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Narrow Rows for Corn and Soybeans - Questions and Answers

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NARROW ROWS FOR CORN AND SOYBEANS -- QUESTIONS AND ANSWERS

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The most discussed topic for the past year on cultural practices for corn and soybeans has been the advisability of using narrow rows. The renewed interest in this practice no doubt has been stimulated by the commercial production of narrow row equipment by the leading farm equipment manufacturers for the first time in 1965. The new planting, cultivating and harvesting equipment is designed for 30-inch rows, although one manufacturer plans to produce a limited amount of 20-inch row equipment in 1966. The largest obstacle to switching to narrow row production -- the lack of commercially available machinery -- thus has now been overcome. The following is an attempt to answer some of the more commonly asked questions about narrow row production of corn and soybeans.

1. What is meant by narrow rows?

They are generally considered row widths of 20-30 inches. Rows closer than 20 inches are generally difficult to cultivate with farm equipment in common use today, particularly on sloping land, and might well be considered as "solid stands." The 30-inch upper limit for narrow rows is arbitrary, however, with 30-inch row equipment now available, there seems to be little interest in, or need for, row widths in the 30 to 36-inch range.

2. What yield increases can be expected with narrow row corn?

A very limited number of recent Indiana trials indicates a yield increase of about 5 per cent when other variables are held constant. The range has been from about 0 to 10 per cent increase in yield. Other corn belt states in the same latitudes as Indiana have been obtaining about the same increase--5 per cent -- for narrow row corn. A summary of available research data is given in Table 1.

3. Don't some states and most magazine articles report larger yield increases than this?

Yes, northern areas such as Minnesota, Michigan and Ontario report increases from narrow corn rows ranging from 10 to 20 per cent. Their corn varieties are shorter, have narrower leaves, and do not shade the ground as much as our larger hybrids. Also, one must remember that growing conditions are much different in the northern corn belt wherein they have a shorter growing season, longer summer days, and more limited light intensity. This could explain the difference in response to narrow rows.

With regard to the large increases reported in some magazine articles, it is the feeling of some research workers that a good portion of this yield increase reported for narrow rows may be due to factors other than row width itself. For example, higher plant

Table 1. Summary of Indiana yield increases from narrow row corn.

Location	Comparison	Per cent response	Yield level
Lafayette, 1940's	42" vs 16"	0	100 Bu.
Lafayette, 1959-61	40" vs 20"	-1	132 "
Pinney-Purdue, 1964			
Early Hybrid	40" vs 32"	6	120 "
Late Hybrid	40" vs 32"	2	103 "
Adams County, 1964	40" vs 20"	6	110 "
Pinney-Purdue, 1965	40" vs 30"	3½	140 "
	40" vs 20"	7½	140 "
Lafayette, 1965	40" vs 30"	3	160 "
(Early Variety)	40" vs 20"	2½	160 "

populations in the narrow rows may contribute toward increased yields. Such increases should be credited to population effect, not narrow rows, per se. Of course, it matters little to the individual farmer what increases the yield so long as it is obtained. Figures 1 through 4 compare the relative amounts of shading and plant canopy as influenced by row spacing and population.

4. Is it easier to achieve higher plant populations in narrow row corn?

Yes. Many planters in use on Indiana farms today were not designed for, and will not accurately plant stands of 20,000 or more plants per acre at planting speeds exceeding 4 miles an hour. The advantage for narrow rows may be seen by the following illustration. If one wishes a harvest population of 22,000 plants per acre in 40-inch rows with a 10 per cent overplant, the plants must be spaced 6.5 inches apart in the row. However, in 30-inch rows they can be 8.6 inches apart and in 20-inch rows almost 13 inches apart for the same number of plants per acre. Practically speaking it is easier to plant high populations with the larger interval in the row. The planter plates can travel much slower with a more accurate fill when planting equal populations in narrow rows.

