

# Seeking Sustainable Protein Sources for Asia and Sub-Saharan Africa

ICRISAT researchers are using Illumina sequencing to develop disease-resistant pigeonpea varieties.



Recognizing that its technology could play a critical role in alleviating global hunger, malnutrition, and poverty, Illumina created the Agricultural Greater Good initiative. Each year, Illumina awards Greater Good grants to agricultural research organizations that are focused on identifying and breeding plants and animals that will increase the sustainability, productivity, and nutritional density of crop and livestock species. Under the grants, Illumina sequencing and genotyping reagents are provided free of charge.



ICRISAT  
2013 Illumina Greater Good Initiative Award Winner

## Introduction

Founded in 1972, the International Crops Research Institute for the Semi-Arid Tropics (ICRISAT) is a non-profit, non-political organization conducting agricultural research for development in Asia and sub-Saharan Africa. It's an area of the world that is in desperate need of new farming tactics and tools, with more than 25% of its 2 billion people living in poverty and hunger.

According to Rajeev Varshney, Ph.D., Research Program Director-Grain Legumes and Director, Center of Excellence in Genomics at

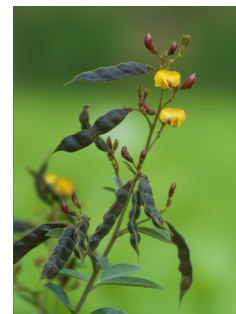


Rajeev Varshney, Ph.D., is Research Program Director-Grain Legumes and Director, Center of Excellence in Genomics at ICRISAT.

ICRISAT, one of the organization's objectives is to apply scientific innovations to dryland agriculture. This farming method is designed for regions of scant rainfall, focusing on water-retentive tillage methods and the selection of suitable crops, rather than relying on irrigation. "The objective of ICRISAT is to develop superior varieties of crops that can thrive in drought conditions," Dr. Varshney said. "There's not much variety within the few crops that are cultivated in Asia and Africa. While breeders have been successful in developing new, hardier crops using traditional approaches, it wasn't until 2005 that we really started to leverage genomics. Molecular breeding enables us to make strides in developing crops that are truly sustainable in this region."

The pigeonpea (*Cajanus cajan*) is a hardy drought-tolerant legume from India that is used for food, livestock feed, soil erosion amendment, and as a wind break. It's an excellent protein source, and is often referred to as the "poor man's meat." India produces 90% of the pigeonpea grown in the world and is also its largest importer. While pigeonpea is important for food security in India, it's an income-generating crop in Africa, particularly Kenya, Tanzania, and Rwanda. In these countries, farming pigeonpea enables families to send their children to school, something that would be otherwise impossible.

"When I joined ICRISAT, we had just 10 molecular markers in pigeonpea," Dr. Varshney said. "These were simple sequence repeats or SSRs. We had no genomic resources such as advanced molecular markers or single nucleotide polymorphisms (SNPs), and no mapping populations. However, when you have a crop like pigeonpea, which has narrow genetic diversity in the germplasm, even if you have 10,000 SNPs, there are only about 200 to 300 that will be polymorphic in germplasm. For the last several years, we have been collaborating with different partners to develop genomic resources in pigeonpea using next-generation sequencing (NGS)."



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