innovation needed or can it be done with little time, intensity, and resources?

***Rationale*:** Public training and extension systems are often thin and lack adequate human and financial resources as well as equipment and infrastructure e.g. transportation and fuel. Any innovation that requires training or significant extension support will not reach scale in most developing countries unless private providers have economic incentives to provide it. Donors can provide support at small scale, but not at large scale, and the private sector may have no incentive.

Scoring: This criterion depends on three factors: (1) how intensive the training and support needs to be for adopters to implement it correctly and benefit from the full impact i.e. length and frequency of support or training; (2) how long or extensive (i.e., over what period) such training and support needs to be; and (3) how sophisticated that training has to be, especially in terms of who can provide it.

Score 3	Innovation requires little or no training or support to implement it correctly with impact, other than what an existing adopter could show a peer. If an agro-dealer, extension agent, or trained lead farmer can supply the required information in a short space of time (e.g., one or two half-day group trainings), use the score of 3.
Score 2	Innovation is likely to require multiple trainings or ongoing support over a season or a few months, *OR* if support personnel must be professionals.
Score 1	Innovation is likely to require two of the following — multiple trainings, ongoing support over a season or longer, use of professional support personnel.

***Sources of Information*:** The PI, POC, IC, and CP should know about the training or support that was provided in field trials and what will likely be needed by adopters at scale to ensure full impact. The assessor should follow up on each of the components in the package from Criterion C1.

Criterion C.3: Is adoption aligned with the existing socio-cultural norms or behaviors of the target areas or population?

***Rationale*:** This criterion measures the changes in behavior necessitated by the innovation, beyond good agricultural practices. It looks at indirect effects, for example, potential conflicts with existing sociocultural norms such as changes in gender roles or traditions associated with when or how to plant or harvest. The level or importance of these changes can pose a challenge for adoption and scaling.

Although such changes may be desirable as far as Agency goals (e.g., gender) are concerned, they, nonetheless, make scaling more challenging.

Scoring: Some innovations require changes in cultural norms, habits, and practices to derive the optimal benefit. In most cases, change is difficult for adopters and therefore an obstacle to scaling even if desirable as a policy goal. Some examples are (1) two-stage grain harvesting, where the grain-bearing heads are taken first and the stalks later, offsetting productivity gains from the introduction of harvesting machinery; (2) increased efficiency in poultry raising may enhance the financial influence of female household members, which may threaten male head of households; and (3) religious or cultural customs may dictate when planting should start, when harvesting should occur, or what crops should be planted together, in opposition to scientifically-based best practice.

Score 3	Innovation can produce full impact with little or no change in the status quo.
Score 2	Adoption requires some changes in behavior that will generate resistance, and some external intervention and support to effect impact successfully.
Score 1	Adoption requires major changes in social norms and behavior, especially those that affect power within a household or community, and will likely cause significant resistance.

***Sources of Information*:** In KIIs, the PI, POC, CP, or IC should be able to point out the actors involved in adopting and applying the innovation, the roles they play, and how this might be different from traditional roles and practices. The assessor should carefully review the entire (production, application) process from beginning to end – including (input) purchasing, control of resources, (community, household or individual) labor, etc. – to determine how and why that process or activity is done prior to adoption, and to identify potential areas of change.

Criterion C.4: Does the innovation use existing practices and equipment? Is investment in new equipment or infrastructure required?

***Rationale*:** Innovations that require significant changes in agricultural practices, or even those that build on existing knowledge pose a challenge for scaling up. This is especially the case where new practices are a major part of the package (i.e., adopters will not experience the full benefits of the innovation if the full package of practices is not adopted).

Scoring: This criterion is scored according to the number and degree of changes in agricultural practices. Examples of large, significant changes might be the shift from (1) traditional to hybrid seeds, requiring farmers to adopt inorganic high-nitrogen fertilizer; (2) broadcast to row seeding; and (3) ploughing to zero-till. Examples of minor changes would include changes in staking (for farmers who already stake), plant spacing, type and dose of fertilizer, or use of phytosanitary products.

Score 3	Innovation uses the same or nearly the same practices.
Score 2	There is/are one or two significant changes, or three to four small changes.
Score 1	There are more than two large changes that represent a significant departure from existing practices, or a number of small changes.

***Sources of Information*:** In KIIs, the PI, POC, CP, or IC should be able to describe existing agricultural practices, and how the new practices accompanying the innovation are similar to or different from the existing technology.

Criterion C.5: Can the innovation be *tried* by potential adopters at small scale with minimal investment?

***Rationale*:** Most adopters are risk-averse and cash-, wealth-, and income-constrained so that affordability of the innovation, and especially to try the innovation, are essential. When and where this is true adopters cannot afford large initial investments in an innovation. Being able to try out an innovation, with minimal investment at small scale, so they can see the benefits for themselves, is a huge advantage for scaling.

Scoring: This criterion depends on two factors: (1) the cost or minimal investment involved in trying the innovation; and (2) the scale upon which it should be tried (e.g., planting a few square meters versus an entire hectare or area under cultivation).

Score 3	Innovation can be tried at small scale with minimal investment (e.g., under $25 purchasing power parity equivalent).
Score 2	Innovation can be tried at small scale but with significant investment (e.g., $25-$200).
Score 1	Innovation must be tried at large scale or with very significant investment (e.g., over $200), or both.

***Sources of Information*:** This information can be obtained from a description of the innovation obtained in KIIs with the PI, POC, CP, or IC.

Group D: Potential Benefits or Business Case for Potential Adopters

Criterion D.1: Can producers expect significant increases in production or reduced losses if they adopt the innovation?

***Rationale*:** Case study evidence shows that innovations that result in multiple (two- to four-fold) increases in yield or off-take are easier to scale than innovations that result in lower increases (under 50 percent), all else equal. In other words, gains need to be very large to be visible and persuasive for change to take place. Note that whether this change translates into increased profitability or decreased losses, and the extent thereof, i.e., the business case for adoption, is addressed in the Agricultural Scaling Decision Tree that is used in conjunction with this tool.

Scoring: Based on the size of the benefit and source of the information.

Score 3	Yield or off-take increase (or loss decrease) is double or more from local evidence.
Score 2	Yield or off-take increase (or loss decrease) is half-again above local evidence or over double from research station/international evidence.
Score 1	Yield or off-take increase (or loss decrease) is under half from local evidence or under 100 percent from research station/international evidence.

***Sources of Information*:** Impact on production or losses avoided should be available from KIIs with the PI, POC, CP, or IC. Data on the actual field conditions that will be experienced by potential adopters, as opposed to data from research stations, are preferable.

Criterion D.2: Will producers who adopt the innovation experience significant intangible benefits (e.g., time savings, increased ease of use)?

***Rationale*:** For many adopters, production increases or financial returns are not the only issue. Intangible benefits – ease of use, time savings, less in-kind labor required, ability to shift work to low seasons – can be equally important, even if returns are the same. Intangible benefits make adoption and scaling more likely.

