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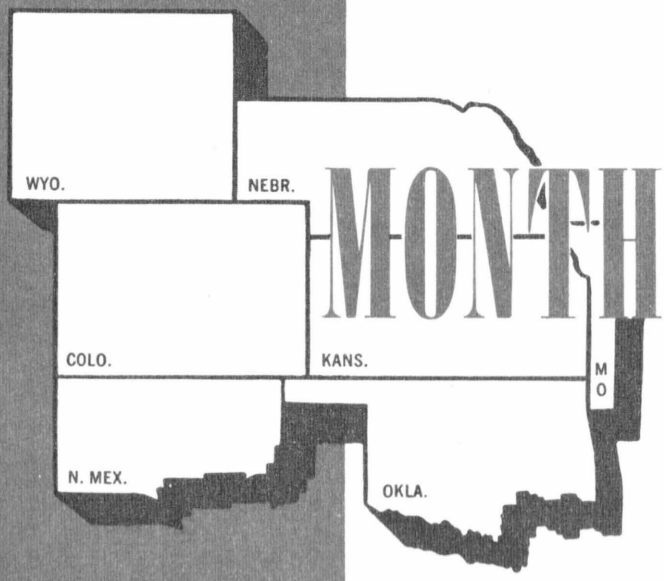

MONTHLY REVIEW

In This Issue

FEDERAL RESERVE BANK
OF KANSAS CITY

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Relationship of Bank Size And Bank Earnings—

Some Further Considerations

THE DECEMBER 1961 issue of the *Monthly Review* discussed in some detail the income advantage of large-scale banking operations, as reflected in ratios of net current earnings to assets at member banks in the Tenth Federal Reserve District. Among a large sample of District members, average ratios of net current earnings to assets during the 4 years 1956-59 were found to be about one-eighth higher for banks with $100 million in assets than for banks with $1 million in assets. This earnings differential, which appears to stem from differences in the efficiency with which ordinary banking functions are performed, continues to grow with further progression up the size scale of District banks.

While the ratio of net current earnings to assets commands wide respect as a guide to profitability in commercial banking, it is not the only measure of bank income that deserves attention. Ratios of profits before and after taxes to assets, for example, convey a somewhat different impression of the size-earnings relationship, and it is worthwhile to consider why this is the case. Another interesting line of investigation involves exploring the association between bank size and income when income is measured in relation to capital accounts. As will be indicated, the superior earnings position of large District banks appears much greater if bank income is measured as a percentage of capital rather than as a percentage of assets.

This latter fact raises intriguing questions concerning the risk of enterprise at large versus small banks and the degree to which capital ratios reflect these risk differences. These questions involve such complex issues that definitive answers cannot reasonably be expected from a study of the present scope. Nevertheless, they are questions that bear importantly on the interpretation of the relationship between size and profitability in banking, and a significant share of this article is devoted to them.

The analysis first compares ratios of profits to assets with ratios of net current earnings to assets, as these ratios are related to bank size, and then turns to a consideration of bank income measured as a per cent of capital. As in previous articles in this series, technical material of interest to a limited number of readers is confined to footnotes or to notes under the charts and tables.

BANK SIZE AND RATIOS OF PROFITS TO ASSETS

Adjustments to net current earnings made by banks in calculating net profits before taxes, as recorded in member bank earnings reports, involve some items which have significance to the question of bank size and profitability, while others depend heavily upon accounting conventions that vary markedly from one bank to another and from one time to another. Actual losses or recoveries on loans are in the former category, while the latter type includes such items as transfers to and from valuation reserves and realized losses or profits on securities sold. These adjustments as a group merit extensive investigation only if ratios of

profits before taxes to assets show a significantly different relation to bank size than ratios of net current earnings to assets.

Table 1 provides data that bear upon this question. Ratios of net current earnings to assets and of profits before taxes to assets shown in the table were obtained by deriving, through statistical techniques, lines of average relationship between bank size and the two measures of income over the period 1956-59 for the group of sample banks on which this study is based. Points along these lines indicate average income ratios for banks of a particular size. For example, the first row of the table indicates that banks with $1 million in assets had net current earnings averaging 1.25 per cent of assets over the 4 years, while their profits before taxes averaged 1.05 per cent of assets.[1]

A close inspection of the income to asset ratios of Table 1 reveals that average ratios of net current earnings to assets rise somewhat more rapidly with increasing bank size than do average ratios of profits before taxes to assets.

Table 1

AVERAGE RATIOS OF EARNINGS TO TOTAL ASSETS FOR SELECTED BANK SIZES

Sample of Tenth District Member Banks, 1956-59

Bank Size (Assets in Millions of Dollars)	Average Ratio to Total Assets (in per cent)	
	Net Current Earnings	Profits Before Taxes
1	1.25	1.05
10	1.32	1.09
100	1.39	1.13
200	1.41	1.14
300	1.43	1.15

Thus, while banks with $100 million of assets have an average net current earnings ratio about 12 per cent higher than those with $1 million of assets, their average pretax profit ratio is about 8 per cent higher. This difference, however, is not large enough to be statistically significant, which suggests that total deductions from net current earnings bear no important relationship to size of bank.

Ratios of profits *after* taxes to assets, on the other hand, are associated with bank size in a way that is quite different from the relationship between size and pretax income. As indicated in Table 2, it is the very smallest banks in the Tenth District, and not the largest, whose aftertax income is the highest in relation to their assets. On the average, the lowest aftertax profit ratios are found among banks in the $25-$50 million asset size class.

