

GCP ARM Bangkok Sept. 18, 2008

World Café Session

Topic: Which Marker System is Best?

Moderator: Jeff Ehlers, Univ. of California, Riverside

Summary of Discussions:

Several marker systems were discussed, with most of the discussions centering on the cost of the SNP vs. DaRT, SSR or AFLP. A general conclusion reached was that the most appropriate marker system will be determined by availability of markers and genomic resources for a particular crop, and local cost and flexibility considerations. Few people were still using AFLPs. The Illumina SNP approach is expensive for crops without large SNP resource. The start-up cost for DaRT was given as about \$20,000. Start up costs for the Illumina system would be close to \$500,000 if SNP discovery is needed. Both Illumina Bead Xpress (384 markers) and Dart appear to cost \$20 per DNA sample, depending on marker number being assayed. Both methods require outsourcing of genotyping. ICRISAT has a well functioning DaRT marker genotyping service. IRRI is buying the Bead Xpress platform, but will only use the machine for in-house work for the time being.

Local cost of adopting different marker systems is the primary driver of which marker system is best. Cost per genotype 'read' is more important than cost per data point. Breeders would generally prefer to evaluate a large number of genotypes at fewer loci than a few genotypes and many loci, hence cost per sample is a key criteria. This can favor the DaRT system over the Illumina. However, if a 'whole genome selection method' is used, the Illumina Bead Xpress system will be much more efficient. Modern breeding will likely be going in the direction of 'whole genome selection' so the future would seem to belong to SNP based systems like the Illumina. There are other SNP genotyping systems/companies similar to the Illumina system, but little was known about the cost and effectiveness of the systems.

Cost structure will vary considerably with different situations, especially program need. For some programs that have either low labor costs or 'subsidized' (institutionally provided) technical help, this is not a major factor in cost calculations.

Outsourcing was mentioned as potentially problematic in terms of turnaround time for breeders decision making process.

Need for marker density, which depends to a great extent on breeding objective, is another consideration, but having more markers can help in re-creating favorable genetic backgrounds.

Many participants interested in using markers asked "what is the best marker system for me to adopt?" **A recommendation would be to have the GCP develop a tool to help people make this decision.**

A chip-based SNP genotyping system is under development in rice, and will likely be expanded to other crops shortly thereafter. Genome sequence information is needed for chip development, but sequencing costs continue to fall and many crop genomes may be sequenced within the next five years. For rice, a 500 SNP marker chip is envisaged that would cost less than \$3.00.