

ILLUMINA, PARTNERS DEVELOP COWPEA GENOTYPING PANEL TO SUPPORT AFRICAN AGRICULTURAL RESEARCH

October 21, 2014

By [Justin Petrone](#)

NEW YORK (GenomeWeb) – The International Cowpea Consortium and Illumina have developed a new SNP genotyping array for the cowpea that the partners hope will aid in improving crop yield, particularly in West Africa, where the protein-rich legume is a dietary staple.

According to Tim Close, a geneticist at the University of California at Riverside, the new 60,000-marker iSelect array provides a 40-fold increase in marker density compared to an older, 1,536-marker GoldenGate panel that Illumina has manufactured since 2007.

"This chip is now available to anybody," Close told *BioArray News*. "The word has spread and will continue to spread," he said of the chip. "We have a great cluster file, and once we see our work published, we expect interest in the array to rise."

Close and colleagues from Burkina Faso, China, Ghana, Nigeria, and Senegal developed the array with the support of San Diego-based Illumina through the vendor's Agricultural Greater Good Initiative, a company program that provides researchers with the tools and technologies necessary to improve agricultural practices in the developing world. The company has awarded the grants each year at the annual Plant and Animal Genome Conference in San Diego since 2011.

Close earlier this year received a Greater Good Initiative grant to improve cowpea tolerance to the stresses of Sub-Saharan Africa through the development of genetic knowledge of the cowpea, training on how to use that knowledge in breeding, and applying that knowledge to cowpea breeding programs in West Africa.

Also known as the black-eyed pea, the cowpea is the "most highly consumed source of protein" in the human diet in Sub-Saharan Africa, the main growing region of which is in West Africa, Close said. The legume is mostly grown by so-called smallholders, village farmers that support single families with a mix of cash crops and subsistence farming.

According to Close, the West African countries of Burkina Faso, Niger, and Nigeria are the three leading producers of cowpeas. Smallholders grow cowpeas not only for human consumption, he noted, but for feeding the small herds of animals they keep. "The cowpea is very important to livestock in the region," he said.

The legume, however, faces a number of problems, including environmental conditions such as drought that can lead to low crop yield and starvation conditions among some West Africans. "Droughts impinge productivity, but even under well-watered conditions, there is always a problem with insects," Close added, as they affect each tissue component and developmental stage of the plant. According to Close, some insect infestations can cause over a 90 percent loss in yield.

Close and colleagues now hope the availability of a cowpea SNP chip can be used as part of the development of cowpea varieties with desirable traits, such as higher yield and quality, disease resistance, pest resistance, and drought tolerance. "We are using the chip to sift through the germplasm to improve variety in the West African cowpea," he said.

To develop the array, Close and his colleagues worked with Illumina to whittle down a master list of about 7 million SNPs to the 60,000 markers that fit within the specifications of Illumina's 12-sample, iSelect array format. While higher-density SNP chips for agricultural research do exist, such as Illumina's 777,000-SNP BovineHD, Close said that the consortium lacked the funds to develop and use such a chip. "The most we could afford for cowpea is what we have," said Close. "But the Greater Good Initiative has helped to bring 40 times more SNPs into the research arena than were available previously."

Members of the International Cowpea Consortium will now use the array to define haplotypes of favorable and unfavorable alleles, knowledge that will go into programs for marker-assisted breeding, Close said. He noted that programs are already in place for transferring genetic knowledge to West African smallholders, meaning that any new insight gained via the cowpea chip will be "superimposed" on these existing programs.

All of the data generation and analysis to date has been done in California. However, Close said that his team is working with African partners so that they will be able to prepare DNA samples and conduct their own data analysis in the future.

Mike Thompson, Illumina's associate director of global sales, told *BioArray News* that the company has made its GenomeStudio data analysis software available to all of Close's partners in Africa. The company apparently sees such collaborations as a gateway to developing the market for its tools on the continent, especially in a region that should benefit most from such efforts.

"We have several installations in Africa now and various programs to promote life in Africa," said Thompson. "Being able to train [Close's] partners is very important from our perspective," he said.

Illumina also hopes to see the cowpea chip adopted in other geographies, such as India, China, and the Middle East. "We are leveraging our systems and sales people to make the chip as broadly available as possible, especially given the global food security issues," said Thompson. "It's a global market."

The new cowpea SNP chip is just one of many consortium-designed arrays for agricultural research being made available more broadly to researchers. In May, the Cotton SNP Chip Consortium introduced a 70,000-marker, 24-sample iSelect [array for cotton](#), with the aim of using the tool to identify markers related to valuable traits that will lead to improved cotton yield and higher-quality crops.

Though Illumina's sequencing revenues now dwarf array revenues, Illumina sees the two technologies as complementary, with the diminishing costs of microarray analysis now making it possible for groups like the International Cowpea Consortium and Cotton SNP Chip Consortium to produce and use their own microarrays.

"There is a lot of life left in the array business," Thompson told *BioArray News* in May, "and there are a lot of business entities working on the technology and pumping a lot of samples through that business."