

**FIGURE 1.** Strip-tillage mulcher: (A) Rotary tiller, planter, press wheel and emulsion applicator; (B) Above machine equipped with grinder and shear plate for dry soil applications.

The tillage rotor for moist soils is shown in Fig. 2 (top). It consists of a spring-tined tiller 8 in. in diameter, rotated at 700 to 900 rpm in the forward-rolling direction. Reduction of clods is accomplished by impact and the pulverized soil is smoothed into place by the deflector plate, Fig. 1 (A). This tiller operates in the range of 1 to 2 in. in depth.

The spring-tined tiller had little effect in changing the size of aggregates of dry soil. Fig 2 (bottom) shows a number of rotors which were constructed and tested for use in dry soil. This rotor was operated at 1200 to 1400 rpm in a counterrolling direction. Soil flows up and over the rotor and is pulverized by rubbing action against the shear plate, Fig. 1 (B).

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# Designing Proper Machine For Emulsion Application

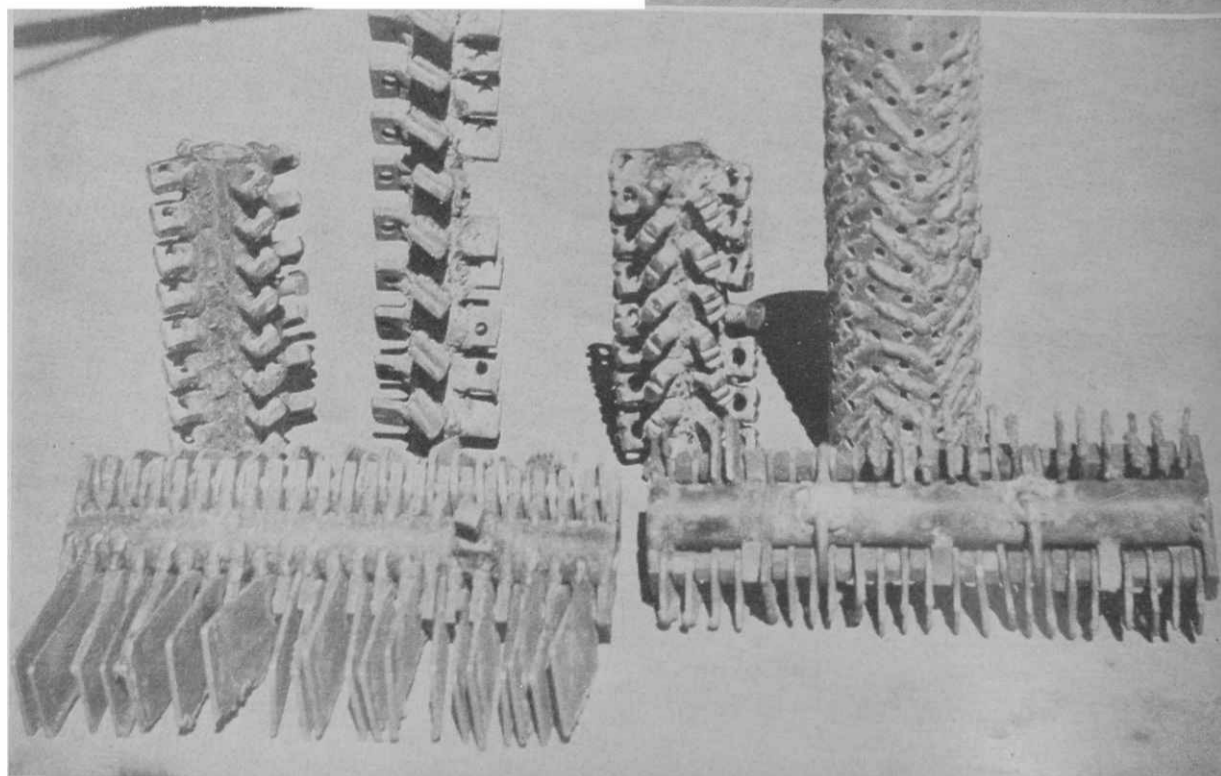
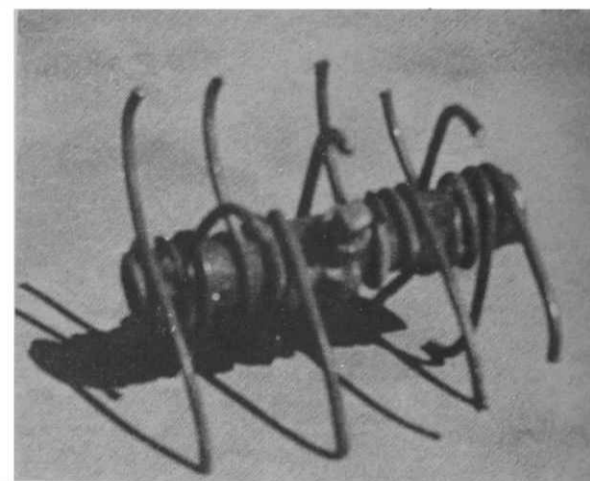
By K. R. Frost