Scoring: These are difficult to measure quantitatively, and require qualitative judgments based on anecdotal reports from users. Three examples of where intangible issues are important are: (1) A major reason for the successful scale up of low-lift irrigation pumps in Bangladesh was that they were much easier to use, especially in winter, since they did not require getting into the water to prime them; (2) The major advantage of seeder attachments introduced in Bangladesh was not so much cost savings as time savings, they required fewer passes over a field, saving vital time during the planting season; and (3) In contrast, Kuroiler chickens are much more difficult to raise, as they cannot be left unwatched unless fenced in, and so require active monitoring unlike chickens indigenous to East Africa. This presented a challenge for women, who primarily raise poultry, who are used to leaving them unattended, so they can do other things.

Score 3	There are substantial intangible benefits.
Score 2	There are some intangible benefits.
Score 1	Intangible benefits are inconsequential or negative.

***Sources of Information*:** Ideally, interviews with early adopters are the preferred source of information but may not be available in early trials. Anecdotal reports on ease of use should be available in KIIs with the PI, POC, CP, or IC. If not, the issue should be discussed with the research team following field trials.

Criterion D.3: Do the benefits of adopting the innovation translate into an increased, marketable surplus or other increased capacity to (re)pay the cost of the innovation?

***Rationale*:** Even if adoption of an innovation is profitable, the ability to pay for an innovation is critical to adoption. This is particularly true of innovations whose price point is significantly above the $25-50 range, which appears to be a lot for many smallholders (see C5 above and D4 below). Many adopters are cash and income constrained and have no access to formal financing. They rely on their own resources or financing from family and friends. For innovations whose price point is above their available means, being able to pay back a loan or justify the expense depends not only on the rate of return or profitability, and risk, it depends on whether the adoption generates additional *cash* income to repay borrowing. Innovations that improve food security and nutrition, save time, or achieve other important goals, but fail to pay for themselves, are more difficult to scale.

Scoring: This criterion is relevant when the innovation affects subsistence farmers or those close to being food-secure, i.e., they generally do not produce for the market or currently generate a marketable surplus. How close they are to self-sufficiency, or whether they already produce an amount for the market, however small, is important. Scoring of this criterion depends on three factors: (1) whether the benefits of the innovation will increase (potential) income, as opposed to intangible benefits; (2) whether and to what extent the adopter is already involved in the cash economy (i.e., whether increases in "income" will transfer into cash), or whether the increased in income will generate a marketable surplus; and (3) whether that increase will cover a large proportion of the investment. Where the adopter is the private sector, scoring should be based on whether the increased income will cover the investment.

Score 3	*Most* target adopters are in the cash economy; adoption is likely to increase income *significantly AND* in ways that can be easily translated into cash; and the increase will cover *all the costs* of the innovation or loan payments for a majority of adopters.
Score 2	A *majority* of target adopters are in the cash economy; adoption is likely to increase income in ways that can be easily translated into cash; and the increase will cover the *majority of the costs* of the innovation for most adopters.
Score 1	*A majority of* target adopters are *not* in, or barely in, the cash economy; *OR* any increase in income is not likely to be easily translated into cash; *OR* the increase in income will not cover *at least the majority of the costs* of the innovation for most adopters.

Sources of Information: Productivity increase forecasts and business case (crop budgets or equivalent) can be obtained in KIIs with the PI, POC, CP, or IC. This should provide data on both expected increased production or other benefits and the cost of the innovation itself.

Data on how many adopters are in the cash economy, or existing levels of food security, may not be available at large scale, although FTF surveys may contain this data. Crude calculations of food security can be made by comparing average household production and consumption. Data on current average yields or production levels are usually available from national sources or FAOStat. Assumptions on average farm/plot size *and* consumption can be gleaned from Internet sources.

Criterion D.4: Is the TOTAL COST (including complementary inputs and new investment) of adopting the innovation at an economically-efficient scale affordable? Is it roughly the same as the technologies and practices it replaces?

***Rationale*:** *Affordability* of an innovation is critical to adoption as well as comparative cost to alternatives, even if those alternatives are more profitable. Costs that are similar to those of existing technology (and existing technology that is already widely adopted) or affordable, given adopters' incomes, facilitate scaling.

Scoring: Scoring for this criterion depends on three factors: (1) cost of the innovation compared with existing technology; (2) cost of the innovation compared with adopter's resources; and (3) how widespread the ownership of existing technology is.

Score 3	Cost of adoption is roughly equal to that of existing technologies and practices, *AND* existing technologies are owned by *most* potential adopters; *OR* the cost is less than seven days of household cash income for target adopters. (For households with 5 people and per capita income of $1.90/day, that would be less than $66.5.)
Score 2	Cost of adoption is roughly 100-300 percent of existing technologies and practices, *AND* existing technologies are owned by *a majority of* potential adopters; *OR* the cost is under a month of household income for target adopters. (For households with five people and per capita income of $1.90/day, that would be less than $285.)
Score 1	Cost of adoption is more than three times those of existing technologies and practices, *OR* the cost is greater than a month of household income for target adopters. (For households with five people and per capita income of $1.90/day, that would be greater than $285.)

***Sources of Information*:** The costs of current and new technology (such as crop budgets) should be available from the PI, POC, CP, or IC. Per capita GNI is available online.

Criterion D.5: Can the innovation be used for multiple purposes (crop/livestock types and seasons) that increase its value (thereby, diversifying benefits)?

***Rationale*:** For most adopters, risk and ability to diversify risk, is more important than the higher returns or production they can earn. One way farmers and other potential adopters assess the risk of a new innovation is whether or not it can be used for multiple purposes, crops, and seasons. Innovations that have lower risk in this sense are easier to scale.

Scoring: Assessment of this criterion is based on three factors: (1) the number of agricultural uses to which the adopter can apply the innovation; (2) the number of seasons in which it can be applied; and (3) whether the innovation can be applied to non-agricultural uses, whether on-farm or off. A prime example is a two-wheeled tractor. It can be used to prepare soil, seed, and fertilizer (with attachments). It can also be used for many different crops, in multiple seasons, and for other purposes (e.g., as a source of locomotive power to pull a cart, transport goods to market, or drive a water pump).

Score 3	Innovation can be used for multiple purposes and across multiple seasons, *OR* other, non-agricultural activities.
Score 2	Innovation can be used for multiple purposes in one season or for one purpose across multiple seasons within the same calendar year.
Score 1	Innovation can be used for one purpose or application annually, at best.

Sources of Information: The uses and applications of the innovation can be learned from KIIs with the PI, POC, CP, or IC. Anecdotal reports from early adopters are particularly useful.

Criterion D.6: Are the expected financial benefits of the innovation associated with low risks (i.e., have a low variance) when well implemented?

Rationale: Presumably innovations will only be scaled if they are profitable for most potential adopters at the average level of yield or off-take increase (or some other measure of impact). For most adopters, risk is often more important than higher returns or production. Some innovations offer less risk because they are multi-purpose, while others are inherently less risky because the returns are stable, or, in technical terms, the variance of impact is low.

