

Drainage Cost Survey

earth moving in northern California
estimated at 15c to 20c per cubic yard

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The cost of draining farm land in the northern section of California varies with the location of the land, the ease of moving the soil, the demand for drainage in the area, and the availability of earth moving machinery, according to a recently started survey.

Excavation contractors interviewed in the survey allowed for variations in soil type and buried snags by using a per hour charge for earth moving estimates.

Costs of dragline operation vary from \$10-\$15 per hour, with a mean value of \$12 per hour.

Wheel- and ladder-trencher costs average 20¢ per foot of trench to a depth of 36", with the charge increasing to 30¢ per foot for a 60" deep trench.

Rentals for backhoes are from \$10-\$15 per hour, as for draglines.

Where agricultural areas are essentially isolated—as in Lake County and the pocket valleys in the Coast Range or the Eastern portion of Lassen County—drainage construction would theoretically be done by a contractor from outside the farming area, in contrast to the Central Valley or the Imperial Valley where several drainage contractors might be available.

The cost of drainage excavations in relatively isolated areas is increased by the cost of bringing in machinery whereas a contractor who can get several jobs within a given area may reduce the unit cost to the farmer by spreading transportation charges across all jobs.

Construction of drains in heavy soil also will increase the per foot cost of drainage ditches.

The three types of machines com-

monly used for constructing drains are the dragline, the trenching machine—or trencher—and the backhoe.

The dragline uses a fixed jib with a single bucket suspended by a cable from the peak of the jib, and the bucket is positioned by the cable. A second cable runs from the bucket to the foot of the jib.

The dragline is used for constructing and maintaining open unlined ditches for both irrigation and drainage water. Using the estimated cost of \$10-\$15 per hour—with a mean value of \$12 per hour—and a mean figure of 100 yards of earth moved per hour, the cost per yard runs at 12¢-15¢ per yard.

The backhoe is similar to the dragline in that its digging stroke is made toward the machine in contrast to a powershovel with its outward stroke.

However, in the backhoe the bucket is mounted on a short boom pivoted on the jib. One line is connected to the bucket at the foot of the boom, and the second line goes to the butt of the boom which extends beyond the jib.

The backhoe has a limited range of excavation but absolute control of the bucket, permitting exact excavation. The dragline has a greater range of excavation, by reason of the cable control, but operation is not so exact. Range of excavation is used to describe the amount of excavation the machine can do before it has to be moved.

Usually, when the bucket is above the half-yard size, both the dragline and the backhoe are mounted on crawler-tracks and are self-contained units using a single power source. At the half-yard size, both machines can be mounted on truck chassis. Some backhoes of less than half-yard size are made to fit on the back of industrial tractors, the size of the backhoe varying with the tractor horsepower. These tractor-mounted units use the tractor power take-off attachment to drive hydraulic pumps and by a suitable series of valves, hydraulic cylinders control the bucket, boom and jib.

Trenchers are of two types: the wheel trencher with small buckets bolted to a vertical wheel; and the ladder trencher with the small buckets linked together to move along a ladder frame as a continuous conveyor.

The depth of cut of a wheel trencher

is controlled by raising and lowering the wheel with respect to a head frame on the machine. In the case of the ladder trencher, the depth is controlled by the angle below horizontal that the ladder makes with respect to the machine. The trencher is limited in depth of cut by the cross-feed belts used to discharge the excavated material from the buckets.

The trencher can excavate more feet per hour of trench—within its depth range—than either the dragline or the backhoe. However, by comparison of total yardage per hour of earth removed this advantage is lessened, because productivity is more in proportion to the horsepower of the engine used, other factors—such as soil—being equal.

Trenchers are used in tile laying, because of their ability to dig a clean, vertical-side trench to a controlled depth. The trencher rental figure is about \$17.50 per hour for operation only. The cost of the tile, its transport to the field, its being laid with or without a gravel envelope or the final cost of backfilling the trench would raise the cost of a completed job of tile drainage to 75¢ to \$1.50 per foot.

Backhoes are used to complement trenchers because of their accuracy in the control of the cut and because of their ability to excavate to greater depths than trenchers. However, their number is limited in northern California.

A fourth type of excavating machine—often used for the construction of long storm ditches—is the tractor-drawn scraper. When the excavated soil is not wanted on the berm, or ditch bank, the scraper has the advantage of being able to remove the excavated material from the ditch and spread it on any nearby area either as industrial or agricultural fill for leveling purposes. If the haul length to the fill area is not great the cost of this type of excavation is not in excess of the highest cost for dragline operation on a per yard basis. However, the ditch must have a bottom dimension equal to the width of the scraper bowl because the cuts are made along the length of the ditch.

Although the survey revealed a similarity in costs of different drainage construction methods—by using averages over the whole area covered—there are sharper differences due to local problems. Contractors—small or large operators—influence the cost of drainage in their own areas and thus their costs are more important to the farmer than a state-wide average price would be.

From this study it appears that earth moving—for agricultural drainage—costs between 15¢ and 20¢ per cubic yard in northern California.

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Backhoe removing a ditch bank.

