Precision Bedshaping and Planting for Cotton

*by M. D. Cannon and G. D. Christenbury**

The practice of precisely shaping beds for planting is not new; vegetable growers have been doing so for years. As a matter of fact, it was from seeing the vegetable fields that the idea was developed to use a similar system for cotton, although it did not come in a sudden, blinding flash. Actually, it "just sort of grew like Topsy." The seed of the idea probably germinated during the earlier days of using plastic and asphalt mulches, for these materials require a relatively smooth, shaped surface. But the real need for bedshaping arose because of herbicides. Some of the more effective herbicides are phytotoxic to cotton, and one of the early problems was how to maintain physical separation between the germinating cotton and these herbicides.

The reasoning was logical. If we could apply the herbicide in the top ¾ to 1 inch of soil in a precise layer, then plant the cotton seed underneath so the roots would not take up the chemical, we were reasonably certain that weeds could be controlled without damage to the cotton plants. The next step in our thinking was that we

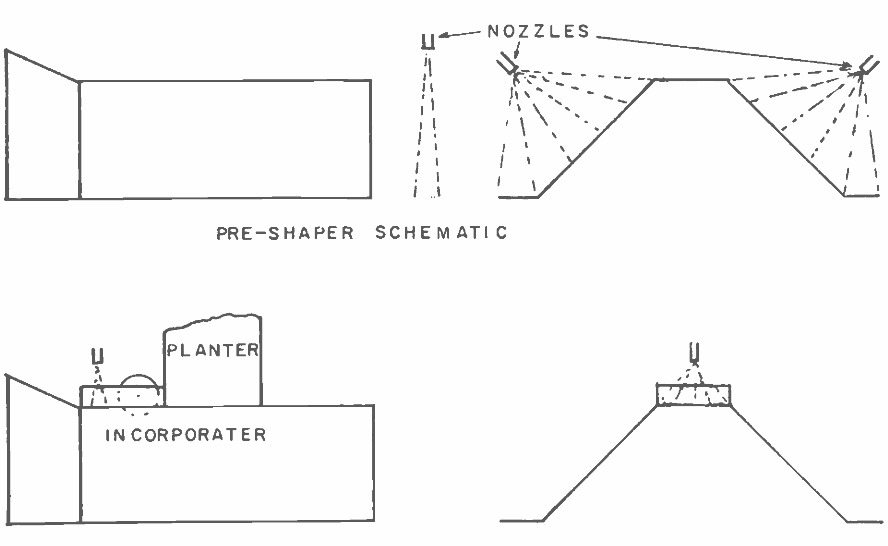

Figure 1. Herbicide placement with the Pre-Shaper in the schematic above; and with the Shaper-Planter-Incorporater below.

needed a "datum plane" from which to work in order to incorporate the chemicals to a precise depth. Thus was born the idea to steal a march from the vegetable growers. We reasoned that cotton would require a different type or shape bed than vegetables, since the cotton producer plants only one row every forty inches, whereas the vegetable grower may plant from two to six rows on top of the trapezoidal bed, depending on the crop.

A number of listed beds were measured to determine the volume of soil in the cross section. An experimental shaper was then built using a top that tapered from 8″ at the front to 6″ at the rear. Hinged side plates were then used, for we did not know exactly what angle would

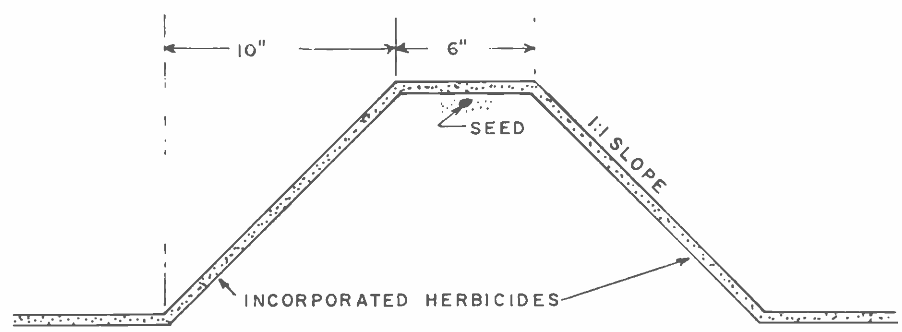

Figure 2. Cross section of bed.

