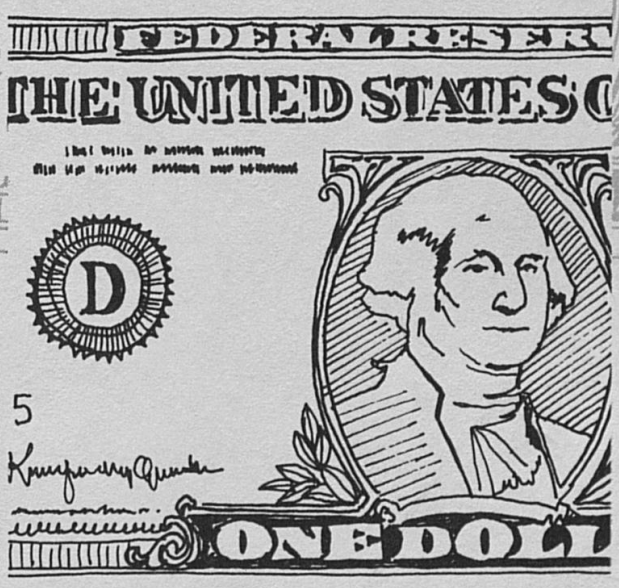
CUTTING FERTILIZER COSTS



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FOREWORD

While its results have considerable significance for farm people, this publication is meant for use by the educators, businessmen, and personnel of state and federal agencies who work with farm people as well.

Since, among other things, the material included bears directly on the effect of farmer cooperatives on the prices farmers pay for fertilizer, the facts discussed may be of interest to farmer-directors and management personnel of cooperatives and to their proprietary competitors. The study is based on data from markets served by only seven cooperatives which may or may not be typical. With different degrees of managerial efficiency, different volumes of business, or different local competitive conditions, the results might be somewhat different. *The results shown should be viewed as illustrative of some possibilities which may be attainable in a given local market situation.* Since each local situation must be judged on its own merits, farmers should become aware of and understand these possibilities.

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In 1962, over 1½ billion dollars was spent for fertilizers in the United States. In the same year, Kentucky farmers spent $37,700,000 for fertilizer and lime, representing about 12½ percent of all current farm operating expenses. Since fertilizer is a major farm expense, the prices the farmer pays for it are very important in determining his net income. Many farmers, unfortunately, are unaware that they can cut their fertilizer costs. "Shopping" for the best price, buying the least expensive source of plant food, and using dealers' discounts are only a few of the ways the farmer can reduce this expense.

The problems of increasing prices for farm products and improving on-farm production have received a good deal of attention. However, careful buying practices of such farm production needs as feed, seed, fertilizer, and farm machinery are equally important since a $100 savings in an expense item increases net income by exactly the same amount.

More effective buying methods will, of course, improve the farmer's net income. Whether the farmer understands and, consequently, benefits from these methods depends on the effectiveness of public education for youth, adult education programs, and public policies, and whether this education is geared to present and future problems and opportunities. The same is true for local group efforts to improve economic conditions.

In this publication, we examine the possibilities for improving farmers' income through better buying methods. Although similar problems may exist in purchasing other production needs, fertilizer is used here as the specific commodity since it is a large part of farm expense. This study, based primarily on a survey of eight retail fertilizer markets in Kentucky, describes (1) some of the factors affecting the price of fertilizer to farmers and (2) how farmers can cut their fertilizer costs. Approximately 30 farmers in each of the 8 markets were interviewed on the survey along with substantially all of the regular fertilizer dealers who retailed fertilizer in these markets.[1]

[1] Excluded were farmer-dealers who sold small amounts of fertilizer and irregular dealers such as grocery stores and the like which sold fertilizer only as a side-line or "convenience" item. Complete results of the study are available in: James E. Berry, "Conventional and Unconventional Determinants of Market Performance," unpublished Master of Science thesis, University of Kentucky, Department of Agricultural Economics, May 1964.

HOW CAN FERTILIZER COSTS BE REDUCED?

The cost of supplying plant food necessary for satisfactory yields can be reduced several ways. These are discussed below.