Scoring: Scoring of this criterion is based on two factors: (1) the variance of outcomes or impact (preferably based on a large sample of actual users); and (2) whether adopters who experience returns below the average are still able to earn positive returns (i.e., the variance relative to the business case). This criterion addresses normal variation found under average agroecological conditions and application of the innovation, e.g. the variation in yield from an improved variety. It does not address variance in the face of market risks; common, adverse climatic events, pests, or disease; counterfeit or adulterated products; or incorrect application or partial adoption of the innovation package. These other sources of risk are addressed in D7, D8 and D9 below.

Score 3	The variance of yield, off-take, or the relevant measure of impact is sufficiently low and the profitability at average impact are such that nearly all adopters will experience significant positive returns in most years.
Score 2	The variance of yield, off-take, or the relevant measure of impact and the profitability at average impact are such that a large majority of adopters will experience positive returns in most years.
Score 1	The variance of yield, off-take, or the relevant measure of impact and the profitability at average impact are such that a significant minority, or more, will experience losses in many years.

***Sources of Information*:** The PI, POC, CP, or IC should be able to supply statistical data on the mean and standard deviation of the impact of adopting the innovation, as well as the crop budget or relevant calculations of a gross margin. If not already in a spreadsheet, put the gross margin or crop budget (or the equivalent) into a spreadsheet. Lower the impact by 0.5 and 1 full standard deviation, and observe if the gross margin remains positive and large, and above zero. If necessary, assume that the distribution is a standard normal, and use a standard normal distribution calculator (can be found on the Internet) to assess what percent of adopters are likely to produce returns above the break-even point.

Criterion D.7: Are the impact and returns of the innovation relatively high (robust, resilient) even in the face of (many, if not all) adverse external events (e.g., weather, disease or pests)?

Rationale: Some innovations and/or their applications are more resilient in the case of adverse weather, disease, or other factors, lowering risk to adopters, and increasing the likelihood of adoption and scaling.

Scoring: Innovations that are either intrinsically or specifically designed (bred) to be more resilient to weather, diseases, and pests score high on this criterion. Some innovations, such as machinery or tools, may be affected by weather (e.g., floods).

Score 3	Impact is robust across most common adverse events in the target context/location, or adverse events are irrelevant.
Score 2	Impact is somewhat affected by common (not extreme) adverse events in the target context, and there is a decrease in impact of 30 percent or less.
Score 1	Impact is significantly diminished (over 50 percent decrease) by common adverse events in the target context.

***Sources of Information*:** The PI, POC, CP, or IC should be able to supply statistical data on how the innovation performs in the face of adverse weather and other events, and the frequency of such events in the target locations. Also, the World Meteorological Organization tracks extreme weather events.

Criterion D.8: Are the impact and economic returns of the innovation high (robust, resilient) when only some components of the innovation package are adopted, or when components are not well implemented?

Rationale: Many case studies of scaling show that in the case of innovation packages with multiple components or where the package is complex, the innovation is often incorrectly implemented, only partially adopted, or adopted sequentially over time as the producer is able to reinvest earnings.

Nonetheless in many of these situations adoption will still produce some benefits. Where this is true, potential adopters are more likely to take up/continue to use the innovation, even if they do not or cannot initially adopt the entire package or implement it correctly. This is relevant to indirect adopters who may not have had training or extension support. Robust impact relative to adoption fidelity facilitates scaling up.

Scoring: Score this criterion according to how partial adoption or incorrect implementation affects impact. Partial adoption is defined as implementing at least one, preferably two, parts of a multi-component package (usually the key technology). A common example of partial adoption or incorrect implementation is where a farmer will adopt hybrid seeds but will utilize less than the recommended quantities of fertilizer, or incorrectly apply good agricultural practices such as when to harvest. Simple, easy-to-adopt technologies, or technologies that are unlikely to be misapplied, should both be scored 3.

Score 3	Partial adoption or incorrect implementation (within reason) still generates significant (i.e., most) of the benefits (above 66 percent).
Score 2	Partial adoption or incorrect implementation still generates some of the benefits (between 33 and 65 percent).
Score 1	Partial adoption or incorrect implementation generates few or no benefits (less than 33 percent).

***Sources of Information*:** Ideally, the PI, POC, CP, or IC would have impact data comparing adoption of some, if not all the components, or comparing results between research station, supervised field trials, and unsupervised or supported field trials. In lieu of this, qualitative discussions with these key informants are a second-best solution.

Criterion D.9: Is there any risk that producers who adopt the innovation end up with counterfeit or poor-quality versions of the innovation that would lead to poor results?

***Rationale*:** Counterfeit, adulterated, or low-quality versions of an innovation almost always result in reduced or no impact. This negatively impacts the perceived value of the innovation, hinders take up, and may even have adverse policy outcomes.

Scoring: Ensuring the quality of an innovation (such as improved seed and livestock varieties, fertilizers, and phyto-sanitary products) is important for agricultural products. If no effective countermeasures are in place (e.g., seed certification, labelling, and enforcement) or can easily be put in place and actually implemented, a low score should be given. There is an important difference between "counterfeit" and lower-quality, lower-priced copies marketed as such. The latter, while perhaps a violation of intellectual property rights, can actually accelerate scaling of the overall concept by offering multiple price/benefit points.

Score 3	Innovation is not easily counterfeited or adulterated, and/or such products are easily identified by potential users; or effective certification, regulations, and enforcement *are already in place*.
Score 2	Innovation can be adulterated or have quality issues (i.e., not 100 percent counterfeit) that are not easily perceived by potential users, but retain much of its impact (e.g., diluted fertilizer). Effective certification, regulations, and enforcement feasibly could be put in place (e.g. with support from a donor project), given existing local resources, incentives and enforcement capacity.
Score 1	Innovation is easily counterfeited or adulterated (which may already be prevalent) and it is impossible for potential adopters to identify the fake product. Effective certification, regulations, and enforcement are not feasible, given local resources, governance and capacity.

***Sources of Information*:** Discuss with the PI, POC, CP, or IC the potential for counterfeiting, adulteration, or poor quality, and its potential impact. In-country actors such as the CP, IC, or law-enforcement agencies may have information on certification, regulation, and enforcement. However, assume that these systems are very weak in production and/or distribution in most low- and medium-income countries.

Criterion D.10: Does the innovation require annual or regular purchases to maintain effectiveness or vigor?

Rationale: Innovations that require regular reinvestment or purchase can strain adopters' financial means in off-years, discouraging adoption of the innovation, or leading to lapses in utilization or misuse. A prime example is saving hybrid seeds, or even open-pollinated varieties where seed saving and storage skills are poor.

Scoring: Based on whether, and if so, the frequency, with which regular purchases must be made. For equipment, infrastructure, tools and machinery, the frequency and cost of either significant maintenance or replacement is the relevant metric.

Score 3	Innovation lasts more than three years.
Score 2	Innovation lasts one to three years, after which it must be repurchased or refurbished.
Score 1	Innovation (or very significant inputs) must be renewed or purchased every season or, at least, annually.

***Sources of Information*:** The PI, POC, CP, or IC should be able to discuss the duration, depreciation, or need for repurchases.

Group E. Business Case for Value-Chain Actors and Strength of the Overall Market System (for Commercial Pathways)

Criterion E.1: Is the ownership or licensing of relevant intellectual property rights in place to allow sufficient supply?