This alteration of the association between bank size and profitability stems from the operation of the Federal tax on corporate income, which assesses the first $25,000 of profits at a rate of 30 per cent, and each dollar

Table 2

AVERAGE RATIOS OF PROFITS AFTER TAXES TO ASSETS BY SIZE CLASS OF BANK

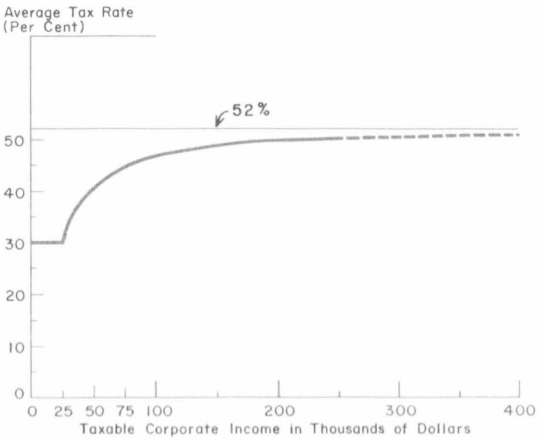
Sample of Tenth District Member Banks, 1956-59

Bank Size (Assets in Millions of Dollars)	Average Ratio of Profits After Taxes to Assets	Number of Sample Banks in Size Class
0-5	.77	114
5-10	.70	53
10-25	.66	50
25-50	.55	24
50-100	.59	7
Over 100	.69	13

[1] The average ratios shown represent points on the lines of simple regression between each measure of earnings (as the dependent variable) and bank size, with the size variable measured in logarithmic terms. As indicated in the December 1961 issue of the *Review*, multiple regression analysis using ratios of net current earnings to assets as the dependent variable and employing structural characteristics of bank assets and liabilities—in addition to bank size—as independent variables does not yield a regression coefficient for bank size that is materially different from the simple regression coefficient. This is also true with ratios of profits before and after taxes to assets.

The simple correlation coefficient for bank size and the ratio of net current earnings to assets was .108, which is statistically significant at the 5 per cent level. For bank size and the ratio of net profits before taxes to assets, the simple correlation coefficient was .065, which is not statistically significant at the 5 per cent level. Use of multiple regression analysis employing such additional variables as the ratio of loans to total assets, the ratio of cash to total assets, the ratio of consumer to total loans, and the ratio of time to total deposits yields partial correlation coefficients for the size variable that are significant at the 5 per cent level in both cases.

Chart 1
AVERAGE TAX RATE ON CORPORATE TAXABLE INCOME



in excess of $25,000 at 52 per cent. The effect of this tax structure is to increase average tax rates as corporate taxable income rises above $25,000. As shown in Chart 1, the increase in average rates is most pronounced for corporations with taxable income just over $25,000. Over a significant range of the size distribution of District member banks, the rise in the tax bite as the size of bank increases is so great that it more than offsets the rise in average ratios of pretax profits to assets. This is the reason that ratios of aftertax profits to assets shown in Table 2 tend to decline with bank size at the lower end of the size scale, but then begin to rise again.

THE QUESTION OF RISK

These statistical measures indicate that, were it not for the influence of the corporate profits tax, ratios of net current earnings, net profits before taxes, and net profits after taxes to assets all would tend to rise with increasing bank size among District member banks, reflecting the ability of larger banks to operate with lower expenses per dollar of assets. There is another advantage of large-scale operations in banking, however, which may be just as important in the interpretation of bank size and profitability as the reduction in expenses per dollar of assets with increasing bank size. This advantage grows out of differences in the degree of risk at large and small banks. If, as is generally believed, the risks of enterprise are significantly less at large banks, ratios of income to assets appropriately adjusted for risk differences would show a much steeper rise with increasing bank size than do actual ratios of income to assets.

It seems reasonable to assume that differences in risk at large and small banks are associated principally with the probability of substantial losses due to defaults on outstanding loans. While a variety of other factors give rise to uncertainty about the future profits of a bank, potential losses on loans are a dominant source of risk in commercial banking and, in any case, a source which seems likely to be related in an important way to bank size.

Two principal reasons exist for expecting that the risks of lending may be inversely related to bank size. First, larger banks tend to lend more heavily to large borrowers with prime credit ratings, while small banks typically make small loans to small borrowers. The result is that average loss rates on loans tend to be higher at small banks, and the likelihood of very large relative losses in any given period is also increased. But even if the risk of default on loans was no less, dollar for dollar, at large than at small banks, the ability of large banks to diversify their loan portfolios by type and geographical location of borrower would reduce the risks of lending. Portfolio diversification is a widely practiced means of limiting risk in all types of asset management, and the ability to diversify is directly related to the size of the portfolio.

Loan Loss Ratios

A measure that is relevant to the degree of risk associated with defaults on loans at the sample banks is the ratio of actual net losses or recoveries on loans to net current

Table 3
AVERAGE ACTUAL NET LOSSES OR RECOVERIES ON LOANS AS A PER CENT OF NET CURRENT EARNINGS
Sample of Tenth District Member Banks, 1956-59

Bank Size (Assets in Millions of Dollars)	All Sample Banks	Banks with Actual Net Losses
0-5	3.18	6.71
5-10	.59	5.04
10-25	.39	3.25
25-50	3.66	4.09
Over 50	2.37	2.55

earnings. Actual net losses or recoveries on loans at each sample bank were aggregated for the 4 years 1956-59 and expressed as a per cent of total net current earnings over the 4 years. Table 3 shows averages of these ratios by bank size classes.

