

Pioneer Soybean Yield Trial — A Decade of Progress

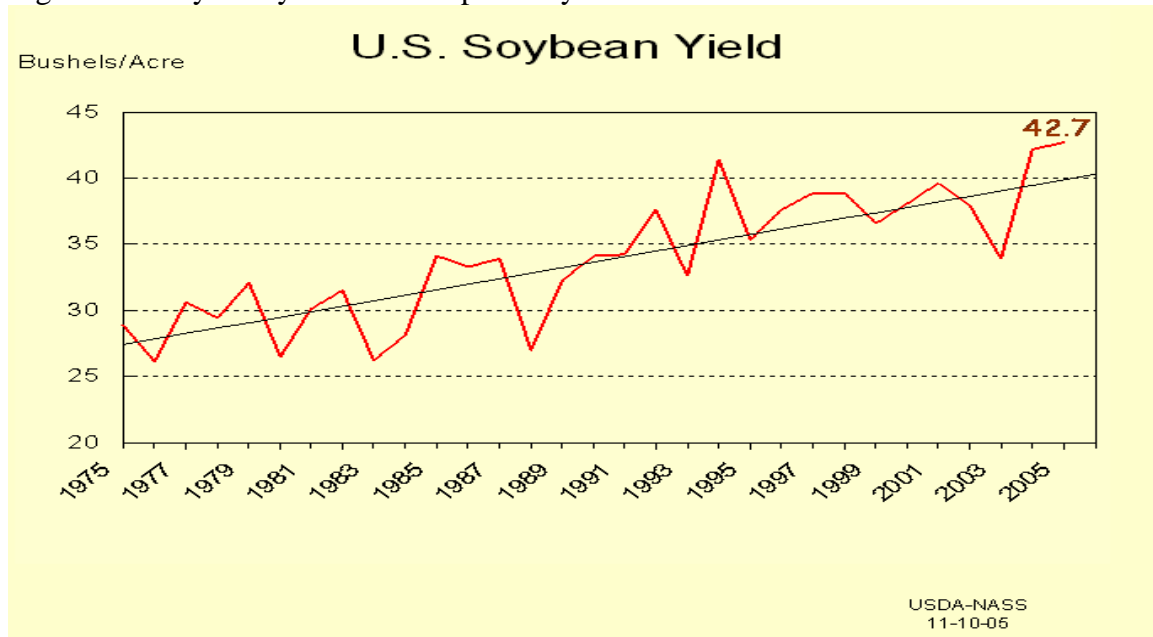
Summary

Pioneer researchers performed a study to compare the yield increase of commercial Pioneer soybean varieties released over the past 10 years. The data indicate a Pioneer brand soybean yield rate increase above industry average. Those Pioneer brand soybean varieties developed via marker assisted selection (MAS) had even higher rates of yield over the industry average—more than three times—contributing to Pioneer’s reputation as the soybean industry leader.

Introduction

The yield gain of soybeans grown in the U.S. increased over the last 30 years on an average of 0.4 bushels per acre per year (Fig. 1). The yield increase is based on genetic improvements made by U.S. soybean breeders. However, environmental factors, as well as disease and insect pressure, prevent growers from realizing the full potential of soybean yield, as indicated in the historic yield swings. Within the last 10 years, breeders focused on the development of soybean varieties with tolerance for poor soil quality (e.g., iron deficiency); disease resistance (e.g. sudden death syndrome, brown stem rot, Phytophthora root rot, etc.); insect/pest resistance (e.g., soybean cyst nematode, soybean aphid); and herbicide tolerance (e.g., glyphosate), by applying traditional breeding methods, biotechnology and MAS.

Fig. 1. U.S. soybean yield over the past 30 years



Source: <http://www.usda.gov/nass/aggraphs/soyyld.htm>

Pioneer has developed a reputation as the industry leader in soybean performance. Pioneer brand soybean varieties out-yield competitor products in side-by-side comparisons including internal trials, customer weigh checks and university trials. To demonstrate the yield potential that Pioneer breeders achieved, Pioneer researchers performed an experiment in which key Pioneer commercial varieties, released over the past 10 years, were grown side-by-side in their respective environments.

Experimental Design

In 2005, a total of 89 Pioneer brand soybean varieties released within the past 10 years, were grown in the field in 12 locations across the Midwest, with two replications per location. The locations covered four relative maturity (RM) groups (four experiments) and the varieties were divided in RM 19-24 (23 entries); RM 23-31 (29 entries); RM 30-36 (28 entries); and RM 34-41 (21 entries). All tested varieties were tolerant to glyphosate and 29 out of the 89 varieties were developed via MAS, with the first MAS variety introduced in the year 2000.