serve for the side slope. We tried this machine in the field and chose a side slope of 1:1, so the final shape of the trapezoidal bed had a 6″ flat top and a nominal height of 10″ from top to furrow bottom. For 40″ spacing this left a furrow bottom width of 14″, sufficient for most of our tractor tires to run in without breaking down the side slopes.

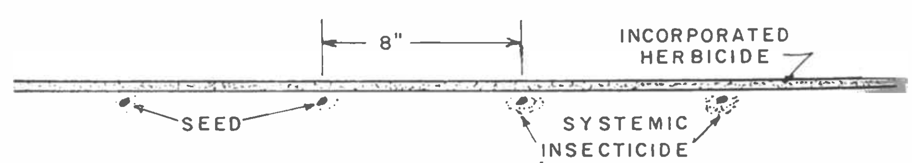

Figure 3. Profile along the row.

Once we had decided on the bed shape it then remained to see what would happen if we applied the phytotoxic herbicides, incorporated them and planted through them. The incorporator was constructed and powered by a hydraulic motor. It was mounted on the front of the shaper. Just behind the incorporator we cut a slot in the top of the shaper and mounted a hill drop planter with a modified opener. The bottom of the opener was set one inch deep, and the incorporator was set to stir the soil to a depth of ¾-inch.

First tests were encouraging. The herbicide controlled the weeds in the 6″ band, and the cotton was unharmed, but the herbicide for controlling weeds on the slopes and in the furrow had to be applied separately. Necessity being the mother of invention, we came up

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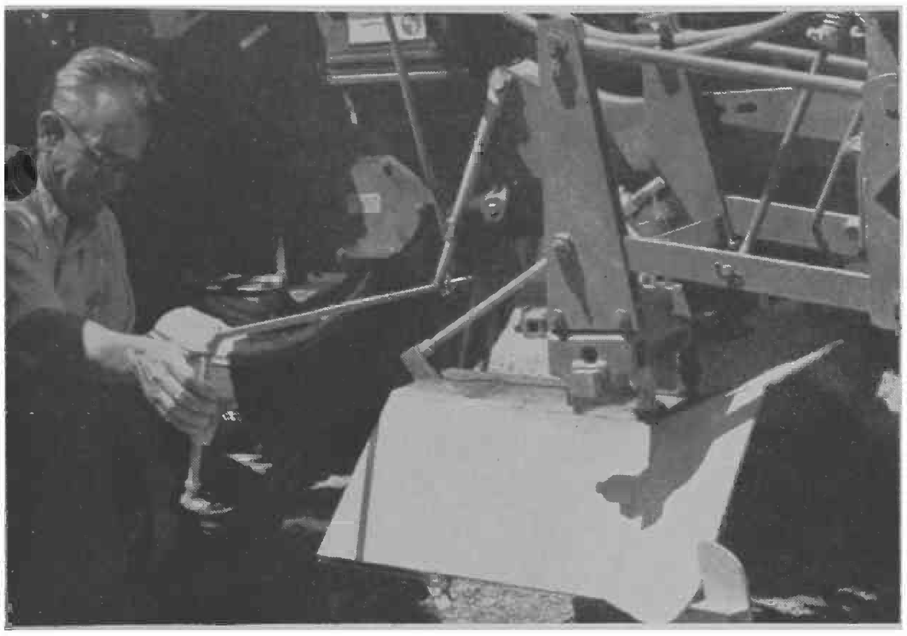

Figure 4. The preshaper forms the bed while the spray nozzles apply herbicides to the sloping sides and bottom of furrow.