Discounts

(1) Some dealers gave a discount for those who purchase fertilizer in bulk rather than in bags. Nearly one-third of the regular dealers in eight local market areas in Kentucky covered by the survey offered such bulk discounts. In most cases the discount was $4 per ton.

(2) Over two-thirds of the firms offered some discount for cash payment. The value of the cash discounts was normally about 2 percent of the total payment within 30 days, which figures about $1 per ton on most mixed fertilizer grades.

(3) Nearly two-thirds provided discounts for those who purchased and took delivery of their spring fertilizer during winter months.

(4) Preseason or "early movement" discounts varied depending on the policies of the dealer, both as to amount and the cutoff dates after which the discount was reduced or cancelled. Normally, this discount was $2 per ton until a cutoff date in the last half of January and about $1 until a date in late February or early March.

(5) Hauling discounts and delivery charges were also generally used by fertilizer dealers, usually as discounts. However, they varied considerably, from $1 to $2 per ton.

Whether the farmer ought to take advantage of these discounts will depend on (1) the availablity of a truck, (2) the availability of cash or alternative credit sources that are cheaper, and (3) whether the farmer has facilities or custom-hire equipment available for handling bulk fertilizer. However, some farmers can save $8 or $9 per ton by taking advantage of these discounts.

High-analysis versus Low-analysis Fertilizers— Farmers Lose Millions

Due primarily to the weight of fertilizer and the cost of transporting and handling it, low-analysis fertilizers such as 4-12-8 are relatively expensive per unit of the available plant food obtained. In these fertilizers, filler materials such as sand or ground limestone and less concentrated materials are used which add weight but no value to the mix. Therefore, farmers can ordinarily get more plant food for their money by buying triple superphosphate rather than ground rock phosphate, 10-20-20 rather than 5-10-10, and so forth. This is not always true, but it can easily be checked. For a given ratio, divide the price by the number of plant food units per ton or per hundred pounds. The mix that yields the lowest quotient is the "best buy." For example, if a

1-2-3 ratio is needed and 5-10-10 @ $60 and 6-12-18 @ $68 per ton were compared, the following computations would be made:

	5-10-15	6-12-18
Price:	$60 per ton, or $3 per cwt	$68 per ton, or $3.40 per cwt
Plant food units:	5 + 10 + 15 = 30 per cwt	6 + 12 + 18 = 36 per cwt
Cost per unit of plant food:	$3 ÷ 30 = $0.100, or 10 cents per lb	$3.40 ÷ 36 = $0.095, or 9.5 cents per lb (BEST BUY)

All this is very obvious. Yet a great many farmers appear to be unaware of how much they are losing. At least, many of them continue to use low-analysis formulations even when higher analysis mixes are available locally. Computations based on fertilizer tonnage by counties in 1959 and prices for major grades reported by the U.S. Department of Agriculture indicated that Kentucky farmers lost, by fairly conservative estimates, about $1,650,000 in net income in 1959 simply because they purchased low-analysis grades. Farmers, on an average, lost more than $3 per ton of fertilizer actually purchased; i.e., they could have bought the same amount of plant food nutrients at $3 less than the average price per ton actually paid —a savings of 6 percent of the total fertilizer bill.

It is important to recognize that the higher analyses are not always the cheapest. In parts of the state, some higher analyses with micronutrients such as copper, boron, and the like added are sold as "premium" grades. Although the cost of the micronutrients is small, applications are needed only under special soil conditions or for particular crops. Therefore the price of these fertilizers is often quite high in relation to the amount of plant food they contain.[2]

Buying the Least Expensive Sources of Plant Food

While the discounts mentioned above are important, the base price will vary at the same dealer depending on the source of plant food that is used. Organic sources of nitrogen and phosphate such as tankage and bone meal, respectively, are quite expensive. Nitrate of soda is more expensive than ammonium nitrate per pound of nitrogen. Generally,

[2] See *Secondary and Trace Element Needs for Crops on Kentucky Soils*, Miscellaneous 302, University of Kentucky, Cooperative Extension Service (prepared by Department of Agronomy).

