A SYSTEMS APPROACH TO HIGHER YIELDS, EFFICIENCY AND PROFITS IN A CORN, WHEAT AND DOUBLECROPPED SOYBEAN ROTATION

F. Ronald Mulford and Dr. William J. Kenworthy

ABSTRACT

Using a systems approach friendly to the environment, a three-crop/two-year no-till system has shown significiant yield increases in a three-year research project conducted at the Poplar Hill Research and Education Facility in Quantico, Maryland. In each case, corn, wheat, and doublecropped soybean yields exceeded average yields produced on Maryland's Delmarva Peninsula. Instrumental in producing these superior yields were enhanced fertility, supplemental water, and appropriate variety selection.

INTRODUCTION

A popular rotation in the mid-Atlantic states includes corn, wheat, and doublecropped soybeans. The three-crop/two-year rotation is ideally suited to the soils and climate of the area. Research into increasing production levels of corn and soybeans is deemed useful because these crops must be imported into this region to meet feed needs of the poultry industry.

We began studying ways to improve wheat production in 1980 and have been able to produce yields over 100 bu/A each year. Other maximum economic yield (MEY) studies on corn and soybeans have proven successful. In our three year study, we have found that these higher yields can be produced in cropping systems that protect the environment.

Exceeding Average

As can be seen in Figure 1, the crops grown using the systems approach significantly outyielded averages in the Delmarva Peninsula.

Corn. Although the three-year average for corn yield did not reach our MEY goal of 250 bu/A, it was almost double the average of the Delmarva Peninsula and significantly greater than that produced by top farmers.

Wheat. Again, wheat yields fell short of our MEY goal of 125 bu/A, but, like corn, almost doubled the average of the Delmarva Peninsula and was significantly greater than that produced by top farmers. Many farmers are adopting the intensive wheat management system. Significant increases in state average yields in recent years reflect this change.

Soybeans. The '91 field-size systems study produced a yield below our MEY goal of 65 bu/A but was substantially higher than the peninsula average and 5 bu/A better than that of top farmers. Farmer yields with double-cropped soybeans have been historically low because of the relatively short growing season and reduced moisture supplies. To maximize yields, double-cropped soybeans must be planted as soon as the wheat is harvested, usually during the first week in July.

In our study, variables were looked at for each crop and those practices proving best for each crop were incorporated.

Corn. Ten corn hybrids (five mid-season and five full-season) were planted on May 14 in 15 and 30-inch rows with a final population of 31,000 plants/A. As can be seen in Figure 2, row and hybrid selection made a significant difference in yield results. Only the top and bottom hybrids are shown in the figure. Eight of the ten hybrids averaged over 10 bu/A more when planted in 15-inch rows. The fertilization program used for corn is shown in Table 1. Soil test levels for P and K were high in the plot area. The goal here was to apply the right amounts of nutrients at the optimum time for the most efficient plant uptake.

Wheat. Factors we've found important to consistently high yields are 1) selection of high-yielding/disease resistant varieties, 2) following planting recommendations, 3) bringing nutrient levels into high range via soil testing, 4) scouting to control weeds, insects and diseases, 5) using a growth regulator in combination with split N applications when needed, and 6) strict N management, including rate, source, and timing.

Soybeans. The five varieties tested in the system were selected for their excellent yielding ability, but yield differences occurred. In 1991, five varieties averaged 56 bu/A with irrigation and 46 bu/A without. Similarly , MEY systems showed a yield increase over conventional systems. Our results showed that maturity was delayed about four days by irrigation, with a beneficial lengthening of the seed filling period. Row spacing is another important cultural practice that has effect on doublecropped soybean yields. We used spacing of 15 inches in our studies, with a seeding rate of six seeds/ft or about 209,000 seeds/A. Several fertility practices have been studies. One variable is direct fertilization of the soybeans. Results to date, where high soil test levels for P and K are maintained, show that farmers have the option of applying the total two-crop P and K requirement to wheat. We continue to experiment with N applications on soybeans.

Rotations

Rotation studies conducted at Poplar Hill to evaluate several cropping systems have shown that no-till corn planted into a wheat and double-cropped soybean stubble continuously produced the best yields. This includes yields of corn planted into a winter cover crop of hairy vetch. This is significant. No expense is involved for the wheat/soybean stubble, which provides a natural mulch following harvest of the two crops. Compare this to the cost for establishing a legume winter cover crop. Rotation also provides a wheat crop following corn, which takes up around 30 to 35 lbs of residual N not used by the corn.