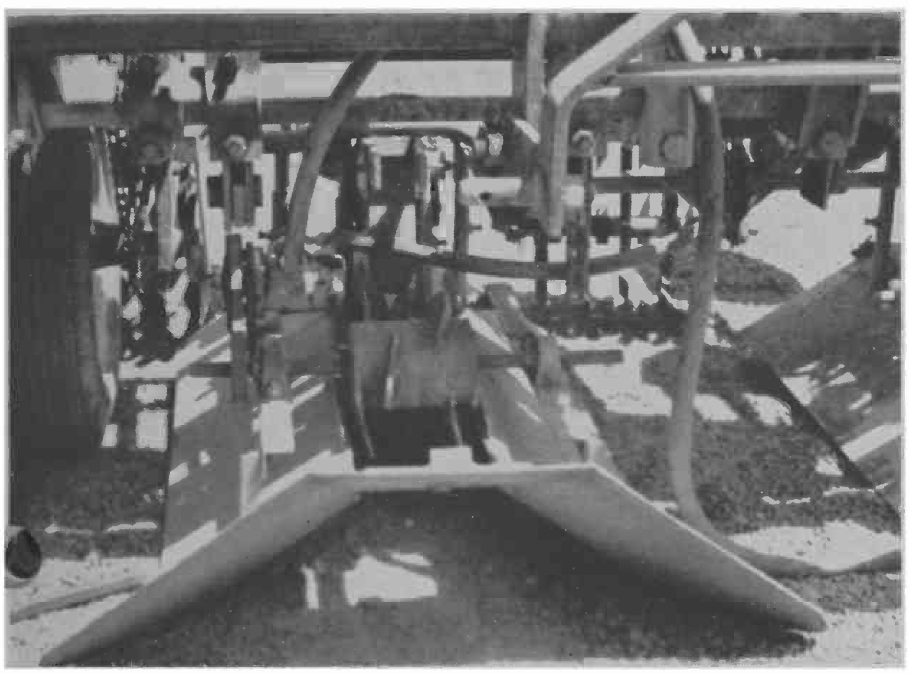

Figure 5. This is head-on view of final shaper with incorporater exposed. The top of the shaper is eight inches wide at the front and tapering to six inches wide at the rear. This theoretically has a firming action on the beds. It has been found that the beds do not slough off after irrigation, perhaps due to this firming or "squeezing" action.

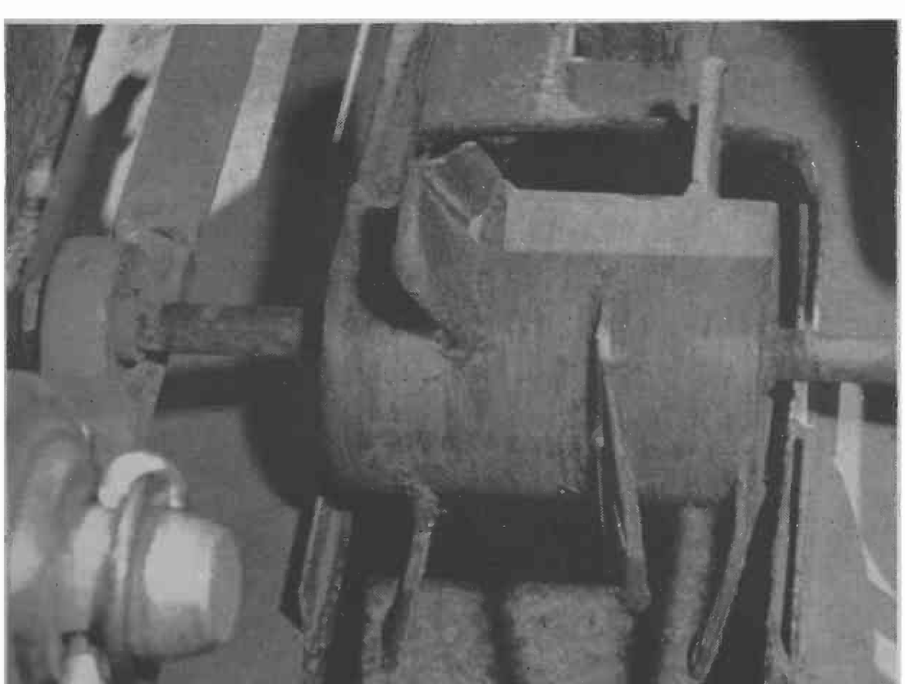

Figure 6. This is a closeup of the incorporater. The effects of striking rocks can be readily seen on the teeth.