Rationale: If ownership of intellectual property rights is restrictive, it can constrain scaling by: (1) limiting production; (2) requiring imports, which can be expensive and imply long delays in response to local demand; or (3) facilitating ongoing monopoly or monopolistic pricing.

Scoring: Keys are whether intellectual property rights arrangement allows the innovation to be freely available at reasonable prices (given production costs) and responsive to demand

Score 3	Intellectual property rights are in place; allows for unfettered supply.
Score 2	Licensing of intellectual property rights is in place or in process but may pose incentive issues for producers.
Score 1	Licensing of intellectual property rights is NOT in place and not likely to occur soon, OR is in place but clearly will pose incentive issues for producers that will likely affect supply.

***Sources of Information*:** The PI, CP, or IC should be able to share the intellectual property rights of the innovation, and the status and prospects of any licensing or import sourcing.

Criterion E.2: Is last-mile delivery in place for the innovation and other complementary inputs, especially in more remote and marginalized areas?

Rationale: Location in remote or rural areas can limit distribution and potential scale.

Scoring: Three factors should be considered when scoring this criterion: (1) coverage of the distribution system to small farmers in remote and rural areas; (2) the profitability of distribution and delivery; and (3) the farmgate price faced by adopters. Delivery to more remote or rural locations may increase prices significantly.

Score 3	Last-mile delivery systems for the innovation and other inputs cover most of the target population, delivery is profitable, and prices will not be more than 10 per cent higher than in major towns; *OR* the innovation (or scaling targets) does not require delivery to small farmers in remote rural areas.
Score 2	Last-mile delivery systems cover at least half of target adopters, delivery is profitable, and more remote adopters face higher prices of 20 percent or more, but adoption would still be profitable for producers at these higher prices.
Score 1	Last-mile delivery systems coverage is low with less than half of target adopters, and distribution and delivery is likely to be uneconomical in remote rural areas or require price increases that make the innovation unaffordable and/or unprofitable for producers.

***Sources of Information*:** Interviews with commercial or local in-country partners should produce information on last-mile delivery systems and coverage. Profitability is harder to assess but can be approximated where the innovation replaces an existing product or service (this is based on the profitability of the product or service replaced).

Criterion E.3: Do downstream actors with the incentives (business case), capacity, and resources to buy/process/absorb any increased output exist?

Rationale: Scaling up of the innovation can lead to significantly increased output. The absence of downstream market linkages and actors with the capacity to absorb that increase will constrain scaling.

Scoring: There are three parts to this criterion. First, all the downstream actors and factors – direct marketing opportunities, brokers, buyers, or other intermediaries; processors (for semi-finished or finished products); and ultimate wholesale/retail markets – should be in place. Second, they should have actual linkage to the target beneficiaries. Third, they should either have the capacity to absorb the

increased output, individually or collectively, or be able to expand easily as supply expands. This criterion does *not* include whether there is sufficient final domestic or export demand to absorb increased output. That is addressed in criterion E5. It also does not address the case where the output may be significantly different from existing output; e.g., orange-fleshed sweet potatoes, and consumer demand for this new product will need to be created. This is addressed in criterion F4.

Score 3	All downstream parts of the value chain are in place with the capacity and linkages to absorb increased output or have the financial resources and incentives to increase capacity as output grows.
Score 2	All downstream value chain actors and linkages are in place, but either linkages or capacity is weak.
Score 1	Downstream value chain actors and linkages are *NOT* in place, and capacity is weak.

***Sources of Information*:** Interviews with commercial or local in-country partners should produce information on downstream value chain(s). If not, USAID mission staff may be of help.

Criterion E.4: Are private sector services (spare parts, repairs, veterinary services, machinery services) that, potentially, will be needed by innovation adopters in place, generally available, and of appropriate quality?

Rationale: Some innovations require adopters to have access to complementary services to justify adoption and investment. Missing services make scaling more difficult, especially as one moves from initial adopters who are likely to be in or near larger population centers and/or benefit from scaling project provided services. Those gaps become evident as the number of adopters grows and the distance from population centers increases. Later potential adopters, especially those who are risk-averse and have seen first adopters struggle with missing services or spare parts, may be reluctant to take up innovations.

Scoring: There are three parts to this criterion. First, if complementary services are needed at all, and if so, how frequently. A producer may be willing to travel once a year, a fair distance for spare parts, vaccinations or maintenance. Second, how far away and available (density) these services are. Finally, if these services are of good quality and reasonable prices.

Score 3	Innovation does not require complementary services (e.g., seed), or complementary services are present and easily available (high coverage) in the target scaling areas with quality.
Score 2	Innovation needs some complementary services for long-term impact, there are gaps in coverage and accessibility of such services (i.e., not easily available to a significant minority of adopters), and quality may be uneven.
Score 1	Innovation requires complementary services that are vital for long-term impact and sustainability, or must be available frequently, and they are *NOT* available to a majority of potential adopters in the target locations, or often with poor quality.

***Sources of Information*:** The PI should be able to identify complementary services needed for long-term availability, as well as the frequency and quality of those services. The CP or IC should be able to describe the availability and quality of those services in the target locations. Independent assessments of complementary services are most useful in this case.

Criterion E.5: Is there sufficient potential or unmet market demand to absorb increased production without adversely affecting output prices (e.g., the possibility of import substitution or rapidly growing domestic demand)?

Rationale: The absorption of increased output can be critical to successful scaling, as insufficient aggregate demand can lead to downward pressure on output prices, reduce profitability, and jeopardize adoption by undermining the business case.

Scoring: Scoring should take into account several factors. Absorptive capacity can come from the local or regional market due to food insecurity or malnutrition; import substitution; rising consumption due to increasing incomes, urbanization, and population growth; or some combination of the three.

Score 3	No significant effect on output at the aggregate level, *OR* sufficient capacity to absorb supply without diminishing prices.
Score 2	Increased production has a small downward effect on prices, with some adverse impact on the business case and potential for scaling.
Score 1	Increased production is not easily absorbed, and will likely apply downward pressure on output prices, with significant negative effects on the business case for adopters as scaling proceeds.

***Sources of Information*:** Data on existing national production and imports are often available from FAOSTAT, national sources, or CGIAR centers. Consumption data can be calculated from per capita consumption (statistics that can be found online) and population data. An online search will sometimes yield articles on growth in demand due to urbanization and income. If not, trend data on imports or consumption can be used to estimate demand growth. Price data are often available from chambers of commerce or local independent monitoring groups and can be plotted against fluctuations in supply to determine if prices are sensitive to supply.

Criterion E.6: The target countries, demographics, and settings (agroecological conditions, socio-cultural, economy, politics, etc.) of individual adopters are largely homogeneous, so the scaling strategy or innovation itself does not have to be adapted or modified.

Rationale: If there are significant differences between the target areas, modifications in strategy or even different pathways will be required. These differences include the strength of the market system and private sector organizations, the strength and capacity of the public sector, or differences in geography, population density or demographics, or agro-ecological zones. Strategy modifications and implementation in different locations makes scaling more difficult, resource intensive, and time-consuming.

