Yield trends from Australian wheats

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Assessments of breeders' contributions to wheat production have usually been based on national or district averages (e.g. Russell 1973; Warren 1969) which are affected by changes in weather, fertility and area cropped. An alternative approach is to study simultaneously varieties from different areas. In a replicated trial on a fertile site near Canberra, 61 varieties that have been important at different stages in our history were sown on May 16, 1978. With 500 mm of rain from May to November inclusive, extremely favourable conditions should have enabled all varieties to produce yields near their potential for the Canberra region. The results showed that Australian breeders have significantly altered several features of wheat.

Harvest index has increased linearly with time at 0.0013 units per year. Average values range from 0.27 for early introductions and 0.28 for Australian varieties produced around 1900 to 0.38 for recent releases. For varieties produced here the range is from 0.22 (Baroota Wonder, 1895) to 0.42 (Condor, 1973).

Dates of ear emergence have narrowed in range and become slightly earlier : early introductions. day 306 ? 6.0; Australian varieties 1880-1950, 303 ? 5.6; 1951-1975, 300 ? 3.0. The earliest and latest heading Australian varieties grown were both bred by Farrer : Sunset and Cleveland, days 286 and 313 respectively.

Mean heights at ear emergence have been reduced by 0.33 cm per year from about 90 cm in 1890 to 65 cm. Australian varieties range from 96 cm (Ford 1916) to 53 cm (Timson 1975).

Yield showed no sign of increasing with successive varieties produced between 1880 and 1944. The highest yielding varieties from that period averaged 4160 kg/ ha (Bald Early 1893; Gluyas Early 1894; Federation 1901; Canberra 1914; Nabawa 1915; Ghurka 1924 and Quadrat 1941). Gabo (1945) lifted yield by 28% to another plateau (5340 kg/ha) shared by Olympic (1956), Halberd (1958). Heron (1959), Gamenya (1960) and Condor (1973). A third significant level in the Canberra environment was established by Egret (1973, 6490 kg/ha). For the Canberra environment at least, increases in potential yield seem to have occurred in steps at lengthy intervals. The apparent lack of increase in potential yields before 1940 may be attributed to breeders' concentration on conferring disease resistance. their concern for low yielding conditions, and their limited scope for wide testing to reveal adaptable genotypes.

Among modern releases there are varieties whose yields in Canberra were little better than those of the lowest yielding varieties from the past. The average yield of the two most recent releases, Songlen and Timson, was only equal to that of Baart. an early introduction dating to 1739 (Macindoe and Walkden Brown 1968). If growers are to capitalize on breeding achievements an understanding of varietal responses to different environments must be obtained. This will only come from coordinated efforts by breeders and agronomists to follow rational approaches, such as that outlined by Boyd et al. (1976).

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