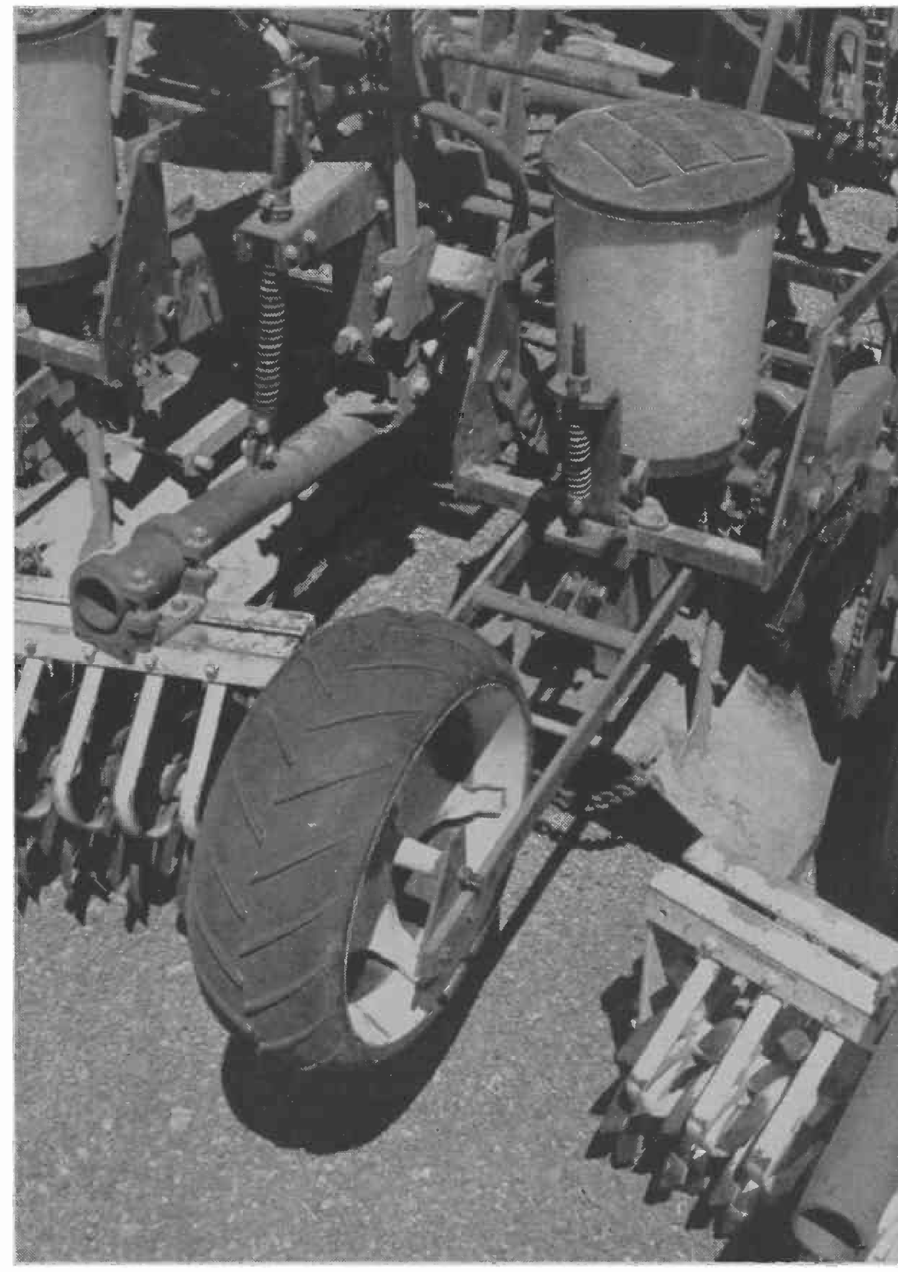

Figure 7. This is a rear view of the machine showing the planters and rolling cultivator sections for incorporating herbicides into the furrow bottoms. The applicator for dry systemics, not seen in the picture, is mounted just above and in front of the planter hoppers.

