

Soybean Crop Vulnerability Statement 2020

Soybean (*Glycine max* L. Merr.) is a major crop in the United States with a six-year average of 84 million acres planted, second only to maize. Like all other major crops, the nation's commercial soybean varieties are descended from a small number of ancestral strains. Acquiring, protecting, maintaining, and enhancing the genetic diversity of soybean germplasm is essential to soybean production in the United States.

1. Soybean varieties are constantly under attack by disease and insect pests and resistance is available for many biotic factors. Resistance has been developed but selection pressure over time on pathogens and insects leads to susceptibility of even the most resistant of cultivars. Screening of soybean accessions for current and emerging disease and pest threats is critically important but generally lacks a systematic approach. Of the soybean diseases, soybean cyst nematode consistently contributes approximately 1/3 of yield loss due to disease each year. It is not uncommon for this yield loss to measure greater than 100 million bushels. Other diseases of significance include Sclerotinia stem rot, various seedling diseases including Phomopsis, sudden death syndrome, frog-eye leaf spot, and phytophthora root and stem rot. Insect pests contributing greatly to yield loss include stink bugs, corn earworm, bean leaf beetle, soybean looper, and soybean aphid.
2. To remain a competitive crop, soybean varieties will need to be more resilient and adaptable to increasing weather and environmental risks including drought, flood, heat and atmospheric changes.
3. A comprehensive analysis of the genetic diversity of current soybean germplasm providers is necessary as the last such analysis was published in 1994 (Gizlice et al., 1994).
4. Threats to the germplasm collection specifically include: an old and deteriorating facility, inadequate cold storage space and equipment, seed born viruses. The current facility is over 40 years old and past its intended usable life. Current cold storage is inadequate to maintain the 4°C and 25% humidity minimum standard. Optimally, a -18°C seed vault is necessary to maintain seed for 30+ years between regeneration. Seed born viruses negatively impact soybean growth and seed production and limit the availability of germplasm to international researchers due to import permit requirements. Funding for systematic screening of viruses and necessary infrastructure (screen houses, green houses) and staff for virus cleanup and clean seed regeneration is needed.
5. Germplasm acquisitions should include *Glycine max* accessions from specific provinces in China as well as *Glycine soja* (wild relative) and perennial glycine.
6. Protein content has steadily declined in commercial germplasm pools as yields have increased. Appropriated funding of soybean germplasm enhancement via introgression directly from the collection would create a deliberate and broad approach for developing unique protein and yield sources.