ABSTRACT Sugarcane is a tropical plant and requires a warm, humid climate for good growth, but is grown in the subtropics of Pakistan with semiarid climate. Sugarcane responds well to higher N application rates and this study utilized crop yield and nitrogen use efficiency as two important criteria of crop performance to identify optimum nitrogen levels. A field experiment was conducted for two consecutive years at Ayub Agricultural Research Institute, Faisalabad, Pakistan. The treatments were comprised of three nitrogen rates (recommended, 168 kg ha-1 ; 50% more than recommended, 252 kg ha-1 and 100% more than recommended, 336 kg ha-1 ) applied full at planting or at 90 days after planting (DAP) or in two equal splits, i.e., 50% at planting and 50% at 90 DAS. A control (no nitrogen) was also utilized. Results revealed significant effects of dose and time of nitrogen application on most studied parameters except commercial cane sugar (%). The maximum stripped cane yield and sugar yield were recorded when nitrogen at 252 kg ha-1 was applied in two equal splits, although high N rate (336 kg ha-1 ) was not inferior statistically. Crop growth rate and leaf area duration were maximized with high nitrogen dose applied in two equal splits. Nitrogen use efficiencies also varied greatly among different treatments. The results suggest a need for revision of already recommended N rates in sugarcane growing areas of Pakistan and possible other areas of the world.