with the idea of spraying the sides of the beds and the furrows ahead of the shaper, but with all the stirring and mixing done by the shaper, we were not sure where the herbicide would end up. Then we considered using a preshaper mounted on a cultivator gang in front of the drive wheels on the tractor. This would give us a smooth surface approximately the same shape as the finished bed, and the second shaper might give us enough incorporation along the slopes to make the chemical work. This left only the furrows, so rolling cultivator sections were mounted behind the final shaper to mix the herbicide into the soil in the furrow.

Earlier, in tests with the hill drop planter, the idea was conceived of dropping systemic insecticides in the hills in order to cut the amount, and thus the cost, of application. This idea was tested, and we found that the rate of application could be cut to ¼-normal if the systemic was fed into the hill drop mechanism and deposited around the seed, leaving the space in between untreated. This idea was integrated into the system, so the machine is now capable of shaping, incorporating, planting and applying systemics, all in a once-over operation.

The machine in its entirety was first tested in 1966,

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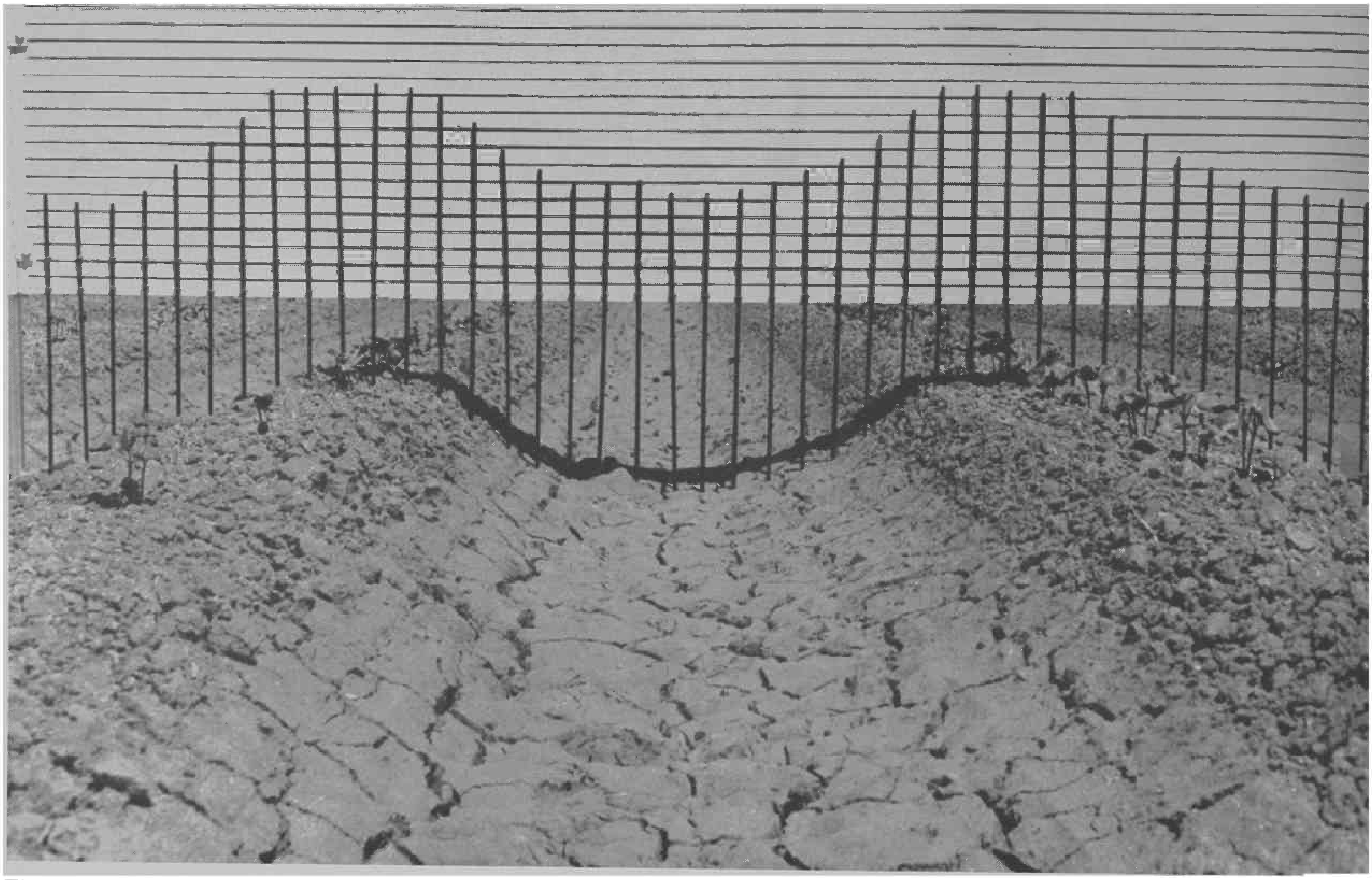

