Cost of Operating the

PULL-TYPE THREE-HOPPER FERTILIZER SPREADER

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SUMMARY

1. When a three-hopper fertilizer spreader is used, equivalent amounts of plant nutrients can usually be bought in straight materials for less money than in mixed fertilizers.

2. The three-hopper fertilizer spreader provides a convenient method for applying three straight fertilizer materials in appropriate ratios and amounts at one time.

3. Farmers with large acreages to fertilize each year can apply their plow-down and topdressed plant nutrient needs at a lower cost with the three-hopper spreader and straight fertilizer materials than with a single-hopper spreader and mixed fertilizers.

4. Custom service of the three-hopper spreader is particularly adapted to use by farmers wanting small acreages topdressed or applications made for plow-down.

5. Custom service with the three-hopper spreader has the shortcomings of most field operating custom services, such as sometimes being unavailable when needed and being vulnerable to bad weather.

Cost of Operating the Pull-Type Three-Hopper Fertilizer Spreader

*By HAROLD G. WALKUP and JOE E. FUQUA**

Farmers usually can buy the nitrogen, phosphate, and potash their soils need for less money in straight fertilizer materials than in mixtures. Ammonium nitrate, concentrated superphosphate, and muriate of potash are examples of straight fertilizer materials. Until recently, however, a convenient method was not available for applying in one operation several straight materials to a field. To meet their mixed fertilizer needs, some farmers used straight fertilizer materials by mixing them with a shovel. A few years ago a three-hopper fertilizer spreader was developed to meet the need for spreading three straight fertilizer materials at the same time. These spreaders have been introduced in Kentucky and are now being used by custom operators and a few farmer owners. Costs of operation, as well as custom operator and farmer experience, are reported in this publication.

THE THREE-HOPPER SPREADER

Sizes

The three-hopper spreaders are made in 8-foot and 10-foot widths. They have three separate hoppers—one each for the nitrogen, phosphate, and potash fertilizer. The flow of materials from each hopper is adjusted individually before spreading so that any nitrogen, phosphate, potash ratio may be spread. Three hand levers, operated from the tractor seat, are used to start and stop the flow of fertilizers.

Capacity

Each hopper of the 8-foot spreader holds 600 to 700 pounds of material—about 1 ton per filling. The 10-foot spreader takes about 2,500 pounds per filling.

Power Needed

The three-hopper spreader is pulled by a light farm tractor and in some cases has been pulled by a jeep.

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Work Accomplishment

Spreader width, spreading speed, and filling time required determine the number of acres that can be fertilized in any given amount of time. Spreading speed depends on field conditions such as softness of the ground, soil moisture, slope, and turns required. The operator's ability to handle the spreader and refill it rapidly also affects the work accomplished. With an 8-foot spreader traveling an average of 4 miles per hour—refilling steps included—30 acres can be fertilized in an 8-hour day. For each additional mile per hour, acreages covered with the 8-foot spreader increase about 7.5 acres per day. A 10-foot spreader covers about one-fourth more acres than the 8-foot spreader for any given speed.

COSTS OF SINGLE-HOPPER AND THREE-HOPPER SPREADERS COMPARED

Purchase Price

An 8-foot three-hopper spreader costs about $800, and an 8-foot single-hopper spreader costs about $260. A 10-foot three-hopper spreader costs about $880, and the 10-foot single-hopper spreader costs about $300. These prices are for new fertilizer spreaders.

Overhead Costs

Owners of fertilizer spreaders have some costs whether their spreaders are used or not. These overhead or fixed costs include depreciation, interest on investment, insurance, and local taxes. Annual *depreciation* costs are the average portion of value used each year of the estimated life of the spreaders—one-sixteenth for the single-hopper spreaders and one-tenth for three-hopper spreaders (Table 1). The *interest* cost each year is 5 percent of one-half the new spreader

Table 1.— Annual Overhead Costs of Single-Hopper and Three-Hopper Spreaders, Kentucky, 1957.