Scoring: Assessing this criterion requires knowledge of at least four factors: (1) the different target areas and populations, and their demographic and socioeconomic characteristics (land holding size, type of agriculture, etc.); (2) economic geography (population density, density of distribution systems, and agro-ecological conditions); (3) characteristics of the market systems and organizations serving those areas and populations; and (4) the strength and effectiveness of public sector organizations. Scoring this criterion may require applying the ASDT for each potential country or location.

Score 3	Population demographics and economic geography, as well as market systems or public capacity, are similar across target areas. Hence, the same strategy and scaling pathway can be applied in all cases with little or no adaptation to local circumstances.
Score 2	*EITHER* population demographics and economic geography *OR* market systems or public capacity are sufficiently different across target areas to warrant a change in strategy.
Score 1	*BOTH* population demographics or economic geography *AND* market systems or public capacity are different in the target areas so as to warrant different scaling strategies.

***Sources of Information*:** Information about population demographics, economic geography, market systems, and public capacity can be gained from in-country sources, such as the CP and IC, as well as country support officers and mission agricultural staff. Information on the relevant sectors in the target areas can also be obtained from USAID documents and Internet sources.

Group F: Public-Sector Enabling Environment Supports Commercial Pathways

Criterion F.1: Does the innovation address an issue that is high on the national or relevant local policy/public sector agendas in the target areas?

Rationale: Even if the public sector has little tangible support to offer financially or in-kind, alignment with policies/priorities opens many doors and facilitates getting things done, especially at the local level.

Scoring: This score is derived from a qualitative judgment of whether the innovation is aligned with a national priority sector, strategic crop, or livestock.

Score 3	Country actively pursues solutions in this area. This is reflected not only in national strategy documents, but also budgets, and programs, irrespective of funding sources. The country is putting this priority into practice or implementation.
Score 2	Issue or sector is mentioned in strategy or other policy documents, but little has translated into budget or program priorities.
Score 1	No or low priority

***Sources of Information*:** Good sources are the websites of relevant ministries' policy and implementation documents, complemented by a web search for public information on speeches, media articles, etc. The PI, POC, or IC will have information on national priorities

Criterion F.2: Do public sector financial incentives exist or are likely to be easily put in place with minimal advocacy to improve the business case for producers, value chain actors, or both?

Rationale: Government subsidies for the purchase of the innovation or complementary inputs (e.g., fertilizer) can facilitate adoption by lowering the price to potential adopters and decreasing the risk to producers and distributors.

Scoring: The four factors relevant for scoring this criterion are: (1) subsidies are in place or imminent following some advocacy, given government policy priorities (a positive factor); (2) the size of subsidies relative to price (the higher the better); (3) the coverage of any actual or likely subsidies, especially in terms of the target population (the wider the better); and (4) fiscal sustainability over time. This latter point, (4) is essential. Subsidies can be critical for reducing risk for early adopters, but they can become very expensive once large numbers are reached at scale, and can also create disincentives. Either the

government should have a proven track record of being able and willing to phase out subsidies once scaling takes off (Bangladesh did this with two-wheeled tractors) or there needs to be fiscal space to keep supporting these subsidies without blowing up the budget. For example, in Senegal the rice sector is heavily subsidized but the state has been able to afford this for over twenty years. By contrast, in Zambia subsidies for maize production have taken over the Ministry of Agriculture budget and become unaffordable. Innovations whose price or pricing is already attractive and affordable to potential adopters should be given a score of 3.

Score 3	Subsidies exist or are likely, (would) significantly improve affordability, have wide coverage, and are fiscally sustainable for several years.
Score 2	Subsidies exist or are likely, but either have a small impact on affordability, *OR* limited coverage, *OR* are not sustainable.
Score 1	Subsidies do *NOT* exist or are unlikely, *OR*, if they exist, have either a small impact on affordability or limited coverage, *AND* are not sustainable.

***Sources of Information*:** Interviews with commercial or local in-country partners, especially research station staff, should produce information on subsidies for the innovation or important complementary inputs. If not, USAID mission staff may be of help. An online search may also produce relevant information.

Criterion F.3: Are regulatory approvals (including registrations, licenses, and authorization) for the innovation in place or will be soon?

Rationale: Regulatory approval may be necessary before widespread introduction of a new product or innovation. If those approvals are not in place, are difficult and cumbersome to obtain because of many layers of bureaucracy or corruption, or require years to be processed, they can delay or prevent scaling up.

Scoring: Based on the number of registrations, licenses, and approvals needed, their current status, and the time and effort it is likely to take to obtain them.

Score 3	Most or all registration, licensing, and approvals are in place, easy to obtain, expected shortly, or are not needed.
Score 2	Most or all registrations, licenses, and approvals can be expected within the year.
Score 1	Approvals are needed and will entail a lengthy, difficult process, fraught with politically-connected interventions.

***Sources of Information*:** KIIs with the PI, CP, or IC should be able to identify the required regulatory registration, licensing, and approvals; the status of those approvals (if they are in process); or what is required in terms of time, effort, and resources to obtain the necessary approvals.

Criterion F.4: Does increased production/output require new standards (public, private, or other), enforcement, or sophisticated consumers?

Rationale: This criterion refers to the output being produced by adopters of the innovation, not the innovation itself. Some innovations produce benefits through higher quality that can command higher prices. Others represent a new product for which there needs to be official or privately-created standards to distinguish the authentic from imitations. Finally, some innovations result in the production

of new products. For those benefits to be realized, may require quality controls, new standards and sorting of output, or creating a market for the output. Examples of this are orange-fleshed sweet potatoes or jasmine rice. The absence of quality assurance measures can constrain scaling of this type of innovation.

Scoring: Note that this refers to output standards, quality assurance or measures to introduce and create demand for a new product, and NOT to address fraud and counterfeiting of the innovation itself.

Score 3	Increased production/output does not require quality controls, standards, or enforcement, or demand creation *OR* what is needed is already in place and functioning effectively.
Score 2	Widespread adoption of higher quality or different outputs require some modification of existing standards or quality controls, *OR* some strengthening in enforcement capacity, *OR* demand creation.
Score 1	Widespread adoption of higher quality or different outputs require new standards or quality controls, *AND* (substantial) strengthening of enforcement capacity. There is little or no evidence that the output is aligned with existing consumer tastes and preferences, and creating demand may take substantial time, if successful at all.

***Sources of Information*:** Interviews with commercial or local in-country partners should produce information on whether standards and enforcement are in place or new ones are necessary, as well as the taste and preferences of consumers. If time and resources permit, interviews with consumer organizations and enforcement agencies are desirable.

Criterion F.5: Are public services relevant to the ongoing utilization of the innovation (extension support, certification, quality control, and enforcement of regulations) of good quality and widely available?

Rationale: Public services such as agricultural extension, certification, standards, and regulatory enforcement are important to scaling up.