These average ratios for all sample banks — the middle column of Table 3 — show little relationship to size of bank.[2] However, if banks that had actual net recoveries on loans over the 4 years as a whole are removed before an average is taken, a distinctly different relationship appears. Thus, in the right column, which shows average ratios for only those sample banks that had actual net losses on loans, the ratios decline quite uniformly with increasing bank size.

The difference between the figures in the two columns of the table expresses the fact that, especially among smaller banks, a rather large proportion of the loans written off as bad debts in the years prior to 1956 subsequently proved to be collectible. Such a fortunate experience cannot, of course, be expected to prevail under all circumstances. Thus, had the years 1956-59 been years of serious economic adversity, those recoveries on loans might not have been possible. It seems wise, therefore, to focus attention on sample banks with actual net losses on loans during the 1956-59 period to gauge the differences in lender's risk at large and small banks.

The figures in the right column of Table 3 therefore are the more relevant ones to the question at issue. Yet, while these averages indicate higher loss rates at the smaller banks, they conceal a diversity of loss experience which bears importantly on the interpretation of risk considerations. This diversity may be seen in Table 4, which shows the distribution of loan loss rates by size of bank for those banks which had actual net loan losses over the 4 years 1956-59.

This distribution indicates that although there were no sample banks with over $50 million in assets whose loan losses exceeded 10 per cent of their net current earnings dur-

Table 4
DISTRIBUTION OF LOAN LOSS RATES BY SIZE OF BANK FOR BANKS WITH ACTUAL NET LOSSES
Sample of Tenth District Member Banks, 1956-59

Actual Net Loan Losses as a Per Cent of Net Current Earnings	Bank Size (Assets in Millions of Dollars)				
	0-5	5-10	10-25	25-50	Over 50
	Number of Banks				
0-5	50*	26	29	15	15
5-10	19	4	9	4	4
10-15	4	2	1	3	0
15-20	3	3	0	0	0
20-30	3	1	0	0	0
Over 30	2	0	0	0	0
Number of Banks with Actual Net Losses	81*	36	39	22	19
Number of Banks with Actual Net Recoveries	33	17	11	2	1
Total Number of Banks in Size Class	114	53	50	24	20
Maximum Loss as a Per Cent of Net Current Earnings	81.26	22.90	12.51	12.37	8.28

*Includes three banks whose actual net losses during the 4 years were exactly zero.

NOTE: The variances of the distribution of loan loss rates, for banks with actual net losses, are as follows: 136.39 for banks with $0-$5 million in assets; 34.01 for banks with $5-$10 million in assets; 8.79 for banks with $10-$25 million in assets; 17.85 for banks with $25-$50 million in assets; and 5.81 for banks with over $50 million in assets.

[2] Simple correlation analysis applied to the individual bank data indicates that loan loss ratios are not significantly associated with size of bank. The simple correlation coefficient between bank size and the ratio of actual net losses or recoveries on loans to net current earnings was .041, which is not significant at the 5 per cent level.

ing these 4 years, losses of that amount or larger are not uncommon among the smaller sample banks. More than 1 in 10 of the total number of sample banks with assets of $5 million or less experienced losses exceeding 10 per cent of their net current earnings, and 2 of the 114 banks in that size group had loan losses equal to more than 30 per cent of their net current earnings. It seems evident from these data that the smaller is the size of bank, the greater is the likelihood of very large losses relative to net current earnings.

In appraising the significance of this fact for risk considerations, it should be noted that the seriousness of loan losses may tend to increase much more than in proportion to the size of the loss relative to net current earnings. For example, if a bank's loss rate jumps suddenly from 10 per cent to 50 per cent of net current earnings, the consequences may go no further than the immediate loss of income. But the possibility always exists that doubts may be raised concerning the financial stability of the enterprise, and customers may react in such a way as to affect permanently the earnings potential of the bank. The probability of this type of adverse development tends to increase directly with the magnitude of loan losses.

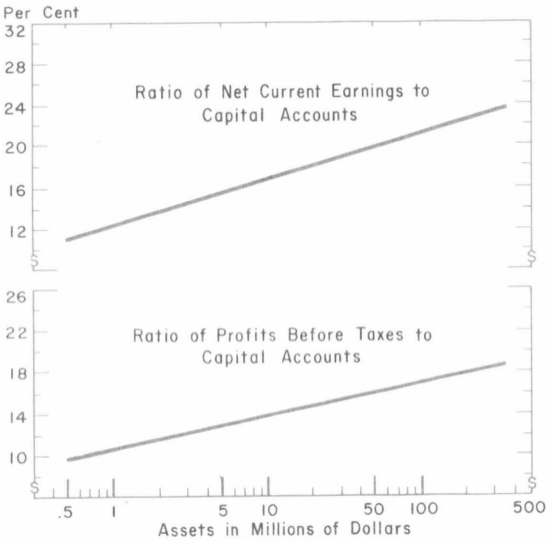
RATIOS OF EARNINGS TO CAPITAL

Because differences in the risks of enterprise at large and small banks are widely recognized, both by the banks themselves and by supervisory authorities, capitalization ratios tend to be substantially greater among small banks than among the larger firms in the industry. Condition report ratios of capital to assets overstate these differences to some degree, because they do not take into account the fact that bad debt reserves are relatively greater among the larger banks. Variations in capitalization ratios by size of bank, nevertheless, are quite significant. For the sample banks used in the study, capital accounts averaged