Cost Item	8-Foot		10-Foot	
	Single-Hopper	Three-Hopper	Single-Hopper	Three-Hopper
Depreciation	$16.56	$80.50	$18.44	$88.00
Interest	6.62	20.12	7.38	22.00
Insurance	4.50	13.50	4.50	13.50
Local Taxes	.32	.97	.35	1.06
Total	$28.00	$115.09	$30.67	$124.56

price, which is the average value of the spreader during its life. Annual *insurance* costs vary by type of insurance carried. A comprehensive type suited particularly to custom operators' needs is used here. *Local*

taxes vary from place to place, and a 3-mill tax rate is used in this case on 40 percent of the cost price. These overhead costs are presented in Table 1.

Total annual overhead costs for the single-hopper spreaders are much less than for the three-hopper spreaders. The overhead costs per acre of fertilizer spread decreases as more acres are spread. For instance, if 50 acres were fertilized annually with the 8-foot three-hopper spreader, the overhead cost per acre would be \$115.09 ÷ 50 = \$2.30. With an 8-foot single-hopper spreader, per acre cost would be \$28.00 ÷ 50 = 56 cents. If 200 acres were fertilized, the overhead costs per acre for the three-hopper spreader would be 58 cents, and for the single-hopper spreader, 14 cents.

Operating Costs

Costs directly connected with fertilizer spreaders are labor, lubrication, pulling power, and repairs. As shown in Table 2, these costs are nearly constant on a per acre basis regardless of the number of acres fertilized.

Table 2.— Operating Costs Per Acre for Single-Hopper and Three-Hopper Spreaders, Kentucky, 1957.

Cost Item	8-Foot		10-Foot	
	Single-Hopper	Three-Hopper	Single-Hopper	Three-Hopper
	(cents)		(cents)	
Labor	20	25	18	22
Lubrication	01	01	01	01
Pulling power	35	40	30	35
Repairs	10	16	09	14
Total	66	82	58	72

Combined Overhead and Operating Costs

Usually, combined overhead and operating costs are lower for single-hopper spreaders than for three-hopper spreaders. For example, these combined costs for 50 acres are \$2.30 + 0.82 = \$3.12 per acre for the 8-foot three-hopper spreader, and 0.56 + 0.66 = \$1.22 per acre for the 8-foot single hopper spreader—a difference of \$1.90. For larger acreages the combined overhead and operating costs per acre are reduced, and this cost is reduced more for the three-hopper spreaders. For example, if 200 acres were fertilized, these costs for the three-hopper spreader would be \$1.40 per acre and for the single-hopper spreader 80 cents per acre—a difference of 60 cents.

Fertilizer Costs

Fertilizer costs are also operating costs, but are so much greater at recommended application rates than the other operating costs that they are considered separately. In general, straight fertilizer materials are less costly for equal amounts of primary plant nutrients than mixed fertilizers. Straight fertilizer materials are used in the three-hopper spreaders, and mixed fertilizers are used in the single-hopper spreaders to meet the fertilizer needs for crops and pastures. For example, a ton of 10-10-10 equivalent as straight materials was bought for about $9 less than a ton of mixed 10-10-10 (Table 3).

Additional laborsaving in terms of less weight handled is achieved through the use of straight fertilizer materials having a high plant nutrient analysis. For instance, a ton of 10-10-10 equivalent can be

Table 3.— Costs of Straight Fertilizer Materials and Mixed Fertilizers Compared on a Plant Nutrient Equivalent Basis, Kentucky, 1957.

Grade or Equivalent	Mixed Fertilizer	Straight Materials	Cost Difference
	dollars/ton	dollars/ton equivalent	dollars
10-10-10	59.00	50.23	8.77
5-10-15	56.00	47.90	8.10
4-12-8	46.00	32.90 - 35.30[1]	10.70 - 13.31[1]
0-20-40	80.00	62.77 - 67.11[1]	12.89 - 17.23[1]

[1] The lower cost equivalent of plant nutrients in straight materials included calcium metaphosphate as the phosphate component. Concentrated superphosphate was included as the phosphate component in the higher cost equivalent of plant nutrients.

spread with the three-hopper spreader by using only 1,380 pounds of materials—600 pounds of ammonium nitrate, 445 pounds of concentrated superphosphate, and 335 pounds of muriate of potash.