Scoring: The assessor should determine which public goods and services, apart from subsidies, are relevant. Three characteristics are important for scoring this criterion: (1) the quality of relevant services (e.g., are extension officers well trained?); (2) coverage and accessibility (e.g., do the relevant services exist in most or all the areas that are appropriate for scaling up the innovation? Are there enough extension officers where needed, and in what ratio to farmers?); and (3) the quantity of services (e.g., do extension officers make frequent visits)? In many cases, especially low-income or the least developed countries, the presumption should be that if public services are needed, they are likely to not meet one or more of these points.

Score 3	Relevant public services are of good quality, have widespread coverage, are available in the quantities needed; or public-sector services are not relevant.
Score 2	Relevant public services are lacking in one of the three characteristics: quality, coverage and availability, or quantity.
Score 1	Relevant public services are lacking in two or more of the three characteristics: quality, coverage and accessibility, and quantity.

***Sources of Information*:** The PI, CP, or IC should be able to identify the public-sector services relevant to the innovation, or the sectors in which they are needed. They should be able to provide a rough

assessment of the quality, coverage, and availability of the relevant public services in the regions, countries, or internal regions that are the primary targets for scaling.

Criterion F.6: Is the public sector able to supply key inputs (e.g., breeder or foundation seeds) to the value chain in sufficient quantities to keep pace with scaling?

Rationale: Even in private sector or donor driven pathways, there may be key inputs or public goods that only the public sector can supply (in most countries).

Scoring: Four items are relevant here. First, does the public-sector producer have the technical knowledge and related equipment to produce the needed goods in question? Second, does it have the capacity to produce them in the volumes needed and in a timely way given when producers need them? Third, is there sufficient budgetary allocation to produce the needed volumes? Even if the output is sold at a price, is the price sufficient to cover costs and are the proceeds remitted to the producing agency, versus going into the general fund? Finally, does the agency in charge of public sector production have incentives to respond to private sector needs or market demand, as opposed to public sector (expert) priorities? For example, the public sector must not only supply a sufficient quantity of breeder seeds, but they must also be the varieties that seed multipliers and producers want.

Score 3	The public sector has the capacity to supply all of the public goods or inputs that are relevant to the innovation, are of good quality, has the financial resources to produce them, and can make them available in the quantities (and varieties) needed on a timely basis. Or, public-sector services are not relevant.
Score 2	The public sector can supply some of the public goods or inputs that are relevant to the innovation, but either cannot keep pace with demand as scaling proceeds; cannot produce or distribute on a timely basis; financial resources are inadequate or is unlikely to be responsive to market demand.
Score 1	The public sector cannot supply public goods or inputs that are relevant to the innovation, and cannot even meet demand before scaling, or demand for similar products. This may be a result of lack of technological sophistication, equipment, and infrastructure or funding, or both.

***Sources of Information*:** The PI, CP, or IC should be able to identify what public-sector inputs may be needed, and provide a rough assessment of production capacity, quality, financial resources, timeliness and whether they are likely to be responsive to private demand.

Criterion F.7: Is complementary public-sector infrastructure (roads, irrigation, ICT networks, etc.) in place, of quality, and at sufficient scale to fulfill long-term scaling potential?

Rationale: Public infrastructure, including roads, irrigation, or ICT networks, is important to scaling up, especially when the public sector is the primary pathway.

Scoring: The assessment requires identifying the infrastructure needed for successful adoption and implementation of the innovation, as well as providers of that infrastructure (in principle) in the target area. Infrastructure must be rated on quality and coverage.

Score 3	Relevant public infrastructure is of good quality, has wide coverage, and is accessible.
Score 2	Relevant public infrastructure is lacking in either quality or coverage.
Score 1	Relevant public infrastructure is lacking in both quality and coverage.

***Sources of Information*:** The PI, CP, or IC should be able to identify public sector infrastructure that is relevant to the innovation, or to the sectors in which the innovation will be used. They should be able to provide a rough assessment of the quality, coverage, and availability of the relevant public infrastructure in the regions, countries, or internal regions which are the primary targets for scaling.

Assessors should keep in mind that for some innovations, one or more criteria may not be applicable (i.e., Non-Applicable). In these instances, the assessor should note "NA" in the "Scoring" column and deduct the number of scoring factors in Column 1, to ensure proper adjustment of the ASAM template.

ANNEX A: DEVELOPMENT OF THE ASAT

The scalability assessment tool (SAT) is the product of 15 years of work by MSI. MSI developed its first version of a SAT between 2005 and 2007 at the request of the John D. and Catherine T. MacArthur Foundation.[9] The tool was developed to: (1) distinguish between grantee programs with low and high-scaling potential; (2) assess the strengths and weaknesses of the programs vis-à-vis scalability; and (3) identify areas where information was missing.[10]

Literature on Scaling and Diffusion of Innovation

The initial SAT was developed from three sources, starting with the literature on the diffusion of innovation. In his seminal work on diffusion,[11] Everett Rogers identified five factors affecting adoption and diffusion: (1) relative advantage – is it better than what is already in use? (2) trialability – can it be tried without substantial investment of time or resources by potential adopters? (3) complexity – how difficult is it for adopters to understand, use, or implement effectively? (4) compatibility – how well does an innovation fit with adopters' existing usage patterns, values, and practices? and (5) observability – how visible are the results?

A second foundational source for the SAT was the work of Dr. Ruth Simmons and her team at the University of Michigan and ExpandNet,[12] and a variety of other scholars[13] who had begun to study scaling. They found that in addition to the factors affecting adoption of innovation identified by Dr. Rogers, *credibility* (i.e., whether the intervention was based on sound evidence and advocated by respected persons or institutions), and *relevance* (i.e., did it address persistent or sharply felt problems) are important.

Perhaps the most important source was MSI's work on Implementing Policy Change (IPC). IPC was developed for USAID beginning in 1990 in response to the perception that many nominal changes in country policy or strategy did not translate into changes on the ground.[14] The IPC work was particularly relevant in cases where the expected scaling up pathway was through the public sector. Among the factors identified by IPC, which affected successful policy (innovation) adoption and implementation, were: (1) the presence of champions advocating for or driving the change effort; (2) sufficient financial resources for both going-to-scale and implementing-at-scale; (3) organizational capacity to implement the policy or innovation; and (4) the presence and strength of potential opponents.

[9] The MacArthur Foundation had requested that MSI provide assistance to a select group of its maternal and child health grantees working in India, Mexico, and Nigeria.
[10] The tool ended up serving several additional purposes. Grantees found that the scoring process produced internal differences of opinion and perspectives and generated very fruitful discussions. They also found the results useful as a snapshot and reflection of their activities from an arms-length perspective and through a scaling lens. Finally, the results of the assessments also frequently provided a foundation for creating a scaling up strategy.
[11] The most recent version of Roger's seminal book is Everett M. Rogers, *Diffusion of Innovations*, 5th Edition (New York: The Free Press, 2003).
[12] See ExpandNet Scaling up Innovations.
[13] The work of Peter Uvin, L. David Brown, and David Miller was particularly useful.
[14] The IPC work was conducted by a large consortium led by MSI, including Abt Associates and DAI, and produced many tools and studies. These can be found at MSI. The work also resulted in the monograph**,** *Managing Policy Reform: Concepts and Tools for Decision-Makers in Developing and Transitioning Countries*, by Derick W. Brinkerhoff and Benjamin L. Crosby (Sterling, VA: Kumarian Press, 2001).