Figure 8. This picture shows the row profile after irrigation. Vertical marks are two inches apart while horizontal lines are one inch apart. The photo was taken near the lower end of the field. Note that the furrow which was nearly ten inches deep when formed is now only seven inches deep. This is partly due to the settling of the entire bed as well as to silt deposition.

and the tests were repeated in 1967. Results are shown in Tables I and II.

Have we solved all the problems? Not quite. There are three basic problems with the system. First, the field must be nearly dead level, at least level enough for subbing up without flooding the tops of the beds. Flooding causes an impenetrable crust. Second, the incorporator

Table 1. Treatments and Yields for 1966 Crop Year. Pounds of Seed Cotton per Acre

Treatment	*Average Yield*
Control	**3,746**
Trifluralin (Treflan) ¾ lb/A	**3,735**
Bensulide (Prefar) 2 lb/A	**4,270**
Planavin ¾ lb/A	**3,813**
DCPA (Dacthal) 9 lb/A	**4,025**
Diuron (Karmex) 1 lb/A	**4,136**
Prometryne (Caparol) 2 lb/A	**3,924**
Diuron 1 lb/A ± Trifluralin ¾ lb/A	**4,025**
Diuron 1 lb/A ± Bensulide 2 lb/A	**3,980**

is not compatible with stony ground. Third, weed control on the sloping sides of the beds is not as good as we had hoped. After the soil drys, cracks appear along the slopes, and weeds, particularly ground cherries, will germinate below the treated layer and emerge through the

Table II. Treatments and Yields for 1967 Crop Year. Pounds of Seed Cotton per Acre

Treatment	*Average Yield*
Control	**3,284**
Trifluralin (Treflan) ¾ lb/A ± Diuron (Karmex) 1 lb/A	**3,396**
DCPA (Dacthal) 9 lb/A ± Diuron 1 lb/A	**3,217**
Bensulide (Prefar) 2 lb/A ± Diuron 1 lb/A	**3,195**
Planavin ¾ lb/A ± Diuron 1 lb/A	**3,217**
Trifluralin ¾ lb/A ± Prometryne (Caparol) 2 lb/A	**3,262**
Bensulide 2 lb/A ± Prometryne 2 lb/A	**3,389**

cracks. Hopefully, this problem can be solved.

Interested producers often ask if this machine is available on the market. The answer would have to be qualified. While the exact machine is not available, at least one farm machinery manufacturer is now making a bedshaper with P.T.O.-driven incorporator. With a little imagination and some welding equipment this machine could be made to do everything ours does — and probably better.