Total Costs per Acre

The decision to use a three-hopper spreader and straight materials or a single-hopper spreader and mixed fertilizer can be made by comparing all costs—overhead, operating, and fertilizer costs. Since overhead costs get lower as more acres are fertilized, the number of acres a farmer expects to fertilize each year tends to determine whether he will buy or use a three-hopper spreader or a single-hopper spreader.

A typical farm organization of crops and pasture in Kentucky and recommended fertilizer application rates are used to compare the two types of spreading. Total costs of three-hopper fertilizer spreading and straight materials are about equal to total costs of using a single-hopper spreader and mixed fertilizer when 35 acres are fertilized each year. With more acres fertilized, three-hopper spreading would be cheaper than single-hopper spreading; for less than 35 acres, the single-hopper spreader would be cheaper.

CUSTOM HIRING VERSUS OWNING SPREADERS

Cost of Custom Hiring

Custom rates for three-hopper fertilizer spreaders, which include pulling power, vary from $2 to $5 per acre depending on the number of acres fertilized. The usual custom rate is $2 per acre. Small jobs, usually on tobacco, cost more per acre.

Custom Rates and Single-hopper Spreading Costs

In areas where three-hopper custom spreading is available at $2 per acre, the cost of using a single-hopper spreader and mixed fertilizers was higher for all acreages fertilized. The saving on straight fertilizer materials plus the cost of owning and operating the single-hopper spreader was greater than the custom spreading charge for the three-hopper spreader.

Cost of Owning and Operating the Three-hopper Spreader Compared to the Custom Rate

The cost of owning a three-hopper spreader is greater than custom hiring unless about 100 acres or more are fertilized each year at recommended rates. When 200 acres are fertilized annually, owning the three-hopper spreader would save the owner 60 cents per acre. For 500 acres 95 cents per acre would be saved.

RETURNS TO CUSTOM OPERATORS

Break-even Point

A custom operator profits from custom operations if he fertilizes more than 105 acres annually. This profit is over and above his wages of $1.25 per hour, and a 5 percent return on his average investment. In fact, when the custom operator spreads 105 acres, he earns a labor and investment return of slightly over $45.

Profits at Different Acreages

A custom operator who fertilizes 250 acres will receive $500 of which $340 will be required to cover costs including his wages and his interest on average investment. If he fertilizes 500 acres he will earn about $430 in profits, if 700 acres, $660.

ADVANTAGES AND DISADVANTAGES FARMERS SEE IN CUSTOM HIRING A THREE-HOPPER FERTILIZER SPREADER SERVICE

When farmers were asked how they liked the custom three-hopper spreader service, they stated the following advantages and disadvantages, which are listed in decreasing order of importance to the farmers who had used the service. Some are criticisms of the three-

hopper spreader, but many are of custom work and custom operators in general.

Advantages—

Lower cost
More uniform application of fertilizer material
Saves the farmer labor
Shorter spreading time
Farmer does not own a spreader
Less fertilizer to be handled
Able to apply a specific mixture

Disadvantages—

Cannot get service at desired time
Operator wasted fertilizer with the spreader
Uneven spreading job
Inexperienced operator
Machine was hard to adjust
Cannot see much material being spread
Cannot cut off machine while on the jeep

NEW DEVELOPMENTS IN STRAIGHT FERTILIZER MATERIAL USE

Truck Spreading

A new method of spreading straight fertilizer materials is the bulk truck spreader. Two types of truck spreaders are in use: (1) trucks equipped with three bins or hoppers (in some cases the nitrogen bin is replaced by a tank to handle nitrogen solutions); and (2) in some areas straight materials are blended at a small plant to the ratio of plant nutrients wanted by the farmer. Bulk straight materials may be loaded in the truck hoppers at the sales agency if bulk handling facilities are available. This is a laborsaving feature which could reduce cost through the elimination of bags and handling by hand. The market area in which a truck spreader can operate is large compared to that of the pull-type three-hopper spreader. On one trip a truck spreader with bins for each straight material can spread desired ratios at each of several farms with small acreages. Also, less time is required to move from one farm to another. By "lining up" several jobs in one locality, a truck spreader will be used more efficiently. The acreage required to make truck spreading economical would be too large for most farmers. However, it may be possible for a group of farmers to own and use one jointly.

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