Chart 2

RELATIONSHIP OF BANK SIZE TO RATIOS OF NET CURRENT EARNINGS AND NET PROFITS BEFORE TAXES TO CAPITAL ACCOUNTS

Sample of Tenth District Member Banks, 1956-59



NOTE: The lines of average relationship shown are based on the simple regression functions: (1) $X_1 = 12.475 + 4.340 \log X_2$; (2) $X_1 = 10.517 + 3.287 \log X_2$; where X_1 is the ratio of net current earnings to capital in equation (1), and the ratio of net profits before taxes to capital in equation (2); and X_2 is assets in millions of dollars in both equations. Ratios are expressed in percentage terms. The simple correlation coefficients are .478 for the first equation and .382 for the second; in both cases the association is significant at the 5 per cent level.

about 10 per cent of assets for banks with $1 million in assets; for those with $100 million in assets, the average was just under 6½ per cent, or approximately 35 per cent lower. As a result of these differences in capitalization, the increase with larger bank size in ratios of earnings to capital is steeper than the rise in ratios of earnings to assets. Chart 2 portrays the association between size and ratios of earnings to capital among the sample banks.

Shown in the chart are lines of average relationship between bank size and two measures of earnings (net current earnings and net profits before taxes) expressed as a per cent of bank capital. Differences in earnings ability of large and small banks judged by these ratios prove to be very substantial indeed. Compar-

ing banks with $100 million in assets to those with $1 million in assets, for example, ratios of net current earnings to capital are about 70 per cent higher and ratios of beforetax profits to capital about 60 per cent higher. These differences in profitability by bank size, it should be noted, are far greater than those suggested by ratios of net current earnings or net profits before taxes to assets.

Due to the effect of the corporate income tax noted earlier, the association between bank size and ratios of aftertax profits to capital is not accurately portrayed by a simple line of average relationship such as the two in Chart 2. The data in Table 5 indicate, however, that ratios of aftertax profits to capital accounts generally tend to rise with increasing bank size, and are highest for the largest banks in the District.

Table 5

AVERAGE RATIOS OF PROFITS AFTER TAXES TO CAPITAL BY SIZE OF BANK

Sample of Tenth District Member Banks, 1956-59

Bank Size (Assets in Millions of Dollars)	Average Ratio of Aftertax Profits to Capital (Per Cent)	Number of Sample Banks in Size Class
0-5	8.24	114
5-10	8.88	53
10-25	8.59	50
25-50	8.78	24
50-100	9.24	7
Over 100	9.26	13

It is possible that the lines of average relationship plotted in Chart 2 and the data in Table 5 may be interpreted as portraying the association between bank size and profitability after due allowance has been made for the risks of enterprise at small and large banks. It is also conceivable, however, that the higher income-to-capital ratios of the larger banks stem in part from the willingness or the ability of stockholders of the larger banks to assume greater risks. The first interpretation would be correct if variations in capital ratios by size of bank were an accurate reflection of the inherent risks associated with the provision of banking services at large and small banks. The second interpretation would be appropriate if, relative to the degree of risk assumed, smaller banks tended to be the more heavily capitalized.

DO CAPITAL RATIOS REFLECT DEGREES OF RISK?

To determine with any degree of conclusiveness whether differences in capital ratios by size of bank reflect differences in the risk of enterprise would require an undertaking far beyond the scope of this article. Indeed, the question cannot be answered fully by reference to empirical data. As noted earlier, the degree of risk faced by a bank depends to an important degree on the reactions of bank customers to evidences of financial adversity, and these reactions cannot be known with any degree of certainty. Nevertheless, gaining some perspective on the problem is itself a worthwhile goal, and the data for the sample of banks used in the analysis can be exploited for this purpose.

One way to search for an answer is to ask a still broader question: Are variations in ratios of capital to assets among the sample banks closely associated with characteristics other than size which might reasonably be expected to imply risk differences? For example, are capital ratios closely associated with the percentage of assets in the form of loans? Again, are capital ratios associated with the percentage of loans made to consumers? One would expect a positive association in each of these cases, since loans are the most risky of the major classes of bank assets, and consumer loans are generally regarded as a type of bank loan that entails considerable risk.

If such characteristics of the sample banks were quite closely related to capitalization ratios, and differences in capital ratios among the sample banks could be explained reasonably well by reference to such characteristics, then the assumption that differences in capital

ratios by size of bank reflect differences in risk would be at least plausible.

Following this line of reasoning, a statistical analysis was undertaken to discover the relation between capital-to-asset ratios of the sample banks during the period 1956-59 and the following characteristics of the banks: (1) the percentage of assets in the form of loans; (2) the percentage of assets held as cash balances; (3) the percentage of assets consisting of securities other than Treasury issues; (4) the proportion of total loans consisting of consumer credits; (5) the proportion of total loans in the form of real-estate loans; (6) the percentage of time deposits to total deposit accounts; (7) bank size; (8) the growth rate of the bank from 1947 to 1959; and (9) the ratio of profits after taxes to assets. These last two characteristics were included in the analysis, not because they were believed to be associated with the risk of enterprise, but because they were expected to affect capital ratios for different reasons. High growth rates tend to be inversely associated with capital ratios because it is more difficult for banks that grow rapidly to keep the expansion of capital in step with the growth of deposit liabilities. Conversely, high aftertax profits tend to be positively associated with ratios of capital to assets because high profits facilitate additions to capital from retained earnings.

