Whole Farm Profitability Impact from Implementing and Harvesting On-farm Trials: A Linear Programming Model

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Introduction

The advent of the combine yield monitor reduced the time commitment of harvesting on-farm trials to levels motivating some farmers to conduct experiments. Although harvest time requirements have been reduced, they were not eliminated. Planting and harvesting on-farm trials potentially impact timeliness of other farm operations. To evaluate these impacts, a linear programming (LP) model was formulated using PCLP Version 5, (Dobbins et al., 2001) which has been used since 1968 in conjunction with Purdue's Top Farmer Crop Workshop.

Hypothetical Model Farm Scenario

This study focused on on-farm trials conducted on a representative US Cornbelt farm considered timely with respect to planting and harvesting. Corn was planted to 30-inch rows with a 24-row planter at 21.3 acres per hour on half of the farm's 3,000 acres and soybeans planted to 15-inch rows with a 31-row interrow planter at 21.1 acres per hour on the other half. Corn was harvested with a 12-row header at 9.0 acres per hour and soybean harvested with a 30-foot platform at 12.3 acres per hour. Planting and harvest took 11.8 and 28.4 total field days, respectively.

Corn and soybean prices were $2.50 and $6.25 per bushel, respectively. Expected corn and soybean yields were 168 and 50 bushels per acre, respectively, when planted and harvested during the optimal period. Direct costs were $183 and $106 for corn and soybean, respectively.

Analysis

Three basic assumptions of on-farm trials guided this study. On-farm trials 1) were implemented and harvested in a single time period, 2) were implemented and harvested on a good field day and 3) diverted 100% of resources away from other farming operations while being implemented and/or harvested. This diversion of resources, e.g. labor and machinery, effectively reduced the number of days suitable for field work.

Three scenarios representing different time requirements to conduct on-farm trials were used: 1) no additional time, 2) one-half a day, and 3) one full day. Therefore, the days suitable for field work were adjusted for planting (April 26 to May 2) and/or harvesting (October 11 to 31) periods by removing 0, 0.5, and 1.0 from the current 2.4 and 12.2 suitable field days, respectively.

Results

LP runs indicated a reduction in returns compared to the base situation of no on-farm trials. This reduction occurs because of increased yield penalties for delayed planting and harvesting of corn and soybeans. In the scenario where only planting was delayed for one-half day, returns were reduced by $2,684 (Table 1). A $5,448 reduction resulted when one full day was diverted.

Table 1. Whole-farm returns reduction from planting and harvesting on-farm trials

	Reduction in days suitable October 11-31		
Reduction in days suitable April 27 - May 2	0.0 days	0.5 days	1.0 days
0.0 days	$0	$859	$1,818
0.5 days	$2,684	$3,543	$4,501
1.0 days	$5,448	$6,307	$7,266

Like planting operations, delayed harvest operations were associated with yield penalties. Although one motivation for farmers to conduct on-farm trials were that yield monitors reduced time requirements, some harvest delay may be necessary to collect data. When the yield monitor was calibrated for differing hybrids, moisture, or even if weigh wagons or spot checks were used, harvest operations may be delayed. When the harvest operation was delayed by 0.5 and 1.0 days during the October 11 to 31 time period, returns decreased by $859 and $1,818, respectively, considerably less than planting operation delays (Table 1).

On-farm trials can cause both planting and harvest delays. When days suitable for fieldwork were reduced by 0.5 days during both the planting and harvesting time periods, returns were reduced by $3,543 (Table 1). When days suitable for planting were decreased by one full day while the harvesting period days suitable was reduced by 0.5 days a $6,307 reduction in returns were calculated. When one full day was removed from both planting and harvesting time periods, a $7,266 reduction was calculated.

Summary

Conducting on-farm trials is not a costless venture. In this modest example, diverting one day of resources away from production to plant on-farm trials cost nearly $5,500. Diverting one-half day of planting time cost nearly $2,700. Losses increase further if there are additional delays in harvesting. When planting and harvesting diverts one full day away from other farming operations, the experiment reduced whole farm returns by nearly $7,300. While yield monitors may reduce the time required for on-farm trials, delayed harvest operations decrease timeliness leading to yield penalties and reduced crop quality. Before conducting on-farm trials, farmers should understand not only the benefits, but also the costs involved.

However, even when the costs from operating delays are recognized, having information that can be used to increase the effectiveness of your specific production system may still be cost effective. An on-farm trial that would save 10 pounds of nitrogen per acre with anhydrous ammonia priced at $480 per ton would save $4,390 across the 1,500 acres of corn in one year, more than enough to offset the loss of a half day planting and harvesting resources.

References

Dobbins, C.L., Han, Y. Preckel P., Doster D.H. 2001. Purdue Crop/Livestock Linear Program User's Manual. Purdue University, IN, USA.