5. How do yield increases from narrowing corn rows compare with responses which might be obtained from other practices?

Narrow row corn yield increases are considerably less than can be achieved by careful attention to fundamentals such as early planting, optimum population, weed control, variety selection, and adequate fertilization in conventional rows if such are limiting. Any of the practices just mentioned can increase yields 15 to 25 per cent or more if they have been neglected.

6. What is the optimum row width for corn?

Theoretically, equidistant spacing. Practically speaking, this would prohibit interrow cultivation for weed control. Until dependable and adequate weed control can be obtained across a wide range of conditions without row cultivation, a choice of row widths permitting such cultivation would seem to be necessary. Right now this leads to 30-inch rows. Research must still determine whether 20-inch rows will give much additional yield over 30-inch rows at the same population.

Figure 1. Wide rows and low population levels allow large amounts of sunlight to reach the ground surface early in the growing season.

Figure 2. The traditional approach of increasing plant population in wide rows (24,000 plants an acre) increases the shading only slightly in the row.

Figure 3. Planting in 30-inch rows at 24,000 plants an acre increases light interception and provides some shading across the entire middle only 6 weeks after planting.

Figure 4. Planting in 20-inch rows at 24,000 plants an acre provides almost a complete plant canopy that should reduce weed growth and soil moisture evaporation.

All photos taken 7-1-65 at Pinney-Purdue Farm, Wanatah, Ind., 48 days after planting.

7. Does the type of hybrid make a difference in yield increase for narrow rows?

Although limited Indiana studies do not show any significant variety by row width interaction, this has been detected in northern areas where increases are greater. It seems probable that plant breeders will develop hybrids that will give a significantly larger yield increase in the narrow rows than the rather tall, late floppy leaved type of hybrids that have been developed over the years for wide rows.

8. What yield increases can be expected from narrow row soybeans?

Soybeans present the greatest opportunity for increasing yields with narrow row culture. Soybeans in row widths ranging from 20 to 30

Table 2. Summary of Indiana yield increases from narrow row soybeans.

Location	Comparison	Narrow row Yield	Increase	Yield level
		Bu.	%	
Pinney-Purdue 1965	40" vs 20"	1.0	3.1	33
Pinney-Purdue 1964	40" vs 28"	1.7	4.6	38
Adams County 1964	42" vs 21"	5.3	15.4	39
Lafayette 1964-65	38" vs 28"	2.5	6.5	42-45
Lafayette 1950		2-5		30+
Lafayette 1942-43	35" vs 28"	1.8	6.2	29-31
	35" vs 21"	4.8	16.6	29-34
Lafayette 4 yrs. (1930's)	32" vs 24"	2.9	11.0	27-30
	32" vs 8"	11.2	41.0	27-38
Lafayette 1931-37	28" vs 8"	5.1	17.3	28-38
Lafayette 1904-19	40"-42" vs 24"-28" @ 30#/A	2.7	15.8	17-20
	40"-42" vs 7" @ 30# vs 60#/A	3.7	21.8	17-21
	42" vs 28" @ 24#/A	3.2	20.0	16-19

inches have shown a consistent 10 to 15 per cent yield increase over wide rows in these latitudes. (See Tables 2, 3 and 4). In fact, soybean yields are the highest in solid seeded stands (7-inch rows) when weeds can be controlled. Here the yield increase often approaches 20 per cent. Soybean yield increases in narrow rows have been highly reproducible in test plots probably because of the fact that soybean yields change very little over a wide range of seeding rates. Thus, one important confounding variable in corn row width studies, population effect, is not a problem in soybean row width studies.

9. Why do soybeans give a larger percentage increase with narrow rows than corn?

One should remember that soybeans are a tap rooted legume that does not branch laterally as extensively as corn. Corn is a fibrous rooted grass plant with a completely different type of root system and extensive lateral branching. By the time corn is knee high the roots have overlapped even in 40-inch middles. If one looked only at the root system and percentage ground cover on a given date, one would expect a greater response from narrowing soybean rows than for corn. The data also suggest larger yield responses for soybeans in narrow rows for northern than southern Indiana. This also is apparently related to root development, plant canopy and the length of day and growing season.

