

Guidance on counting “technologies” for USAID crop and animal breeding and selection projects

INDICATOR TITLE: 4.5.2-39 Number of technologies or management practices in one of the following phases of development:

- ...in Phase I: under research as a result of USG assistance**
- ...in Phase II: under field testing as a result of USG assistance**
- ...in Phase III: made available for transfer as a result of USG assistance (S)**

A number of research projects supported by USAID involve plant or animal breeding and selection activities spanning from lab based work to field testing and technology transfer. To monitor the progress and product delivery of these projects, and to meet the Feed the Future Monitoring System (FTFMS) requirements, a consistent and meaningful way of counting and categorizing the technologies under research, field testing or available for transfer is necessary.

The Feed the Future (FTF) handbook of indicator definitions provides a broad definition of a number of technologies or management practices in each of three phases of research and development – i) the research level, ii) the field testing level and iii) the ‘made available for transfer to users’ level. These are outlined in indicator title 4.5.2-39. This indicator is broadly used for different disciplines of agriculture and it is necessary to further define how technologies are categorized in each specific field of research and development. Thus, this document provides further definition to the categories of plant and animal breeding and selection technologies and how to count them at each phase of indicator 4.5.2-39.

Because the results of this indicator are aggregated across different projects and across the agency, it is important to have consistent/meaningful definitions for this indicator – this allows operating units to monitor progress and performance. This document is a supplement to, and not a replacement for, the guidance outlined in the FTF Indicator Handbook¹ – users should consult both documents.

Note:

1. This indicator is currently disaggregated according to phase of research and development, with the implication that a technology can only be listed in one phase of research at any one time, as the results at each phase are added to arrive at a “Total number of technologies”. However, we recognize that 1) the definition of a technology may differ at each phase, 2) a technology may stay within one phase for several years, and 3) a technology can legitimately be in more than one phase of research at any one time, either within a project or in different projects. For this reason, this indicator would be most useful if it were split into three separate indicators and technologies assessed and counted independently at each phase (as it was prior to FTF). However, it is unlikely that we will be able to add additional indicators to the FTF list. As a next best solution, FTFMS will no longer calculate the sum of technologies across the three phases and enter the results at the overall indicator level. Instead, the overall indicator value will be left blank and shaded out, and all aggregation and analysis of indicator results will be done by phase.² This is essentially the same as treating each phase as a separate indicator, **meaning you may count one technology in multiple phases in any given year.**

2. This document only attempts to define technologies related to animal and plant breeding and selection. Similar uncertainties exist when defining other categories of technologies and management practices. The Research Division will be developing additional guidance for other categories of technologies, but this may not be available for the FY13 reporting season.

¹ <http://feedthefuture.gov/resource/feed-future-handbook-indicator-definitions>

² To a certain extent, this is already being done. For example, only the results of phase 3 are reported in the FTF Progress Scorecard.

Categories and definitions of technologies for plant and animal breeding and selection projects – by phase of research

Phase of Research	Categories of Technologies	Individual Technologies	Suggested way of counting technologies
1. Technology “Under Research” Technologies are being evaluated or validated under ideal conditions – usually a lab, field station or contained holding facility (but confined field trials for transgenic crops or animals go into the next phase of research).	1.1 Genes, Quantitative Trait Loci, marker loci, panels of genes or markers	1.1.1. Novel genes with known major effect(s) on specific traits	Each unique gene or genetic element identified that controls the expression of a specific major function in the plant or animal should be counted as a separate technology.
		1.1.2. Transgene or genetic element for improved trait	Each unique transgene or genetic element with a known function in the plant system.
		1.1.3. Tissue specific gene promoters identified and validated	Each gene promoter with its own unique sequence and function in the plant or animal can be counted as a separate technology (but see note below under gene constructs).
		1.1.4. Molecular genetic markers linked to genes controlling specific traits	Each molecular marker identified and linked to a particular gene with a major effect that is related to a specific function/trait can be counted as a separate technology (but see note below under gene constructs).
		1.1.5. Transformation ready gene constructs	Each gene construct capable of being used in transformation can be counted as a separate technology. Note: If a gene and/or promoter are included in a construct for transformation, they should not also be counted separately.
		1.1.6. Quantitative Trait Loci (QTL) for major effects identified and validated	Each QTL in a specific position on the linkage group and related to a specific trait can be counted as a separate technology.
		1.1.7. Panels of genes or markers used in association mapping studies	Each specific panel for a given trait is counted. For example, if 50 genes represents 3 previous panels for 3 traits then count of number of technologies is three
	1.2 Breeds or lines with improved trait [transgenic lines, introgression lines, Near Isogenic Lines (NIL), RILs]	1.2.1 Population of lines or breeds used in phenotyping and large crossing blocks	Counts are number of populations (not lines)
		1.2.2 Introgression lines, lines of self-pollinated crops, recombinant inbred lines (RILs), near isogenic lines (NILs) with desired specific genes, quantitative trait loci (QTLs), marker loci or traits incorporated in a background genotype	The improved trait, the genetic control of the trait and the genetic background of the lines are important points to consider in counting lines. A group of lines identified for the same trait with the same genetic system and derived from the same parents should be taken as one technology. However, lines identified for a different trait from the same population may be counted as separate technology.