Manifestly, these nine factors do not exhaust the list of measurable characteristics that might show some relation to bank capital ratios, but one would expect them to explain a large proportion of the variation in capital ratios among the sample banks. When multiple correlation analysis was applied to the sample bank data, however, it was found that only 45 per cent of the variation in capital ratios was accounted for by these nine characteristics. More than half of the observed variation was left unexplained.

Perhaps a more basic consideration is the relative importance of these nine characteristics in explaining variations in capital ratios. The statistical analysis indicated that, apart from bank size, the two most significant characteristics in explaining differences in capital ratios among the sample banks were growth rates of the banks and ratios of aftertax profits to assets.[3] These two characteristics, it should be remembered, were included in the analysis not because they were thought to reflect risk considerations, but because they influenced bank capitalization for other reasons. Indeed, among the first six characteristics listed above, only two—the ratio of loans to total assets and the ratio of real-estate to total loans—displayed an association with capital ratios strong enough to be statistically significant.[4]

The evidence, then, suggests that one cannot accept without question the assumption that variations in ratios of capital to assets among the sample banks accurately reflect differences in the risk of enterprise. Capitalization ratios vary partly for reasons that have little apparent connection with risk considerations; they also vary for reasons that cannot readily be identified except by much more detailed study of the characteristics of individual banks.

SUMMARY AND CONCLUSIONS

The lack of assurance that bank capitalization ratios adequately reflect risk positions means that differences in ratios of bank in-

[3] In the multiple correlation analysis using the ratio of capital to assets as the dependent variable and the nine characteristics indicated above as independent variables, the highest partial correlation coefficient was for the ratio of aftertax profits to assets (.355). The second highest was for bank size (—.306), and the third highest for the growth rate variable (—.292).

[4] The ratio of total loans to total assets and the ratio of real-estate to total loans were both significant at the 1 per cent level; none of the other four variables were significant at the 5 per cent level. Interestingly, the association between capital ratios and the ratio of real-estate to total loans is negative, possibly because of the rather substantial proportion of real-estate loans backed by Government guarantees.

come to capital need not represent accurately differences in profitability of banks after due allowance for risk considerations. The appropriate allowance for risk that should be made in comparing earnings positions of large and small banks remains uncertain.

What appears to be clear from the data on loan losses, however, is that small banks do indeed face risks that are in excess of those encountered by larger banks. Consequently, comparisons of rates of return on assets by size of bank—which make no allowance for risk considerations—understate the profits advantage of increasing size by an unknown, but perhaps very considerable, amount. Large-scale operations in banking, by permitting the selection of earning assets of higher credit quality and enabling greater portfolio diversification, confer a profits advantage by reducing uncertainties concerning the future as well as by permitting the adoption of more efficient ways to organize and conduct banking operations. The certainty of profits, as well as the magnitude of profits, clearly is an important consideration to banks and their stockholders.

SOYBEANS—

An Alternative Crop?

BECAUSE OF THE rapidly changing environment in agriculture, farmers are constantly on the alert for good alternative enterprises, and soybeans have become an attractive crop in many areas in recent years. Recent increases in both domestic and export demand have stimulated interest in the crop. Domestic demand for processed soybean oil and soybean meal—the major soybean products—has nearly doubled since 1950 and export demand during this same period has increased almost fivefold. Soybean oil is being used in increasing quantities in such food products as vegetable shortening, margarine, and cooking and salad oils. Also, use of soybean meal as a protein supplement for livestock has increased substantially.

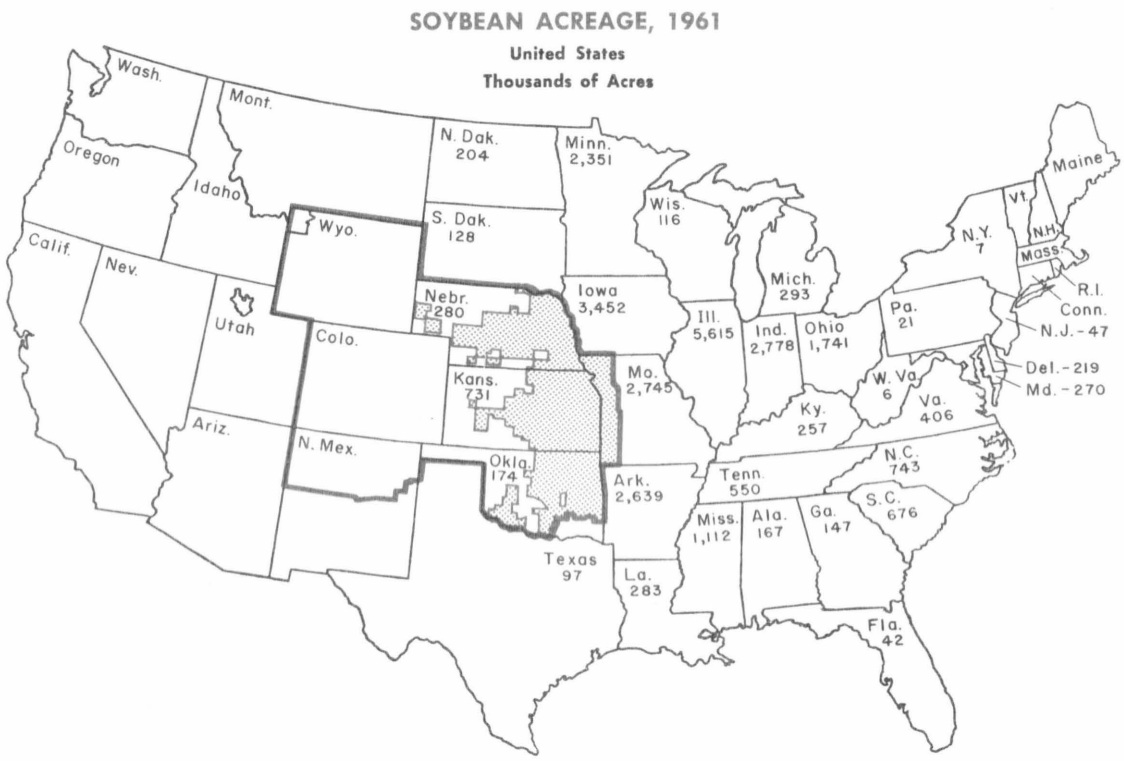
Increasing demand for soybean products and relatively favorable prices have tended to stimulate production. Acreage planted to soybeans in the United States rose from 15.6 million in 1950 to 28.1 million in 1961—an 80 per cent increase. Increasing yields during this same period resulted in expansion of production at an even faster rate—from 300 million bushels in 1950 to an estimated 693 million bushels in 1961—a 131 per cent increase. Soybean prices have been supported since 1941, but market prices generally have been above support levels each year since then. In recent years, land frequently has been shifted from the production of crops restricted by Government programs to soybeans.