10. If this is so why have farmers been growing soybeans in wide rows for the past 30 years?

This is the price Indiana farmers have paid for the convenience of growing soybeans with corn equipment. Research results showing higher yields in narrow rows have been largely ignored with soybeans. As soybeans become more important and farmers more concerned about increasing yields, they should begin to give them the individual attention they deserve.

Table 3. Yield increase reported by other states for narrow row soybeans.

State	Comparison	Yield increase
Illinois	40" vs 30"	10-15%
Iowa	40" vs 30"	10%
	40" vs 20"	17%
Ohio	40"-42" vs 21"-28"	3.5-4.0 Bu.
	40"-42" vs 7"	6.5-7.0 Bu.
Minnesota	40" vs 24" @ May 18	13%
	@ June 18	35%
Arkansas	38" vs 32"	6%
	38" vs 26"	-6%

Deep South - No Advantage Except for Late Planting.

11. Will we eventually go back to 7-inch rows for soybeans?

This is probable if a satisfactory herbicide can be developed that will control the weeds without row cultivation. Soybeans, when originally introduced to Indiana about 1900, were grown in solid stands, but row culture was later adopted by virtually all farmers because the rotary hoe was often inadequate for weed control in solid stands.

12. Should I wait until 20-inch row equipment becomes available before changing?

Probably not for corn, although this question is difficult to answer now. With corn it would appear that most of the yield increase can be obtained in 30-inch rows; the cost of conversion would be less than for 20-inch rows and cultivation less complicated, particularly on sloping land. Soybeans do indicate a somewhat higher yield for the

Table 4. Effect of cultural practices on soybean yields at Agronomy Farm, Lafayette 1963-65.

Treatment	1963 Bu/A.	1964 Bu/A.	1965 * Bu/A.	3-Yr. Ave. Bu/A.	% Change
38" Rows + 2 Cult.	43.5	37.2	47.8	42.8	Check
38" Rows + Row Amiben + 2 Cult.	44.2	37.5	47.5	43.1	+0.7
38" Rows + B.C. Amiben	42.5	36.2	47.1	41.9	-2.1
28" Rows + B.C. Amiben + 1 Cult.	--	41.2	49.3	45.3 **	+6.5 **
7" Rows + B.C. Amiben	48.9	43.7	49.7	47.4	+10.7

* Yield differences in 1965 were smaller possibly because of herbicide injury (drift) from adjacent small grain plots.

