

What Have we learned?

What can we do that will be revolutionary?

How will we tell that we've succeeded? (metrics)

Is there a silver bullet for plant transformation?

Significant variation from plant to plant (and genotype to genotype, environment to environment) makes development of a universal tool to improve transformation efficiency unlikely.

However...



Is this a plausible ARPA-E Project/Program?

- Design/develop a tool/strategy that, with a single transformation event on any organism of known sequence, that would
 - Create a “supercompetent” host by knocking out host genes
 - Immortalize host cells
 - Introduce site directed recombination
 - Be excised when necessary by a single transformation

Other ideas for discussion

- Methods for reliable culture/regeneration for single cells
- Transformation using automation at the single cell/subcellular level
- High-throughput transient expression methods
- Single cell sequencing or screen-by-sequence
- Methods for inter-species crossover (translation of traits from one species to another)
- Alternative trait delivery systems that don't rely on transgenic plants
- Single site direct homologous recombination (i.e. MAGE for plants)
- Methods for screening for or synthesizing strong promoters
- Laser capture micro-dissection/micro-grafting
- Analyzing microenvironments
- Biosensors for visual analysis
- Robust omics platform to predict mature phenotypes at early stages

Technology readiness levels (TRLs)

TRL 9

TRL 9 : Actual technology system qualified through successful mission operations.

TRL 8

TRL 8 : Actual technology system completed and qualified through test and demonstration.

TRL 7

TRL 7 : Technology prototype demonstration in an operational environment.

TRL 6

TRL 6 : Technology demonstration in a relevant environment.

TRL 5

TRL 5 : Technology validation in relevant environment.

TRL 4

TRL 4 : Technology validation in laboratory.

TRL 3

TRL 3 : Analytical and experimental critical function and/or characteristic proof-of-concept.

TRL 2

TRL 2 : Technology concept and/or application formulated.

TRL 1

TRL 1 : Basic principles observed.