Phase of Research	Categories of Technologies	Individual Technologies		Suggested way of counting technologies
		1.2.3	Lines from gene pyramiding	Each group of lines containing the unique gene for pyramiding
		1.2.4	Doubled haploid lines (DHLs), inbred lines (hybrid parents), hybrids with desired traits	A group of DHLs identified for the same trait with the same genetic system and derived from the same bi-parents should be taken as one technology. However, DHLs identified for a different trait from the same population should be counted as separate technology. Each inbred line or hybrid with its own features can be counted as a separate technology.
		1.2.5	Germplasm accession with specific trait (e.g. heat, drought, salinity, or disease tolerance) as sources of genes for desired traits	Each germplasm accession identified as a source of gene(s) for a specific trait can be counted as a separate technology
		1.2.6	Transgenic lines with desired traits	Each transgenic line with its own desirable attribute for further use. Note – distinct events with the same construct in the same background material do not constitute multiple technologies.
		1.2.7	Animal line with specific trait (e.g. heat, drought, growth, and disease tolerance) as sources of genes for desired traits	Each line with desirable attribute for further use
2 Technology “Under Field Testing” Refers to field testing taking place under representative user conditions or confined trials of GE animals or plants.	2.1 Superior genotypes, lines and varieties	2.1.2.	Superior genotypes from field testing	Each new and superior genotype over the standard check for a specific trait with field performance data
		2.1.3.	Lines of self-pollinated crops, Recombinant Inbred lines (RILs), Near isogenic lines (NILs) or isolines, and Doubled haploid lines (DHLs) with desired traits incorporated	Each new and improved line over the standard check for a specific trait with field performance data
		2.1.4.	Breeds or lines or crosses with improved traits	Each new and improved line over the standard check for a specific trait with field performance data
		2.1.5.	Hybrids with desired traits	Each new and improved hybrid over the standard check for a specific trait with field performance data
		2.1.6.	Transgenic lines	Each new and improved transgenic line over the standard check for a specific trait with field performance data
		2.1.7.	Ideotypes of crops designed for a specific environment (e.g. drought prone environment)	Each improved ideotype created and tested for a specific environment

Phase of Research	Categories of Technologies	Individual Technologies	Suggested way of counting technologies
		2.1.8. Improved variety or breeds for which regulatory approval or certification is actively being sought so that it may be commercially released.	Each new variety, improved line or breed may be counted as a separate technology. Inclusion in this phase is to account for the fact that research and field trials may continue in order to supply data for the approval process.
3. Technology “Made Available for Transfer” New varieties, breeds or lines must have passed all approvals (variety registration, biosafety approvals, certification, etc...) before they can be said to be “available”. End users (eg farmers or service providers) must be able to use them freely.	3.1. Varieties, cultivars, lines, breeds and management practices	3.1.1. Varieties, cultivars, lines or breeds with various desirable traits ready to be disseminated	Each variety, cultivar, line or breed being made available for dissemination during the reporting year may be counted as a separate technology. Note, if those same technologies are also being disseminated to end-users during the same reporting year, the uptake of those technologies is counted under other indicators.