** 2-Year Average.

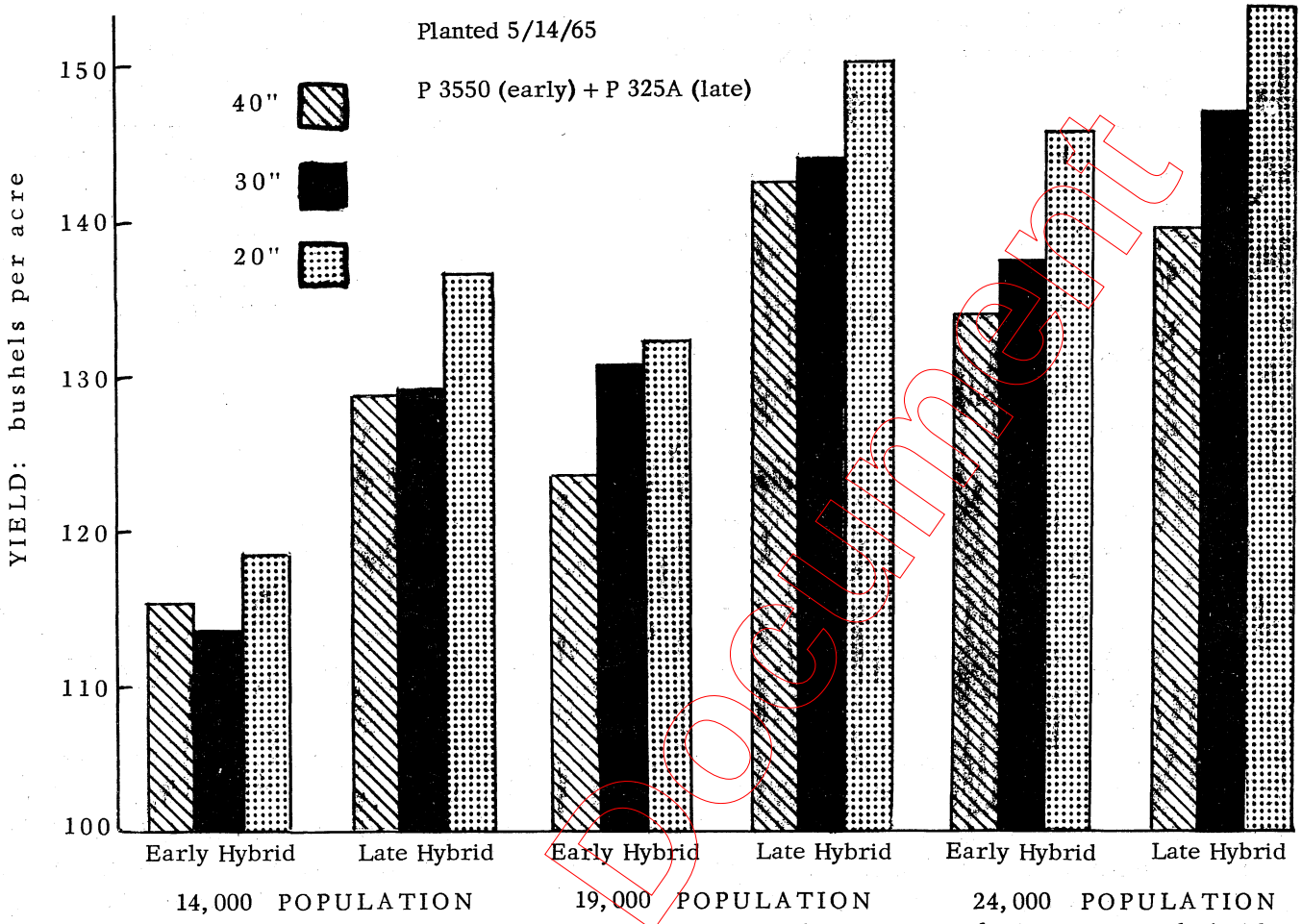

Figure 5. The relative importance of narrowing rows, changing population or corn hybrid. Greatest yield increases were obtained for increasing population or using the later hybrid. Yield increases for narrow rows, although smaller, were highly significant.

20-inch rows, but logic suggests that both crops be planted at the same row width. The decision to switch should be made on the basis of: (1) equipment that is available and (2) the profit potential possible with that equipment--using realistic conversion cost estimates offset by yield increases attributable to narrow rows. At this stage, the 30-inch row equipment is available, and the 20-inch row is not available in quantity. For soybean only producers, then harvesting equipment is not an expense consideration and the 20 to 24-inch row widths have considerable merit for the initial conversion.

13. What is the cost of changing over to narrow rows?

This can vary rather widely, but the average is around $2200 for a conversion of 4-row wide to 6-row narrow equipment with a new planter, cultivator and a 3-row narrow corn head. This assumes continued use of the existing combine and would maintain the same harvesting capacity in terms of bushels per hour or day but would slightly reduce the acres harvestable per day if the existing combine has been used at capacity previously--because of the projected increase in corn yields. The range of conversion expense is about $1500 to $3,600; the latter being for a 6-row to 8-row narrow conversion. This is the additional cost of going to narrow rows assuming one was going to trade equipment anyway. The extra cost of the narrow row

corn head accounts for about two-thirds of the conversion expense.