Before a new enterprise is incorporated into an individual farm program, however, a careful evaluation should be made to determine the comparative advantage of the anticipated combination of enterprises. If soybeans are incorporated into the cropping system of a particular farm, both physical and economic considerations need to be evaluated. Physical factors must be recognized because soybeans require certain environmental conditions for adequate growth and maintenance. Economic considerations are important because soybeans compete with alternative enterprises for the farmer's land, labor, and capital.

In this article, an effort will be made to familiarize interested farmers and agriculturally related businesses with soybeans in the Tenth Federal Reserve District, and to discuss some of the problems and limitations that might be encountered with the crop. The material in this study is based on information obtained from the U. S. Department of Agriculture, land-grant universities, and other sources in the District.

ADAPTATION

Soybeans are grown in scattered areas throughout the eastern half of the United States. Production for many years was confined largely to the states of Iowa, Illinois, Indiana, Ohio, and Missouri, but, in recent years, the proportion of the crop produced in that area has declined substantially. Production in those states has expanded, but a greater increase in planted acreage in other areas has reduced that section's proportion of total acreage from a record 75 per cent in 1944 and 1945 to 58 per cent in 1961. Prior to 1941, soybeans were grown primarily for forage or conservation purposes. At present, they are grown chiefly for their beans. Areas



NOTE: Heavy color line outlines Tenth Federal Reserve District and shaded area denotes District areas reporting harvest of soybeans in the 1959 census.
SOURCE: U. S. Department of Agriculture.

within which the crop can be grown effectively have been expanded because of improved varieties. Better cultural practices and improved technology also have enabled soybean production to be expanded to other parts of the country by making the crop more competitive with other enterprises.

The adaptation of soybeans in the Tenth District has been confined for the most part to the eastern half of the District. A county-by-county report in the *U. S. Census of Agriculture: 1959,* indicated that substantial quantities of soybeans were harvested in the Corn Belt area of western Missouri, eastern Nebraska, and northeast Kansas, and in the general farming areas of southeast Kansas and northeast Oklahoma. Other areas harvesting soybeans in 1959 were the Cotton Belt of southern Oklahoma and scattered regions in the central and western areas of Nebraska, Kansas, and Oklahoma. The physical adaptation of soybeans in the District is determined largely by soil and climatic conditions. Soybeans require an environment similar to that required by corn. Both crops can be grown on widely varying soil types, but they yield best on mellow and fertile silt or sandy loams. Soybeans are quite adaptable, however, and frequently can be grown successfully on soils that are not well adapted to many other crops. At least 20 inches of rainfall usually is required to produce a crop of soybeans, and research reports indicate that adequate moisture must be available during the blooming stage for the bean to form properly. Except during crucial stages of plant development, soybeans can withstand

short periods of drought as well as excessive amounts of rainfall.

In western areas of Nebraska, Kansas, and Oklahoma, where scattered areas of production were reported harvested in 1959, soybeans are generally grown under irrigation. Where irrigation is practiced, the number and frequency of irrigations will depend to a large extent upon the rainfall and temperatures prevailing. Relatively little water is required to carry the crop from planting to the blooming stage, but larger amounts are needed thereafter to obtain good yields. Frequent light irrigations are likely to be more effective than less frequent but heavier applications of water.

In the extreme western areas of the District, which include Wyoming, Colorado, New Mexico, and the Sand Hills of northwest Nebraska, soybeans are not grown commercially. Although many different crops are grown in those areas, the soil, elevation, topography, and climatic conditions are, for the most part, not adapted to soybean production and no varieties are currently recommended for those parts of the District.

ECONOMIC CONSIDERATIONS

Soybean production in the District is not completely dependent on physical factors. In cropland areas where the physical factors are favorable for soybeans, production may depend on the comparative returns of soybeans and alternative enterprises. The combination of enterprises that provides maximum returns to the farm family is generally chosen. Therefore, yields, costs, and returns between soybeans and competitive enterprises for a given area need to be considered in evaluating the position of soybeans in the farm business. Within the framework of relative returns, however, farmers also need to consider the longer-run effects of such things as soil fertility, erosion, weed control, complementary relationship between crops, and similar factors that might affect net returns over a period of years.

