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Yield and yield gap responses to sowing dates in the Northern Pampean region of Argentina

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In the Northern Pampean Region of Argentina, soybean can be sown from September to February. In order to identify the optimal range of sowing dates and quantify yield gaps, soybean crops were sown in different dates during 19 years (1996/97-2014/15) without water or biotic limitations. The best yield attained in each sowing date (Y) was registered, estimating the best relative yield (RY) with respect to the best yield of the year. Maximum and minimum yields and relative yields were obtained from the percentiles 95% y 5% of Y and RY, and their response to sowing date was adjusted with bi- and tri-linear models. Yield gaps within sowing date (Yg or RYg) were calculated as the difference between the maximum and minimum yields estimated with the models. Maximum yields (ca. 5400 kg ha⁻¹) were obtained from the earliest sowing until Dec-6 and then decreased at a rate of 45 kg d⁻¹. Highest minimum yields were obtained between Nov-20 and Dec-17. Yg decreased when sowing was delayed, being lower than 2000 kg ha⁻¹ from Nov-10 onwards. The best RY (ca. 88%) decreased after Dec-20 at a daily rate of 1.1%. However, low relative yields (ca. 50%) were obtained in the earliest sowing dates; in consequence, the minimum RYg (20%) occurred from Nov-10 to Dec-6. The responses of plant height and nodes to sowing date suggest that some yield responses were associated with crop growth and development; the low interannual variation of these morphological attributes suggests that yield gaps are mainly defined by environmental conditions during reproductive phases. Early sowing expose these phases to high yielding environments (high radiation and long photoperiods) in some years but stressful environments (high evaporative demand and high temperature) in others. In conclusion, optimum sowing dates in Parana ranged from mid-November to early-December, as attainable yields were maximum and interannual variability was minimum.