Effective application of petroleum emulsion requires a smooth soil surface that will aid in development of a thin continuous film at a minimum application rate. The reduction of cloddy and rough surfaces is necessary if emulsion performance is to be physically and economically satisfactory.

Strip-seedbed preparation may be desirable in either moist or dry soils. Cotton is normally planted in soil at or near field-moisture capacity. Vegetables and melons are normally planted in air-dry seedbeds. Initial field trials of strip-tillage machines indicated that wet and dry seedbeds required quite different mechanical treatment for satisfactory pulverization.

Fig. 1 shows strip tillers developed for wet and dry soil preparation. In these units the strip-tiller, tiller housing, adjustable vee-type clod pusher, seed-furrow opener, seed hopper and drop, seed press-shoe, and convex zero-pressure smoothing press-wheel are combined into one assembly.

**FIGURE 2.** (Top) Spring type rotary tiller for mulching moist soil. (Bottom) Rotors built and tested for use in dry soil.



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**FIGURE 3.** (Top) Grinder-type mulcher operated by gasoline engine and used for preparing surface for asphalt emulsion for dry planting. (Bottom) Strip of soil surface prepared by grinder-type mulcher for emulsion application.

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Fig. 3 (top) shows the action of an engine-driven dry-soil grinder mounted on a sled which was constructed for testing purposes, and Fig. 3 (bottom) shows the action of the moist-soil tiller operated as a one-row tractor-mounted test unit.

#### Result of Tests

Evaluation of tests with the dry and wet soil tillers gave information for design of a two-row tractor-mounted tilling, planting, mulching assembly. The tiller rotors for wet and dry soil preparation were interchangeable. The units are driven by reversible hydraulic motors which permit conven-

ient transmission of power to the floating tiller-planter assemblies.

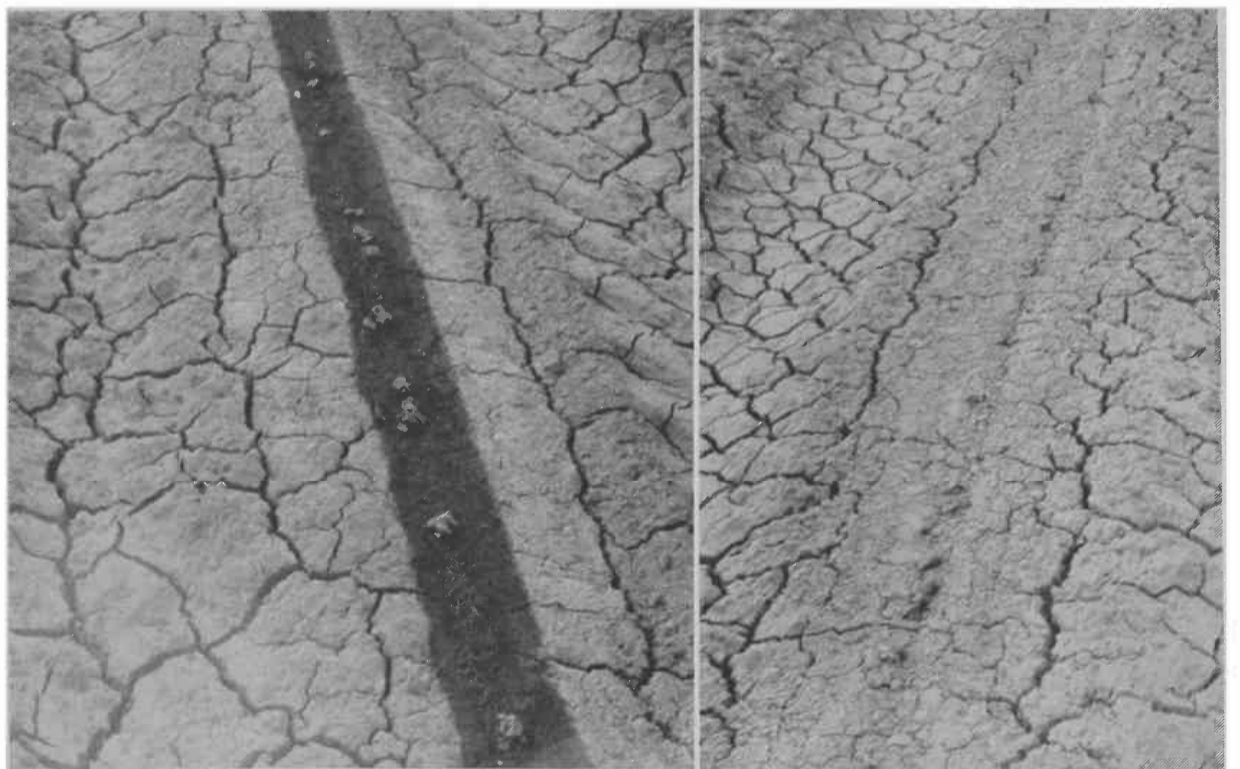
The furrow opener designed for cotton (Fig. 1) was a special type shoe of  $\frac{3}{8}$  in. width to minimize disturbance of the finely pulverized seedbed. A press-shoe prevents full coverage of seed by soil so that the smoothing press-wheel does not compact soil over the seed and prevent emergence. Side ports in the rotor housing allow excess soil to discharge to the sides, preventing overloading of the rotor, Figure 4.