straight materials such as ammonium nitrate triple superphosphate, and muriate of potash are somewhat less expensive than these same materials purchased in a mixed fertilizer. If suitable spreading equipment is available, use of these straight materials often means savings. A study by Fuqua and Walkup indicates savings on the cost of the material itself ranged from $4.47 to $13.45 per ton for equivalent plant food, depending on the analysis of mixed fertilizer used.[3] Of course, the cost of hiring custom spreading services along with the chance of getting uneven distribution or covering the ground three times with the conventional single-hopper farm spreader must be taken into account in deciding whether there are real economies in use of straight materials. The typical charge for spreading was from $1 to $1.50 per acre in the five markets out of the eight where such service was available. On a tonnage basis, charges were from $5.50 to $6 per ton. In the Fuqua and Walkup study, reported charges were similar except the adjustments for spreading on plowed ground, intensive application on tobacco land, and for very large acreages. In any event, in some cases it is obvious that considerable savings are possible—as much as $7 per ton—depending on the rate of application, the analysis of mixed fertilizer for which the straight materials are substituted, and so forth. A method for comparing the cost of straight materials and mixed fertilizer is illustrated in the Appendix.

Selecting a Low-cost Dealer

For the most part, the ways of cutting fertilizer costs which we have discussed do not involve selecting a particular dealer or bargaining with him. Rather, they involve only taking advantage of opportunities that many dealers offer. Bulk-spreading service which would make it easier to use straight materials is the main exception. Only a small proportion of dealers now offer bulk-spreading service. However, if more farmers were interested in the economies of straight and bulk materials, more dealers would probably offer these services. Also, a particular dealer may not carry a complete line of all analyses and concentrations.

Is it valid to assume that one dealer is about as good as another and that nothing is to be gained by shopping around and bargaining for the best combination of price, analysis, and service available? Do farmers' attempts to buy from the dealer who offers the best price for

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[3] Joe E. Fuqua and Harold G. Walkup, *Bulk Fertilizer Spreading Practices in Kentucky—With Special Emphasis on Three-Hopper Truck Spreader Custom Services*, Bulletin 683, University of Kentucky Agricultural Experiment Station in cooperation with the Agricultural Economics Branch, Tennessee Valley Authority, May 1963.

a particular fertilizer pay off in significant savings? Do farmers who are better informed about fertilizers get more for their money?

A statistical analysis was made of the prices paid by about 240 farmers in the 8 retail fertilizer markets which were covered in the 8 market survey. What did this analysis show? When other factors were held constant, including the ratio of plant food nutrients in the formula, the farmers who checked several dealers' prices and/or analysis of the fertilizer and who bought their fertilizer based on this "shopping," paid significantly less per unit of plant food. That is, they paid less than those farmers who did not "shop." The most careful buyers, or the ones who apparently made the most effort to get the best buy, on the average saved $1.60 per ton on 5-10-15 fertilizer compared with those who were rated as the least careful or who made the least effort to find the best buy.

Furthermore, the farmers who had the most knowledge of fertilizers including their most efficient use and who were, perhaps, least susceptible to misleading advertising saved about $1.50 per ton on 5-10-15 fertilizer.

The figures shown above refer to the possible economies that an *individual buyer* can realize, irrespective of what other farmers in the same market may do. In other words, they tell us what he could expect to achieve if other farmers in the same market did not change their buying habits. However, if all farmers were to make greater efforts to search out the best buys, more competitive pressure would be applied on the retail firms in the market, forcing them to adjust their prices to nearer "at-cost" levels. This is exactly what the statistical analysis indicates. In the market where the farmers were rated as being, on the average, the most careful buyers, i.e., as being the ones who made the greatest effort to base their fertilizer purchases on prices and analysis, farmers obtained their fertilizer at about $1.75 per ton less than in the markets where farmers were least inclined to make this kind of effort.[4]

Cooperatives and Their Influence

When firms have relatively few competitors, regardless of the reasons, prices normally tend to be somewhat higher. In the markets

[4] This probably underestimates the possibilities somewhat since the range between the highest and lowest level among the markets studied is quite low, about 2 points on the 8-point scale used to measure this variable. It is quite likely that in some retail markets in commercial farming areas the upper limit of the average score might be an additional 2 points higher. If the range were that much greater and if an extrapolation of the results of this analysis were valid, one would expect an additional $1.20 per ton potential savings.

