LEWELLEN, ROBERT T., USDA-ARS-PWA, U.S. Agricultural Research Station, 1636 E. Alisal St., Salinas, CA 93905. **Population improvement within multigerm, self-fertile, random-mated breeding lines of sugarbeet.**

Population improvement in sugarbeet has been a major breeding objective at Salinas. In addition to improvement within conventional self-sterile (S^sS^s), open-pollinated breeding lines, self-fertile (S^f), genetic-male-sterile (*aa*) facilitated, random-mated populations have been developed. One distinct advantage of these self-fertile populations is that S_o (*Aa*) plants can be easily self-pollinated to produce sufficient S_1 seed for progeny testing and recurrent selection procedures. These S_1 lines have been evaluated per se and/or testcrossed to evaluate hybrid performance. Selected lines can be both recombined through genetic-male-sterile segregants to produce improved synthetic populations and increased in bulk or by selfing to test as potential parental lines. Disease resistance has been a primary objective. In addition, improvement for sugar yield combining ability has been attempted. From base population 931, subpopulations and synthetics have been developed for several objectives. From these sources, S_1 progenies have been evaluated in replicated field trials. Selected S_1 lines have been recombined and/or individually testcrossed to evaluate hybrid performance. Genetic variability and improvements have been demonstrated for resistance to diseases and bolting and for components of sugar yield. Under relatively nondiseased conditions at Salinas and Brawley in 2000, population 931 had higher sugar yield than most open-pollinated lines and its sugar yield was equal to the mean of four commercial hybrid checks. In other tests, experimental hybrids with population 931 were about 95% of the mean for the commercial hybrids. Sugar yield for testcross hybrids from a set of 32 selected S_1 lines ranged from 87-119% of the mean for four commercial hybrids. The experiences and potential of self-fertile, random-mated populations in sugarbeet breeding will be discussed.