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Breaking Corn Yield Barriers: A Cropping Systems Approach

G. Balboa and I.A. Ciampitti

Summary

A corn research trial was conducted at Scandia, KS, during the 2014 growing season. The objective was to study the contribution of different farming systems in developing efficient and high-yielding corn production systems. The experiment had five treatments: farmer practices, comprehensive fertilization, production intensity, ecological intensification, and advanced plus. Farmer practice was the lowest-yielding treatment, and ecological intensification and advanced plus treatment presented similar yields.

Introduction

Gaps between potential and actual on-farm yields are primarily defined by crop management practices (such as row spacing, planting date, and fungicide and nutrient application) and their interactions with the environment (weather). Thus, after considering genetics and the environment, on-farm yield is primarily influenced by farmers' decisions, the main components of which are agronomic practices. Crop management practices are often specific to the environment, hybrid/variety, and/or yield level. Row spacing, plant population, nutrient management, and other agronomic practices can modify yields. Selecting appropriate management practices can help farmers increase yields and close yield gaps. Increasing plant population under irrigated conditions is a common intensification practice in high-yielding corn systems.

Procedures

A corn research trial was conducted at Scandia, KS, under irrigated conditions. The hybrid P1151 was planted on May 15 with 30-in. row spacing in minimal crete soil (3% organic matter, pH 6.4). The experiment was designed with five production systems: (1) farmer practices (FP), or common farming practices (32,000 seeds/a + without phosphorus-potassium [P-K] + preplant N); (2) comprehensive fertilization (CF), or balancing nutrients (32,000 seeds/a + with P-K + preplant N + side-dress N); (3) production intensity (PI, 38,000 seeds/a + without P-K + preplant N); (4) ecological intensification (CF + PI, 38,000 seeds/a + with P-K + preplant N + side-dress N); and (5) advanced plus (AD), increasing input applications (38,000 seeds/a + with P-K + preplant N + side-dress N). Corn was harvested on October 15.

Results

Weather: 2014 Growing Season

Maximum and minimum temperature historical (4-year average) variations presented a trend similar to that documented for the 2014 growing season.

The historical precipitation pattern portrayed a peak during the first two weeks of August (Figure 1). The 2014 growing season precipitation pattern was unlike the historical weather trend because precipitation was more concentrated during the last week of August and first two weeks of September (close to 16 in. during that 3-week period; Figure 1).

Yields

For corn, AD and EI treatments resulted in similar yields (close to 230 bu/a). FP was the lowest-yielding treatment but presented a high-yield scenario (225 bu/a) potentially associated with the high fertility of the soil (N mineralization) and irrigation, which provided the main two inputs for corn production (water and N) (Figure 2).

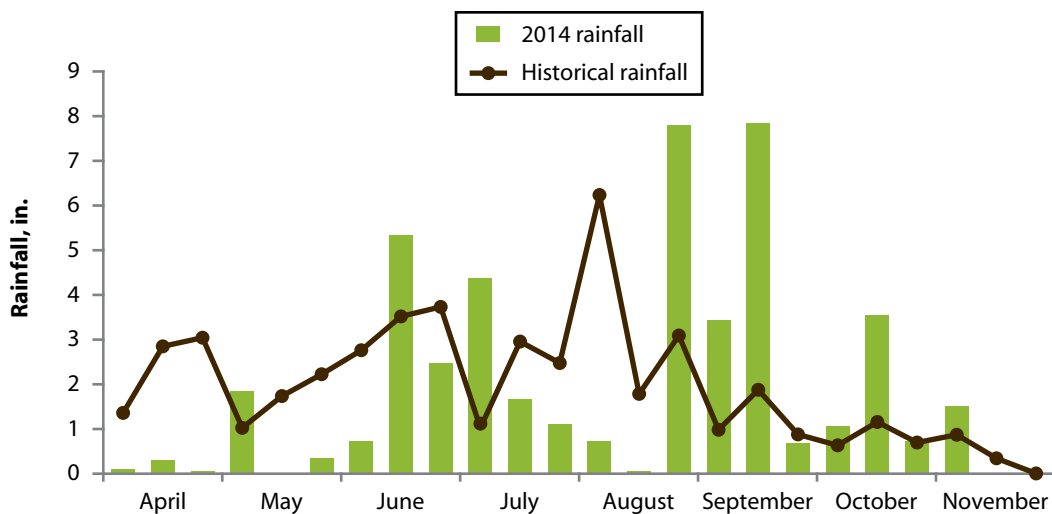


Figure 1. Historical (4-year average) and 2014 precipitation record, Scandia, KS.

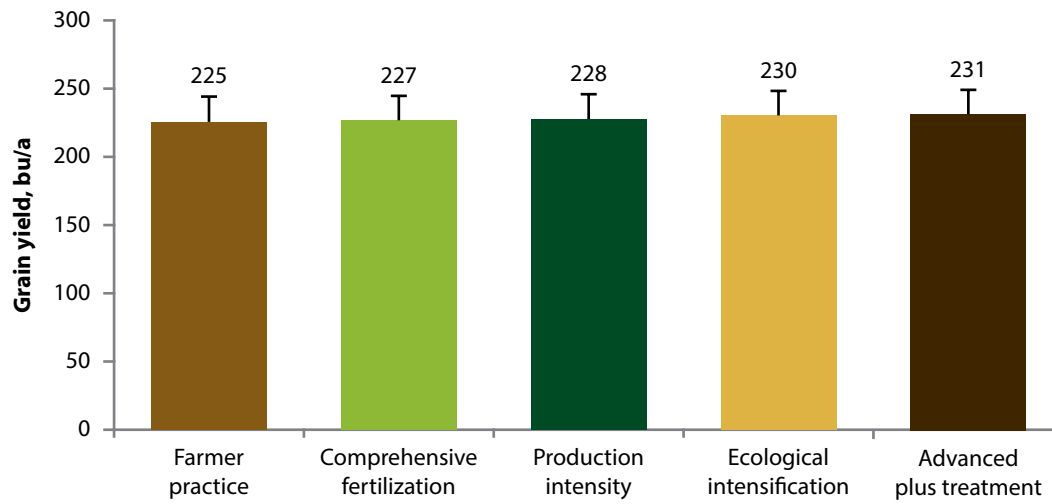


Figure 2. Corn grain yield (15.5% moisture), expressed in bu/a, for diverse farming scenarios.