Learning and Refining through Application

The SAT went through multiple iterations at MSI. This was based on learning acquired from use of the tool in a variety of sectors and countries the following decade. A major insight was the importance of the intermediary organization (also called the scaling entity or resource organization) in driving the scaling process.[15] It became clear that a major source of multiple breakdowns in scaling was whether the intermediary had the motivation and necessary skills, capacity, and resources to drive the process.

The further development of the SAT benefitted, particularly in agriculture, from collaboration between MSI and the Brookings Institution's Wolfensohn Center.[16] The Wolfensohn Center was asked by the International Fund for Agricultural Development (IFAD) to assess IFAD's scaling experience with the goal of improving its success rate and systemically integrating scaling up into its projects and procedures.[17] The findings of this effort were integrated into IFAD's process of designing, approving, and implementing its rural poverty projects.[18]

The final source for the development of the ASAT was work done on scaling up FTF innovations by Dr. Richard Kohl, one of the co-authors of MSI's original SAT. Dr. Kohl worked with BFS to assess and enhance the scaling strategies in more than half the 19 FTF countries. This work generated valuable lessons at a granular level as to the external factors and innovation characteristics that adopters, and particularly small farmers, take into consideration in adopting new agricultural practices and technology.

Dr. Kohl's work with FTF projects was followed by a series of five detailed case studies that a MSI team led by Dr. Kohl conducted for BFS. These cases examined the determinants of successful scaling of agricultural innovations through commercial pathways in developing countries.[19] The five cases were hybrid maize in Zambia, Kuroiler chickens in Uganda, hermetically sealed storage bags in Kenya, agricultural machinery in southwest Bangladesh, and a package of technical and value-chain innovations affecting irrigated rice in the Senegal River Valley. The findings from these studies provided numerous insights into scaling processes and underlined the importance of an effective business case (generically, profitability and risk) for both adopters and other relevant actors in the market ecosystem, and a functioning upstream/downstream value chain. Despite the explicit focus on scaling through private-sector pathways, the studies found that, even in commercial scaling, a positive public policy enabling environment was vital, especially the presence of subsidies that mitigate risk for (early) adopters.

The criteria contained in the ASAT represent an amalgamation and integration of the 60 scalability factors identified in these sources. The list was subsequently reduced to 41 criteria by eliminating similar or overlapping criteria, and limiting the list to those criteria likely to be relevant for most agricultural innovations.

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[15] In other words, in addition to a "piloting" organization demonstrating proof of concept and feasibility of an innovation or intervention at small scale, and an organization capable of delivering the program or innovation, there was a need for an organization or entity to provide direct support for the scaling process.

[16] See A. Hartmann A. and J. Linn, "Scaling up: A Framework and Lessons for Development Effectiveness from Literature and Practice." Wolfensohn Center for Development, Working Paper 5. The Brookings Institution, Washington DC, 2008; and "Scaling Up through Aid - The Real Challenge," Wolfensohn Center for Development Policy Brief, The Brookings Institution, Washington DC, 2008.

[17] Many of these papers can be found at Brookings Scaling Up Development Impact.

[18] IFAD has subsequently produced a set of country and thematic notes on scaling up. See, for example, Scaling Up Results.

[19] This effort began with a more specific literature review on mathematical modeling of adoption and diffusion of innovations and agricultural innovations in developing countries.

ANNEX B: SAMPLE QUESTIONS FOR KIIS WITH RESEARCHERS AND PRIVATE SECTOR PARTNERS

1. What is the problem or challenge that this innovation or new technology seeks to address? What crops or livestock is this relevant to?
2. What agro-ecological conditions is this applicable to?
3. On a global level, or at least for low and medium-income countries, how big is the scale of that problem? How many farmers, hectares, countries, animals, etc.?
4. In those countries, how supportive are government policies, strategies and programs?
5. What is the innovation, and how does it work (in layman's terms)?
6. How similar or different is this innovation from current technology? Is this an upgrade or improvement on existing technology, such as an improved seed or water pump?
7. Are potential adopters dissatisfied with current technology? Or, alternatively, how much of a felt need is the issue being addressed by this innovation on the part of potential adopters?
8. What is the evidence of efficacy and impact? Where, when and how was that measured? By whom?
9. Is there evidence of impact and efficacy from research organizations within the relevant countries? What did they find?
10. Is there evidence of impact from trials with actual farmers or adopters in country? Under live conditions?
11. If there were farmer trials, what other challenges were found in terms of successful adoption, correct utilization or implementation?
12. Has the innovation received any explicit endorsements from government or research organizations?
13. Is there any evidence of intangible benefits, such as time savings?
14. In addition to the innovation itself, what other technologies, inputs, or agricultural practices would producers need to adopt or already be doing to effectively adopt this innovation? For example, would the need to adopt different types of land preparation, sowing, use and application of fertilizer and phytosanitary chemicals? different types of animal husbandry practices and management?
15. What infrastructure or capital goods and equipment need to be in place for farmers or adopters to successfully benefit from this innovation?
16. How different are these inputs and practices from what target producers currently do?
17. What kind of training, mentoring, handholding and technical support is recommended or required for successful adoption? Over what period? What is the source of this assessment?
18. What is the quality and coverage of existing public or private extension systems in the target countries and regions?
19. How does adoption of this innovation affect farmers need for labor? At what time of year? Whose labor in a household, or hired labor, is most likely to be affected?
20. How sensitive is the impact of adoption of this innovation to climatic conditions? Does it require farmers to have access to irrigation or other sources of year-round water?
21. If adoption by farmers or others is incomplete, partial, or incorrect, how would that be expected to affect the impact or benefits adopters see? How likely would they be to derive most if not all the benefits in these cases? In other words, if adoption of the innovation package is partial or incorrect, how much will the benefits decrease?
22. Is widespread adoption of this innovation likely to displace other technologies or innovations? Which ones?
23. What are the existing solutions to this problem, or competing solutions also coming on line soon? Why (or how) is the innovation you have developed better than those alternatives?