This type of soil treatment has made it possible to develop satisfactory petroleum films at application rates of 8 to 10 gpa per inch of band with 40-in. row spacing. Two-stage application of the petroleum emulsion was found most effective for film development by use of two nozzles in line at 24-inch spacing. Pressures of 35-40 psi from a PTO-driven pump were used with fan nozzles (Tee Jet-6506). The pump was a Continental Belton (PT-2, Belton, Texas) rotary type.

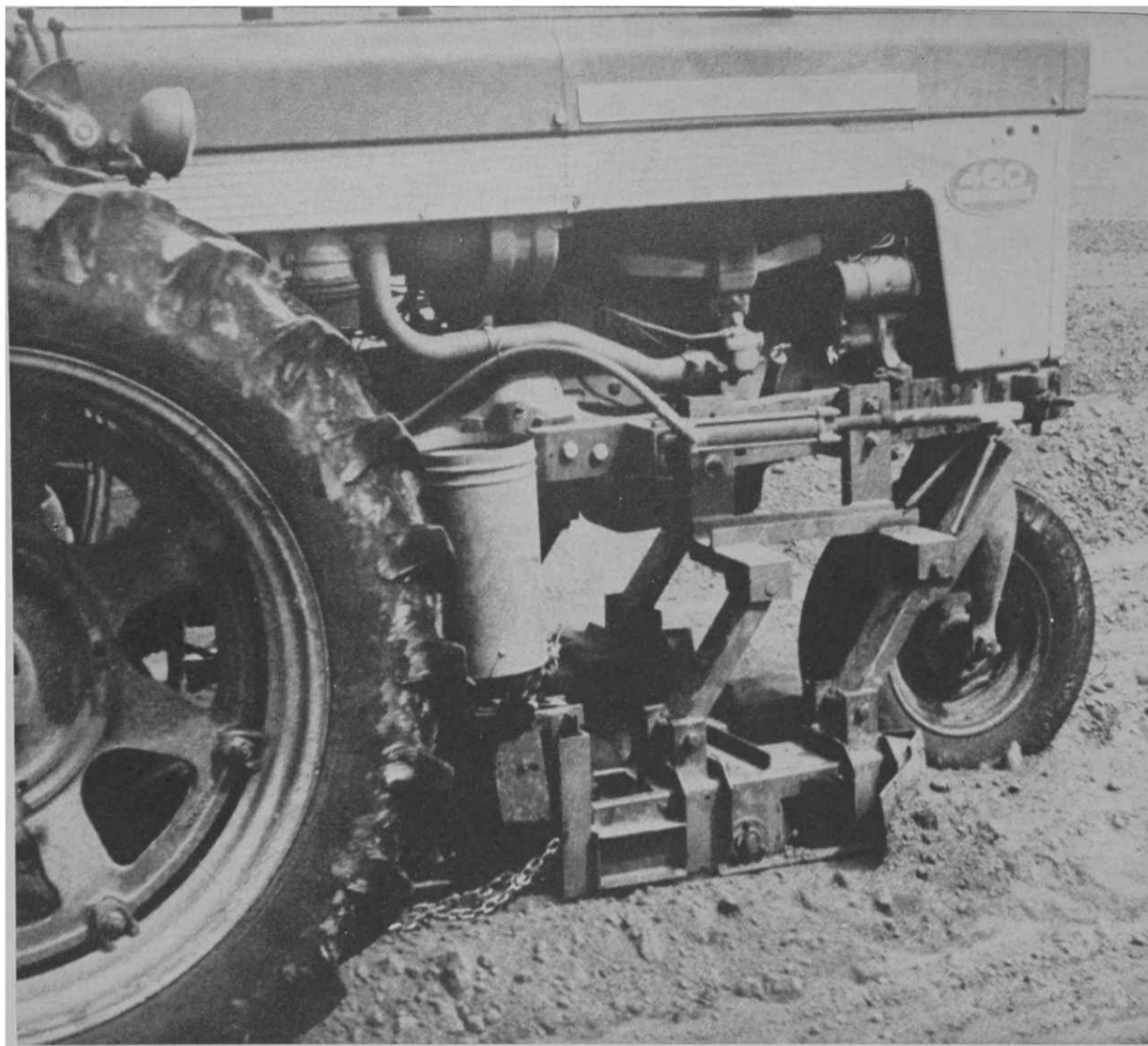
#### Machine Testing in Field

Preliminary field testing of the strip tillage system for petroleum emulsion treatment of the soil surface for cotton was conducted in 1964. The spring-tined tiller or the grinder was used, depending on soil-moisture conditions. In this test, the petroleum emulsion was applied at 70 to 80 gpa in 8-in. bands on 40-in. row centers. Plantings were made "to stand" with no subsequent chopping. Proper re-

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**FIGURE 4.** Cotton emerging from emulsion-covered soil after rain and sun baking (at left). Note few cracks in the row. Row on right was not treated and too few plants are emerging to make a satisfactory stand.



**FIGURE 5:** Side view of tractor mounted equipment for emulsion application, showing clod pusher, mulcher, and planter with press wheel and spray nozzles beyond tractor wheel.

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duction of clod size was obtained in most of the tests. Some difficulty was experienced in maintaining proper seed depth. Germination was not good where seeds were shallower than 1 in., but deeper placement was found to be practical with petroleum emulsion because of the higher soil temperatures developed.

In 1965 field tests were conducted with cotton and included strip tillage, petroleum emulsion versus strip tillage without petroleum emulsion and conventional seedbeds. These tests were conducted near Phoenix, Arizona. Early spring plantings were also conducted near Wellton, Arizona, on March 7, (Figure 5). A fair stand was obtained although rows were over-irrigated and two rains followed which left soil hard and cracked. A poor stand resulted from the germination on conventional seedbeds, and these rows were replanted.

Other tests were run in 1966 and 1967 using the strip-tillage machine (Progressive Agriculture, Sept. - Oct. 1967) and it performed satisfactory

without apparent need for modifications.

