Agricultural Technology Assessment Tool

In assessing the utility and appropriateness of an agricultural technology for farmers and other actors in the value chain, it is important to consider multiple interlinked factors. These include the potential for risk exposure, the availability of complementary inputs, and the reliability of delivery institutions. The decision to introduce or promote a new technology should weigh the potential pitfalls—such as increased risk to farmers, or environmental degradation—alongside the magnitude of potential benefits. It is also essential to evaluate the quality of the evidence on costs and benefits (i.e. the certainty with which pitfalls or positive impacts can be estimated or predicted). Note that we define technology broadly to include improved agricultural practices, crop varieties, inputs and associated products such as crop insurance.

This tool is designed for use as a framework for assessing the potential scalability of an agricultural technology and to facilitate decision-making discussions by NGOs, donors, governments, technology developers and other stakeholders. The tool is broken into three sections:

- Section one helps identify the problem that the technology seeks to address and to identify alternative solutions.
- Section two offers a rubric for estimating the magnitude and certainty of a technology's benefits to small-holder farmers, their communities, and to other actors in the agricultural value chain.
- Section three provides a framework of potential pitfalls to consider. Each type of potential pitfall is accompanied by a series of questions intended to stimulate discussion. Not all questions are relevant to all settings, and many relevant questions are omitted, so those included should be used to start the conversation, not as an exhaustive list.

In using this tool, you should be able to roughly estimate the probability of appropriate technology adoption and the scalability of the technology, given existing knowledge of potential benefits and failures. "Appropriate technology adoption" is defined to mean the take-up and use of a technology in a way that proves utility-enhancing, profitable, and/or welfare-increasing for farmers and others along the agriculture value chain.

A. Problem Identification

What problem is the technology intended to address? On what evidence is the definition of the problem based? What are alternative or competing technologies (or non-technological approaches) for addressing this problem? Where did the idea for the proposed technology come from? What evidence is there on what has worked/failed in for addressing similar problems?

B. Magnitude & Certainty of Benefits

What is the magnitude of the technology's benefits for small-holder farmers?
The benefits for each technology will be different—a technology might reduce yield variability, increase yields, reduce labor costs, etc. There are trade-offs between benefits and costs, but let's begin by identifying and listing the types of benefits and their magnitudes. Describe and discuss, then use the table below to select the overall magnitude of the benefit you expect: Low, Medium, or High.

How certain is the estimate of magnitude? Is there high quality evidence to support that prediction?
Consider whether this technology is new or has been adopted elsewhere. If the latter, have rigorous impact assessments been carried out to measure not only changes in yield/output, but also changes in household welfare (e.g. nutrition or consumption)? How extensively has the technology been adopted elsewhere—what is the take-up rate? Who are the main adopters in these settings? How do these settings differ from the proposed context? Describe and discuss, then use the table below to select how certain the benefits are: Low, Medium or High.

		Magnitude of the potential benefits		
		Low	**Medium**	**High**
Certainty about the magnitude	**Low**			
	Medium			
	High			

C. Pitfalls of Scaling Up

Below is a listing of potential barriers to the appropriate (i.e. profitable or utility enhancing) adoption of a new technology. For the technology under consideration, please explain how appropriate adoption might be affected by each of the barriers listed below. How problematic is each barrier likely to be in the proposed context ("magnitude" of problem)? Is there any evidence to support this prediction ("certainty" of failure)?

For each potential pitfall, describe and discuss how it applies to the setting and technology under consideration.

1. Does this technology increase the amount of risk that farmers or other actors in the agricultural value chain face?

Are yields, sales or profits highly variable? Is the risk known and understood by users of the technology? Are benefits from the technology dependent on unreliable or uncertain access to other inputs or complementary technologies? Will profits become more dependent on output prices?

2. Does this technology require any other inputs, systems, institutions or supporting markets?

Are credit, insurance or other financial services required? Does it require complementary inputs like irrigation or fertilizer? Are seed sources or other supply chains reliable? Does it require post-harvest processing, additional labor, or linkage to new markets? Is the technology distributed by agricultural extension workers? Is contract enforcement or other supporting legal or political institutions required for scale-up?

3. Does the use of this technology require any information or training?

Will diffusion and scale-up of the technology require knowledgeable trainers or marketers? If this is a new technology, how is information made available? Is there a need for training for users? Who will need to maintain or fix the technology? Do men and women have equal access to information about the technology?

4. Are there social or cultural constraints to adoption of this technology, or its product?

Is there low willingness to pay for the technology or its outcomes? Are there cultural preferences (i.e. food flavor or appearance) that could cause failure to adopt? Is there community sanctioning of certain activities associated with the technology or its adoption (e.g. gender constraints)? Are there local traditions that might inhibit adoption? Are there power dynamics within the household or community that would affect adoption?

5. Are profits, benefits or yields shared among many people?

Do some benefits (or costs) accrue beyond the direct user? Do some benefits (or costs) accrue to society at large? Do benefits (or costs) accrue preferentially for women or men?

6. Are yields and profits distributed across time?

Are some benefits delayed into the future? Do additional costs come before benefits are realized? If so, is the technology accompanied by sufficient short run incentives to encourage adoption? Will the technology deliver profits in the short and long term?

7. Will geographical constraints or a need for targeting make distribution difficult?

Are communities too sparsely settled for efficient distribution of the technology (or associated marketing information)? Will the product require targeting to certain groups? Is it only appropriate for some types of users, and not others? Is there demand from only certain types of users, such as farmers with very small or very large landholdings?

8. Does the purchase or use of this technology have any negative spillover effects?

Does the technology cause environmental degradation? Does it displace other important [economic or household] activities? Does it displace other purchases? Will introduction of the technology cause rapid changes in other market prices? Are there negative health consequences?

9. Are local microclimates or agro-ecological zones appropriate for this innovation?

Is the technology designed or adapted for different rainfall patterns or soil types? Is it vulnerable to local pests and diseases? Is high quality evidence available on the agro-ecological appropriateness of the technology? How adaptable is the technology to variations in microclimates?

10. Does this technology require cooperation among groups of farmers or households?

Does the technology generate unequal benefits among group-members? If a cooperative or other collective institution is required, is there risk that resources or decision-making will be "captured" by community elites? Is there a risk that some group-members will "free ride"?

11. Is this technology sustainable?

What is the long term growth opportunity? Does this technology help a dying market or a declining crop? Is the technology accessible/affordable for farmers? Does the technology require long term support from the public sector (NGOs, donors, governments)?