24. What is the status of the innovation? Proof of concept, field testing, commercial viability?
25. What has been the source of funding for this research, and how much longer will that funding support exist?
26. What, if any, are the outstanding research challenges that remain?
27. Will additional funding be required to address those challenges? For what period? Is that funding already in place?
28. What countries, or partners located in which countries, have been involved in the research? Are those countries the intended target for initial introduction and scaling?
29. Has it been transferred to the field, and if so, to whom? Have any farmers (or other intended adopters) actually used it?
30. What is the status of the ownership of the intellectual property relevant to this innovation? Will some sort of transfer, licensing etc. be necessary as part of scaling? What kind exactly, and what is the status of effecting that?
31. What types of regulatory or other approvals, acceptance, endorsement etc. is required, or would be desirable (e.g. endorsements or recommendations), from public agencies or private sector actors would be needed for introduction and scaling?
32. Are you aware of any other laws, regulations, licenses etc. that will affect production, imports, adoption and scaling?
33. What are the technical competencies necessary for a distributor, seller, marketer to have?
34. Can the innovation or needed inputs or complementary inputs be produce locally?
35. What is the status of putting large scale production and distribution in place? Are there public or private producers in place in the target countries or regions who could produce and distribute the innovation?
36. What public or private organizations are or are expected to be involved in the production and distribution of the innovation, or other relevant inputs? What relevant capacity and experience do they have?
37. Are there downstream market linkages capable of processing, marketing any additional or new output?
38. What is the size of the total market that the output would feed into? What share would any increased output be relative to the total market? Would additional output be likely to put downward pressures on prices?
39. Are agreements and relationships with any of these organizations already in place?
40. Is there any information available as to how profitable this would be to produce and distribute?
41. What public or private organizations are or are expected to be involved in the roll-out, awareness building, initial field testing, demonstrations and scaling with farmers or other expected adopters?
42. What is the status of demonstrations or awareness building? At what scale?
43. What capacity do those organizations have in terms of roll-out, awareness building, initial field testing, demonstrations, and marketing to farmers, et al?
44. Are agreements and relationships with any of these organizations already in place?
45. Who would be expected to be the last mile seller or distributor of this innovation who would have direct contact with the adopter e.g. farmers? Agro-dealers, public sector extension agents, veterinarians, or?
46. Is funding or other resources (e.g. in-kind) in place to support of roll-out, awareness building, initial in country field testing, demonstrations and marketing to farmers?
47. For a farmer or other adopter, what kinds of training, extension support would be required for them to learn to use it properly? How much time, seasons, would this take?
48. What challenges are likely to arise for farmers or other adopters in effectively adopting, implementing and using this technology?

49. Are there any studies or evidence available on the cost of adopting this innovation for farmers or other adopters? Cost-effectiveness? Cost-benefit? Crop budgets or the equivalent?
50. How prone is this innovation to being counterfeited or fake versions being produced? How easy is it for adopters to distinguish the real thing from fakes?
51. How many years or seasons would a farmer or adopter need to recover the cost of adopting this innovation?
52. What do we know about the potential profitability for producers and distributors of this innovation?
53. What is the minimum scale that a farmer et al could adopt this to try it for the first time?
54. If the innovation is adopted on something approaching potential scale, what impact would this have on total output production relative to current production?
55. Is any output produced by this innovation been tested for compatibility with local tastes, appearance, culture, cooking, and processing standards?
56. Are there any government subsidies in place that would affect the cost of adoption in relevant countries?
57. Are needed government infrastructure, inputs and support services, e.g. irrigation infrastructure, breeder seeds in place, and of sufficient quality and coverage to allow for reaching most potential adopters?

ANNEX C: DATA SOURCES FOR USING THE ASAT

The information with which to use the ASAT can be obtained from several data sources. Foremost are the websites of CGIAR centers. These are listed in Table 5. Column 1 shows CGIAR centers with a focus on tropical agriculture, column 2 lists specific CGIAR organizations concentrating on the most important staple grains and crops, and column 3 includes specific initiatives between donors, national research centers, CGIAR centers, and universities around certain crops, products, or issues. These lists are indicative, not exhaustive.

TABLE 5: CGIAR DATA SOURCES

Regional CG Centers	Product-Specific CG Centers	Alliances, Initiatives, and Partnerships
International Center for Tropical Agriculture (CIAT)	Africa Rice	Africa RISING
International Crops Research Institute for the Semi-Arid Tropics (ICRISAT)	International Livestock Research Institute (ILRI)	Agricultural Technology Adoption Initiative
International Food Policy Research Institute (IFPRI)	International Maize and Wheat Improvement Center (CIMMYT)	Alliance for a Green Revolution in Africa (AGRA)
International Institute of Tropical Agriculture (IITA)	International Potato Center (CIP)	Drought Tolerant Maize for Africa initiative
International Center for Agricultural Research in Dry Areas	International Rice Research Institute (IRRI)	Global Alliance for Climate-Smart Agriculture
	International Water Management Institute (IWMI)	Pan African Bean Research Alliance (PABRA)
	World Agroforestry Centre (ICRAF)	Power Africa
		Scaling Seeds and Technologies Partnership in Africa (SSTP)

Additional information can be found on the websites of UN agencies, international foundations supporting agricultural development, and leading universities. The most important of these are listed in Table 6.

TABLE 6: FOUNDATIONS AND INTERNATIONAL DATA SOURCES

Foundations	Major US Research Universities	Other Universities and Research Centers
The Bill and Melinda Gates Foundation	Cornell University	Addis Ababa University
World Bank	Texas A&M	Ayub Agricultural Research Institute (AARI)
	University of California at Davis	Borlaug Institute for South Asia
	University of California at Riverside	Ethiopian Institute of Agricultural Research
The Rockefeller Foundation	J-PAL (US University institute)	Indian Council of Agricultural Research (ICAR)
The Syngenta Foundation	Kansas State University	Kenya Agricultural Research Institute
	Michigan State University	Makerere University, Kampala, Uganda
United Nations Agencies in Agriculture	Oregon State University	Stellenbosch University
International Fund for Agricultural Development (IFAD)	Pennsylvania State University	University of Eldoret (Kenya)
Food and Agriculture Organization (FAO)	Purdue University	University of Ghana
	University of Illinois – Champagne Urbana	University of Namibia
	University of Georgia	University of Natal
	University of Texas El Paso	University of Pretoria
	Washington State University	University of Reading (UK)
		Wageningen University (Netherlands)

There are also a few international sources.

- The United Nations Food and Agriculture Organization (FAO) has several websites that should be used as the primary source for much of the data required.
    - **FAOStat** has data on area harvested, number of livestock, employment in agriculture, and area under agriculture, with multiple sub-categories. This might be the single most useful site, especially as national data are more likely to be comparable across countries.
    - The FAO Global Agro-Ecological Zones (**GAEZ**) provides data on areas, broken down by thermal and moisture areas, irrigation and rain-fed, crop suitability, etc.
    - **CountrySTAT** is a web-based information system for food and agriculture statistics at the regional, national, and subnational levels.
    - **GLiPHA**, the Global Livestock Production and Health Atlas, is an extensive data warehouse containing global and subnational information on the livestock sector. It shows livestock related information in the form of maps, graphs, and exportable tables.
- Statistics can also be found on national Ministry of Agriculture or Statistical Bureau websites,

though not all countries have them, and the number of statistical series covered varies widely. (Most publish a hard-copy statistical abstract, if statistics are not available online).

- National Statistics may exist but tend to be outdated (at least two to three years out of date).
- Two private/nonprofit sites have some aggregate data, though these are usually derived from the international or national statistical sources cited above. Good examples are **NationMaster** and **CountryStat**. Other aggregators with specific interests can also be used, but with caution.
- **United States Department of Agriculture (USDA)** publishes a variety of statistics, but these are less useful for the purposes of the ASAT when applied to international development projects. The USDA series tends to have commodity-specific estimates of global production, production by the US and world's largest producers, and trade in that commodity. In most cases, medium and low-income FTF countries are not listed as they are rarely among the top five or ten producers.

ANNEX D: AGRICULTURAL SCALABILITY DECISION TREE DIAGRAM