#### Summary

1. It is possible to prepare dry soil for petroleum emulsion application with a self-feeding grinder with a relatively low horsepower requirement, using 8-in. strips per row.

2. This machine is easily converted to a tiller for moist soil by changing the rotor and shear plate and reversing direction.

3. Much smaller quantities of emulsion are needed when a smooth surface is obtained by strip-tillage operations — 40-in. rows will require less than 10 gpa per in. of band width for good film cover. Field tests indicate that petroleum-emulsion-covered soil warms faster, resulting in early germination, and aids emergence by avoiding crust formation.

4. Use of emulsion provides stand insurance and should eliminate the need for replanting under adverse weather conditions. Emergence is unaffected by rains, occurring after planting.

# Resource Development In Arizona

By Clarence D. Edmond

Before we discuss resource development, perhaps we should first define what we mean by the term. It has had, and still has, many interpretations.

Workers in Extension and research, and in many agencies, have said they or their agencies have always worked in resource development. And if we define resource development in very broad terms, this is true.

But, by community resource development, we mean work with local governments, organized groups, and state and federal agencies, (1) in defining public and group objectives for improving the area, (2) in determining the most desirable means of obtaining the objectives, and (3) in developing action programs for achieving the selected goals. This sort of a definition excludes much work which has been classified as "resource development."

#### Our Work in Arizona

Under the above definition, community and resource development work in Arizona began about 1961 when one economist in the State Extension Office was assigned part time to Resource Development. Two county agents also began devoting part time to resource development work. Progress was slow due to a shortage of funds and personnel, and lack of interest of Extension personnel and farm organizations. An attempt was made to establish a State Rural Areas Development Committee, but was postponed due to disagreement among political factions.

During 1961-1963 Extension assisted four counties in organizing resource development organizations. Three of these became quite active. Accomplishments have ranged from human resource studies, to studies of natural resources such as water, to industry feasibility studies, to secur-

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