14. Who should switch to narrow rows?

Not everyone should. Narrow rows must be kept in proper perspective. Narrow rows will increase corn and soybean yields. Narrow rows will not overcome or offset other poor production practices. They are a supplementary practice that can boost yields for many farmers, especially those that can prorate the cost of conversion over larger acreages and those that are already producing in the neighborhood of 125-bushel corn or 30-bushel beans. Many of our better Indiana farmers should consider the conversion to narrow rows the next time they trade for new equipment. The corn farmer consistently producing 100 bushels an acre or less probably has more important and more rewarding things to do before changing to narrow rows.

15. Can you give an idea of the number of acres required to pay the cost of conversion to narrow rows from the increased corn and soybean yields?

This is the crucial question and the answer one obtains will depend largely upon the assumptions made. Agricultural Economists Mueller (U. of Illinois) and Robbins and Strom (Purdue) have recently completed economic analyses of conversion to narrow rows. Mueller concludes "With an owner-operator producing 200 acres of row crop equally divided between corn and soybeans, and in the process of replacing a planter, cultivator and combine picker head, the break-even yield increase for narrow rows is 2.6 bushels of soybeans priced at $2.50 per bushel." This projection requires only a 10 per cent soybean yield increase from a 26-bushels per acre yield level. This is a very realistic assumption and any additional soybean yield increase or any yield increase from the 100 acres of narrow row corn would represent profit.

Break-even acreages would about double in the case of crop-share tenants since the tenant would usually share in only one-half the projected yield increase and would pay virtually all the added costs. Mueller states "For crop-share tenant arrangements with the same acreage, the projected break-even yield increase for soybeans would be 4.5 bushels per acre which is close to the upper limits suggested by agronomists." This would require 15 per cent soybean yield increase from a 30-bushel yield for soybeans or else the use of some of the projected yield increase from corn to break even.

Robbins and Strom arrived at slightly higher added costs for converting to narrow rows than did Mueller. But with similar assumptions as to acreage and also assuming old equipment must be replaced and will depreciate over 8 years, they conclude that a 10 per cent increase in soybean yields at the 30-bushel level and a 3 per cent increase in corn yields at the 100-bushel level will cover added costs for converting. Thus Robbins and Strom conclude that if a farmer has a sizeable acreage (200 or more) of corn or corn and beans and his equipment is ready to replace, he should give serious consideration to conversion to narrow rows.

From economic analyses available at this stage one would conclude that a good corn producer with 200 or more acres of corn annually should consider the narrow row conversion the next time he trades for new equipment. It would also appear that a corn-soybean producer with 100 or more acres of soybeans should give serious consideration to narrow rows regardless of corn acreage the next time he updates his equipment. For those few farmers with soybeans only, the production of as little as 75 acres of soybeans should justify the narrow conversion because of the relatively low conversion expense and the larger, more consistent yield response of soybeans in narrow rows.

16. What seeding rate should be used for narrow rows?

If corn is already being planted at optimum populations, no increase in seeding rate is necessary for narrow rows. A 1965 survey of Indiana crop reporters, however, indicates an average harvest population of only 15,500 plants an acre. This is low and should be increased when necessary regardless of row width. Many Indiana farmers should now be in the range of 20,000 to 24,000 population at harvest even in conventional 40-inch rows.

For soybeans the seeding rate should be increased from the recommended rate of 45 pounds an acre for 40-inch rows to about 55 pounds an acre in 30-inch rows and 70 pounds an acre in 24-inch rows. If solid seeded soybeans are tried than a seeding rate of 90 pounds an acre is suggested as a start. This assumes the use of well recleaned seed, with 80 per cent germination or better.

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