studied the number of primary competitors was quite small, as few as two in some of the markets. One of the bargaining tools farmers have is the right to organize as cooperatives so that they can perform their own buying or selling operations. Cooperatives operate on an "at-cost" or nonprofit basis. Any charges for their services in excess of costs must be returned as refunds to the patron in proportion to his volume of patronage. These may either be in cash, stock in the cooperative, or other legal claims on the cooperative's assets. Cooperatives operating in markets with little competition can reduce the cost of farm supplies to the farmers if (1) the management of cooperatives is highly efficient, (2) if they are able to obtain sufficient business volume for efficiency in the use of fixed capital items, and (3) if profits of existing firms tend to be high. However, all of these conditions are not always met. Therefore, it is important to know just how well Kentucky farm supply purchasing cooperatives function as tools for improving the economic position of farmers.

Statistical analysis of the prices paid by farmers for fertilizer indicates that, in the seven markets in which farm supply purchasing cooperatives were active, prices at cooperatives, after allowing for the influence of other factors, were significantly lower—about $1.60 lower than their competitors.[5] This does not mean that the stated price at time of sale was this much lower. This figure represents the price after refunds were computed at the end of the year. Since the estimated difference is about the same as the patronage refund, it shows that the price of fertilizer at the time of sale was about the same at the cooperative as in other fertilizer retailers. This condition may exist because cooperatives in most markets are regarded by their competitors and by the cooperatives' managers themselves as price leaders. That is, the other retailers may have tended to copy the price set by the cooperatives. How much higher the prices of other retailers would be if the cooperatives did not operate in these markets is not analyzed in this study, but the recognition of them as price leaders tends to indicate that they have had some influence in holding down prices. In any event, when refunds are considered, it is obvious that they are now

[5] These results relate only to the average for patrons of the seven cooperatives in the eight markets studied and only for the 1963 spring fertilizer season. Whether cooperatives in other markets or during other seasons offer similar reductions in fertilizer costs will depend, among other things, on the factors noted earlier; namely (1) management efficiency, (2) volume of business, and (3) local competitive conditions. Most farm supply cooperatives in Kentucky operate under contractual arrangements for management supervision by a large regional manufacturing and wholesaling cooperative, including five of the seven cooperatives included in this study. Therefore, we might expect some uniformity in management. However, volume varies widely and possibly competitive conditions do also.

contributing significantly to lowering the cost of fertilizer for their patrons.

While these benefits are significant, these cooperatives, quite likely, are not contributing as much as they could if their services were used more by farmers. Most cooperatives in Kentucky now operate at annual business volumes too small for maximum efficiency. Therefore, the cost of their services is above what it could be, and, thus, their charges must be somewhat higher to cover their costs. Obviously, unless and until farmers make a real attempt to discover the best buys in fertilizer and unless they know enough about fertilizers to recognize them when they see them, farmers may not take full advantage of the economies available and, therefore, may not allow their cooperatives to function at maximum efficiency.

Many Farmers Do Not Base Purchases on Price and Analysis Information

Many farmers do not base their purchases on price and analysis, for in the 8 markets studied, only one-third of the farmers could be rated as highly careful buyers. Many bought simply on the basis of habit. Similarly, only about one-third of the buyers could be rated as very well informed about fertilizers and their use. As the earlier statistical analysis showed, this probably means that many of them were paying significantly more for their fertilizer than they would have to if they were better informed and more careful about purchasing fertilizer. Since the cooperatives offered substantial benefits, this means that they did not obtain the additional volume of business necessary to provide lower cost service to their member-patrons.

From these facts it should be obvious that farmers need to be trained (1) to understand the importance of buying carefully, of checking and comparing the offerings of various dealers, and (2) to understand key facts concerning fertilizers that will enable them to buy effectively and make them unsusceptible to doubtful advertising claims.

SUMMARY AND CONCLUSIONS

It is evident that more attention is needed in our extension and public education programs to some of the business aspects of farming, specifically the purchasing of fertilizers. Undoubtedly, the buying of other inputs such as feed, machinery, and the like is similarly affected by ineffective purchasing.

These buying habits mean dollars and cents losses to individual farmers. However, this study indicates that improved buying practices can lower the entire price structure in the market.