As mentioned earlier, the production of soybeans on many District farms has been influenced by Government programs. No acreage restriction or marketing quotas have been imposed on soybeans and, in many cases, they have been used as an alternative crop for acreage diverted from the production of restricted crops. The Agricultural Act of 1961 states that in order to be eligible for price supports on soybeans in 1962, the producer must maintain at least as many acres in soil conserving use as he had in 1959-60. There are no other special provisions for soybeans in the 1961 Act. The provision is intended to encourage any further increases in soybean production on acreage previously used for crops now in abundant supply, such as wheat, cotton, corn, grain sorghum, and other feed crops, rather than on land under conservation practices or lying idle.

PRODUCTION

Techniques for producing soybeans are similar in many respects to those for producing other major crops in the District. Soybeans are usually planted in 35- to 42-inch rows, but can be planted by solid-row spacing with a grain drill. Farmers who raise crops such as corn, grain sorghums, and small grains, generally have the necessary planting, cultivating, and harvesting equipment for handling soybeans and, in most cases, can produce the crop without capital outlays for additional machinery. Planting dates are slightly later for soybeans than for corn, but the seedbed preparation is much the same for each crop. It is important to have the seedbed smooth, firm, and as free of weeds as possible at planting time.

Weeds can be a problem in soybean production, and the need for thorough tillage before and after planting is essential. Soybeans are planted in wide rows primarily for the purpose of weed control. Although the yields from solid-drilled beans may be higher in certain

instances, this type of spacing is recommended only where the field is relatively free of weeds. With regard to row-crop spacing, however, it may be feasible in some instances to narrow the regular 35- to 42-inch planted row. Research studies in Nebraska and other midwestern agricultural experiment stations indicate that nonirrigated soybeans often give increased yields if rows are spaced less than 35 inches. Yield increases, however, depend to a large extent on location, variety, and growing conditions. The desirability of planting in narrower rows also may depend on whether available row-crop equipment can be readily adapted to the narrower spacing.

Regardless of the spacing used in planting, a rotary hoe or similar equipment can be used to control weeds prior to the emergence of the plant and in the early stages of growth. The effectiveness of this type of cultivation depends to a large extent upon the timeliness of the operation. If weather conditions or other factors do not prevent proper use of such implements, they can be effective in controlling weeds. This type of equipment normally can be used until the row planted beans are 8 to 10 inches in height, or until solid-drilled soybeans completely shade the ground. It is usually advisable, however, to cultivate in the late morning or on afternoons of clear days, since small soybean plants break easily on cool, cloudy days and during early morning dampness. When such equipment as the rotary hoe can no longer be used, one or more cultivations are generally required for effective weed control for row-crop soybeans. Possibly more timeliness is necessary for effective weed control in soybeans than in corn, but control problems are similar to those for grain sorghum and possibly less difficult than with castor beans and some vegetable crops.

The use of chemicals shows promise as a means of controlling weeds, but economically feasible methods have not yet been developed in most cases. In addition, extreme caution must be taken in the application of herbicides as improper use can result in destruction of the crop. If a safe, reasonably priced chemical can be developed for effective control of weeds, farmers can plant soybeans in solid-row spacing with a grain drill, thereby eliminating cultural practices and lowering production costs. Currently, there are several chemicals that can be used before the emergence of the soybean plant. Their effectiveness varies and they may injure soybeans under certain climatic and soil conditions. Chemicals for controlling weeds must be used with extreme care, and only after checking with persons familiar with their use in a particular area.

Although soybeans generally do not respond readily to the use of fertilizer, inoculation of the seed with nitrogen-fixing cultures has proved beneficial in boosting yields. Where soybeans are grown for the first time, and in the absence of proper nitrogen-fixing bacteria in the soil, bacteria in cultures can be applied directly to the seed before planting. These bacteria cause nodules to form on the roots of the plant shortly after germination, and soybeans—like other legumes—are able to obtain a large part of their nitrogen requirements from the air with the aid of these bacteria.

It should be mentioned, however, that the calcium level of the soil has an important effect on the growth of soybeans. Soybeans are highly susceptible to salt damage in saline soils. Strongly acid soils are also unfavorable for nitrogen-fixing bacteria and applications of lime on this type of soil may be needed to correct this condition. The acidity or alkalinity of the soil is measured by a series of numbers called pH values. A pH value of 7.0 indicates a neutral soil; a value below this level, an acid condition; and a value above 7.0, an alkaline condition. Soybeans appear to produce their highest yields on moderately acid soils or soils with a pH of around 6.0.

Soil erosion can be a problem with soybeans as with other row crops. Where soybeans are

planted on land with more than a 2 or 3 per cent slope, planting should be done on the contour and provisions made for winter and spring protection of the soil. Soybeans, however, are considered no more susceptible to erosion during the period of seedbed preparation and the growing season than are corn, sorghum, cotton, or other crops planted in late spring. Due to the loosening effects that soybeans have on the soil during the growing season, however, erosion losses may be greater after harvest than for other crops, especially on sloping land. This special hazard is generally recognized by farmers, and soybean production has been confined primarily to the more level land.