Mulford is manager of the Poplar Hill Facility in Quantico, Maryland, and Dr. Kenworthy is professor of Agronomy at the University of Maryland.

Table 1. Corn fertilization program for a three-crop/two-year rotation system, Mulford/Kenworthy, Maryland.

Application time and method	N	P205	K20	S	B	Mn	Zn	Cu
		----------lbs/A----------						
Preplant broadcast	60	40	40	20		6	2	2
With herbicide--preemergence					1			
Sidedress-5-leaf	110	20	60	10				
Sidedress--row closer	70	20	60	10				

Figure 1. Yield comparisons, Delmarva average versus three-crop/two-year systems approach, Mulford/Kenworthy, Maryland.

Figure 2. Yield response of corn hybrids to row spacing, three-crop/two-year systems approach study, Mulford/Kenworthy, Maryland.

Figure 1

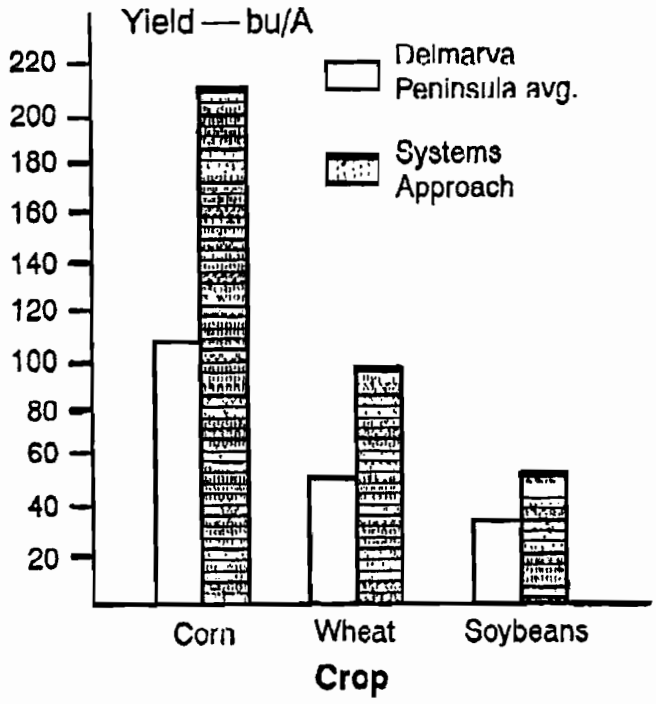
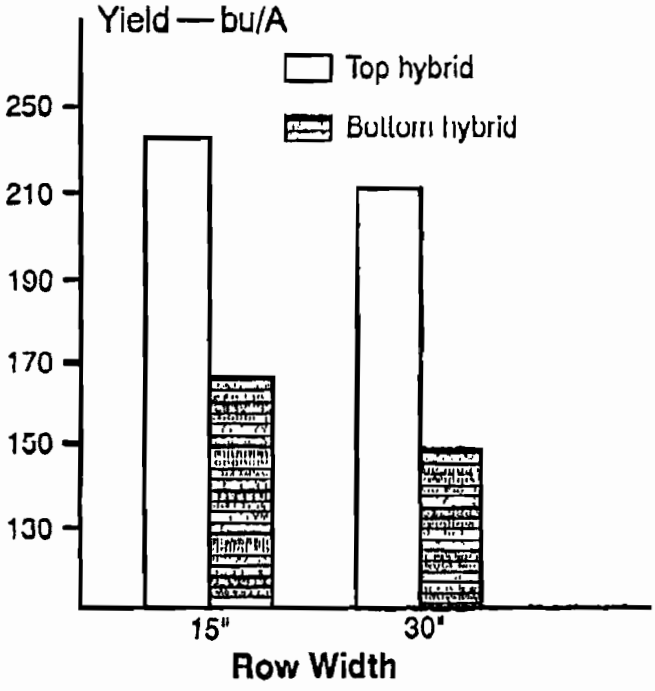


Figure 2



PROCEEDINGS OF THE TWENTY-FIFTH

NORTH CENTRAL EXTENSION-INDUSTRY

SOIL FERTILITY CONFERENCE

Published for
The North Central Extension-Industry Soil Fertility Conference
by
Potash & Phosphate Institute
2805 Claflin Road, Suite 200
Manhattan, KS 66502
913-776-0273

November 15-16, 1995

St. Louis Westport Holiday Inn
St. Louis, Missouri

Volume 11

Program Chairman and Editor:

Dr. George Rehm
University of Minnesota
Dept. of Soil, Water and Climate
439 Borlaug Hall
1991 Upper Buford Circle
St. Paul, MN 55108-6028