Yield data from each experiment were analyzed separately and yield trend lines were established, based on the year of commercial release and whether or not MAS was utilized for the development of the soybean variety.

Results and Discussion

The yield data from the Decade Study, across all four experiments (or RM), indicate that soybean yields from Pioneer commercial soybean varieties improved over the past 10 years at a rate of about 0.8 bushels per acre per year (Table 1), which is 0.4 bushels per acre per year higher than reported for the long-term U.S. production average of 0.4 bushels per acre per year. In three out of four experiments, the varieties developed via MAS improved at a higher rate compared to the non-MAS varieties. Across all four experiments, the data indicate that the MAS varieties contributed to the above industry yield increase with a rate of 1.44 bushels per acre per year, whereas the non-MAS varieties improved at a rate of 0.59 bushels per acre per year. As an example, the yield rate increase for the varieties tested in the experiment that covers the RM 23 to 31 is shown in Fig. 2.

Table 1. Yield improvement (by per acre per year) of Pioneer commercial varieties over the past 10 years.

Variety type	Relative Maturity (RM)				All
	19-24	23-31	30-36	34-41	
Non-MAS ^a	0.68	0.44	0.49	0.75	0.59
MAS ^b	1.92	1.45	1.81	0.57	1.44
All ^c	0.79	0.69	0.76	0.83	0.77

a, over the past 10 years

b, over the past 7 years

c, over the past 10 years

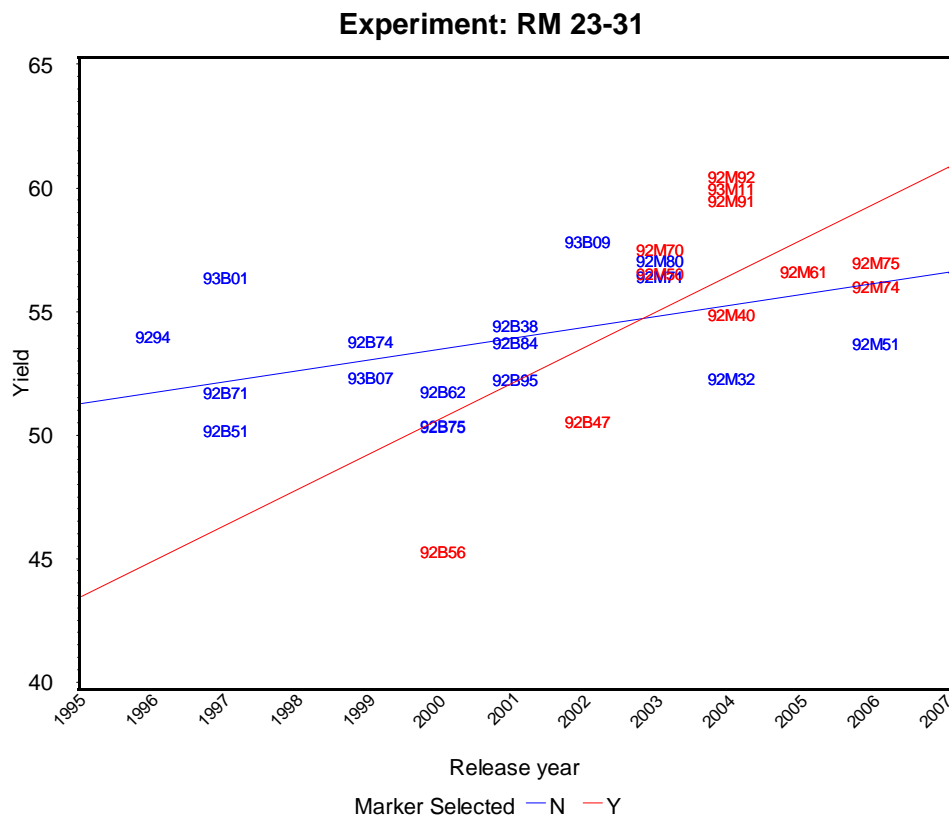


Fig. 2. Yield increase of Pioneer commercial varieties with relative maturity (RM) 23-41. Yield in bushel per acre. Rate increase (bu per acre per year) for non-marker selected varieties (blue) = 0.44, and for marker selected varieties (red) = 1.45.