HARVESTING AND MARKETING

Harvesting of soybeans is similar in many respects to that of other crops where combines are used. Harvest losses of 10 to 20 per cent are common but, with efficient operations, losses can be reduced substantially. It is generally recommended that the cutter bar of the combine be operated as close to the ground as possible to reduce harvest losses from shattering and lodged plants. Changes in the moisture content of the seeds and pods during the day may also necessitate frequent checks to assure proper threshing action. Harvesting as soon as possible after maturity is also recommended to reduce possible losses from unfavorable weather conditions. Soybeans usually mature quite evenly and harvest can commence as soon after maturity as a safe level of moisture content is reached for storage of the crop. The moisture content of the beans should be 14 per cent or less before harvesting unless facilities are available for artificially drying the crop. It should be noted, however, that as the moisture level falls, mechanical injury to the seed may increase. If the moisture level reaches 10 per cent or less, widespread cracking of the seed coat and injury to the embryo of the seed is likely to result from harvesting.

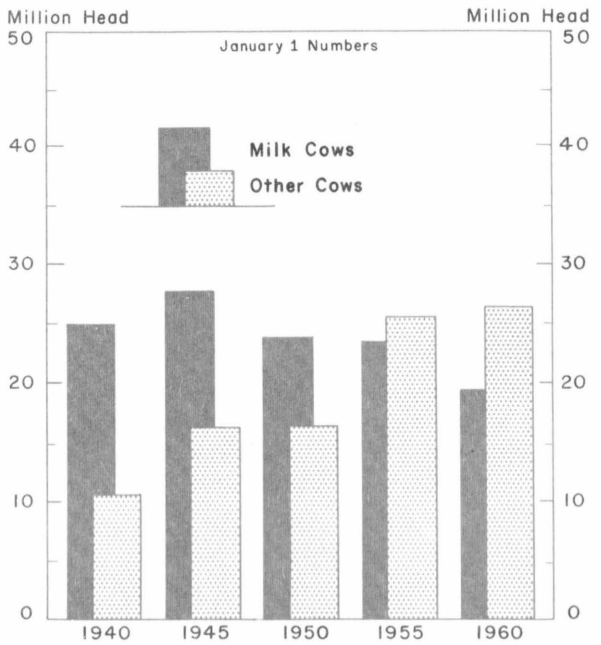
Market outlets for soybeans are located in scattered areas throughout the eastern portions of the District and in adjoining states near areas of production. In some areas where production is small, however, local market outlets may not be satisfactory. Greater production in such areas may be necessary if marketing agencies are to handle the crop more efficiently. Attention might also be given to local storage facilities for soybeans. In some areas of the District, storage facilities for the 1961 crop were inadequate for utilizing price support loans or purchase agreements at harvest time. Construction of farm storage facilities may be feasible where other storage facilities are inadequate.

Another problem in connection with the marketing of soybeans is the wide fluctuation in the production from year to year, particularly in local areas. Combined production in Nebraska, Kansas, and Oklahoma, for example, fell from 11 million bushels in 1952 to 6 million in 1953. After fluctuating near the 6 million bushel level from 1954 to 1957, production increased to 16 million bushels in 1958. In 1959, production fell to 14 million bushels, increased to 20 million bushels in 1960, and to 25 million bushels in 1961. Such wide swings in production make it difficult for marketing and processing facilities to operate efficiently.

CONCLUSIONS

Soybeans have become an attractive crop in many areas of the District in recent years. Utilization of soybeans in both the domestic and export markets has expanded at a rapid rate and relatively favorable prices have tended to stimulate production. The future expansion of soybean production in the District will depend on physical and economic considerations. The potential of soybeans as an alternative crop will depend for the most part on its comparative advantage with other competitive enterprises.

COWS ON FARMS



PER CAPITA CONSUMPTION

BANKING IN THE TENTH DISTRICT

District and States	Loans				Deposits			
	Reserve City Member Banks		Country Member Banks		Reserve City Member Banks		Country Member Banks	
	December 1961 Percentage Change From							
	Nov. 1961	Dec. 1960	Nov. 1961	Dec. 1960	Nov. 1961	Dec. 1960	Nov. 1961	Dec. 1960
Tenth F. R. Dist.	+9	+10	+2	+7	+7	+11	+3	+9
Colorado	+5	+10	+3	+10	+14	+24	+2	+10
Kansas	+17	+17	+3	+6	+8	+7	+5	+8
Missouri*	+6	+7	+2	+5	+10	+6	+5	+9
Nebraska	+2	+9	+3	+7	+3	+6	†	+8
New Mexico*	**	**	−2	+4	**	**	−2	+5
Oklahoma*	+15	+11	†	+7	−2	+9	+4	+9
Wyoming	**	**	+3	+12	**	**	+1	+8

* Tenth District portion only.
† Less than 0.5 per cent.
** No reserve cities in this state.

PRICE INDEXES, UNITED STATES

Index		Dec. 1961	Nov. 1961	Dec. 1960
Consumer Price Index	(1947-49=100)	128.2	128.3	127.5
Wholesale Price Index	(1947-49=100)	119.2	118.8	119.5
Prices Rec'd by Farmers	(1910-14=100)	240	238	242
Prices Paid by Farmers	(1910-14=100)	302	301	298

TENTH DISTRICT BUSINESS INDICATORS

District and Principal Metropolitan Areas	Value of Check Payments		Value of Department Store Sales	
	Percentage change—1961 from 1960			
	Dec.	Year	Dec.	Year
Tenth F. R. Dist.	+8	+7	−2	+2
Denver	+19	+13	+2	+5
Wichita	+2	+5	−4	−2
Kansas City	+7	+5	−5	0
Omaha	+3	+4	−8	+9
Oklahoma City	+13	+12	−6	−8
Tulsa	+8	+3	0	−1