Mere knowledge of fertilizer is not so important as the farmer's attempts to buy on the basis of price, analysis, and related services. This has important implications for educational agencies. The role of these agencies as disseminators of scientifically established facts to those who request them will not solve this problem. Basically, the problem is to motivate a search for, or receptiveness to, information. To achieve this condition, educators must make farmers aware of the importance of sound purchasing decisions to financial success. The problem is to change the purchasing habits of farmers. This is a much more complex task than simply acting as a purveyor of information. It not only involves filling requests for technical assistance, but creating an awareness of the need for information not now fulfilled.

The study shows that cooperatives in the seven markets in which they operated provided significant benefits to their patrons, most of which were received in the form of patronage refunds. However, since most of them operated at business volumes insufficient for maximum efficiency, there is reason to believe that if farmers had been more discriminating buyers and used the services of their cooperatives to a greater extent, the benefits of these cooperatives could have been significantly increased. In other words, the potential benefits of a cooperative cannot be fully exploited if farmers, who benefit as patrons, do not learn to take full advantage of them. The success of a cooperative is, in some degree, dependent on the buying habits of the farmers in the service territory it is designed to serve.

APPENDIX

A METHOD FOR COMPUTING THE COST OF PLANT FOOD EQUIVALENT TO MIXED FERTILIZERS USING STRAIGHT FERTILIZER MATERIALS

For illustrative purposes it is assumed that the choice is between a 6-12-12 mixed fertilizer and a combination of *ammonium nitrate, triple superphosphate* and *muriate of potash.*

A ton of 6-12-12 costs about $52 (assumed) and contains:

$20 \times 6 = 120$ pounds of nitrogen.

$20 \times 12 = 240$ pounds of phosphorus pentoxide (P_2O_5).

$20 \times 12 = 240$ pounds of potassium oxide (K_2O).

Analysis of fertilizer materials:

Ammonium nitrate contains about 33% nitrogen.

Triple superphosphate contains about 45% phosphoric acid (P_2O_5).

Muriate of potash contains 60% potash (K_2O).

Therefore:

120 pounds of nitrogen could be supplied by $120 \div .33 = 364$ pounds of *ammonium nitrate.*

240 pounds of phosphoric acid (P_2O_5) could be supplied by $240 \div .45 = 533$ pounds of *triple superphosphate.*

240 pounds of potash (K_2O) could be supplied by $240 \div .60 = 400$ pounds of *muriate of potash.*

Prices of fertilizer materials (assumed for illustrative purposes):

1. *Ammonium nitrate* = $80 per ton = $4 per cwt. = *4 cents* per pound.
2. *Triple superphosphate* = $80 per ton = $4 per cwt. = *4 cents* per pound.
3. *Muriate of potash* = $55 per ton = $2.75 per cwt. = *2.75 cents* per pound.

Total cost of supplying:

Nitrogen = $364 \times \$.04 = \$14.56$

Phosphorus = $533 \times \$.04 = \$21.32$

Potash = $400 \times \$.0275 = \$11$

Total Cost = $46.88

In this situation with 6-12-12 priced at $52 per ton, the farmer who used straight materials and spread each separately by conventional methods would earn a return of $5.22 per ton for his labor and machine

expense. If custom bulk spreading were used, an additional saving of about $4 might be expected for use of bulk materials and the labor and machine expense connected with spreading the mixed fertilizer would be eliminated. Where such bulk service is available for these prices it would clearly be advantageous if the cost of spreading were no more than $5 or $6 per ton.* Without counting in the labor and machine expense saved, there would be a net gain of $4.22 per ton.

Normal cost of bagged materials	$46.88	
Minus—Bulk discount	4.00	
Cost of bulk materials	$42.88	
Plus—Bulk spreading charge	5.00	
Net cost of materials (spread)	$47.88	
Cost of 1 ton 6-12-12 (not spread)	$52.00	
Net cost advantage of straight materials	$ 4.22	per ton equivalent 6-12-12 mixed fertilizer

Note: By copying the steps shown above and leaving the underlined figures blank, these sheets can be used as worksheets for teaching purposes. Only the sentence denoted by an asterisk (*) would be inapplicable.

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