Improvements in Cultural Operations Through Mechanization

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The urge to save time and labor in cultural operations relating to the growing of the sugar beet crop is a driving force which has induced many practical farmers as well as designers of machinery to investigate new concepts in machine operation.

In retrospect it would appear that two courses lay open to the investigators; one was the combining of cultural operations into a single complex machine which would simultaneously perform a number of tasks and the second was the facilitating of sequential operations by removing limitations of travel, speed and steering precision.

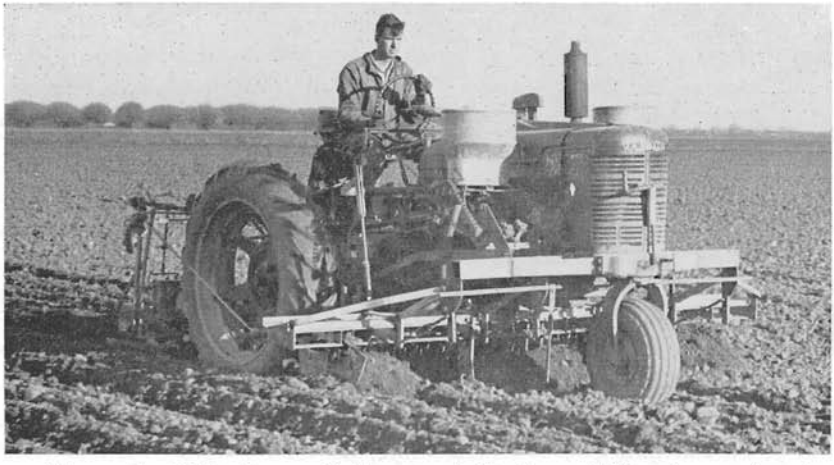

Figure 1.—1947—Jaeger & Stevens of Madison, California, equipped a tractor for listing, bed shaping, and planting in one operation.

During the late 1940's and early 50's, a considerable number of combine machines appeared in California, principally in the Woodland area. About a dozen such machines were built by individual growers and custom manufacturers (See Figures 1, 2, 3, and 4). These "planting combines" were machines mounted on sleds which in one pass over the field performed any or all of the following operations:

1. Listing
2. Bed Shaping
3. Fertilizer placement
4. Seedbed preparation
5. Planting
6. Rolling

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In practice, the saving of time and labor effected by these machines was very considerable. Furthermore, there were some very real advantages in the quality of work which was achieved. For example, the long sled runners made necessary by the multiplicity of functional components achieved a straightness of rows superior to that possible with conventional methods of seedbed preparation and planting. Further, the accuracy of row placement on the bed together with the level character of the beds made subsequent operations of mechanical thinning, cultivation and irrigation very much more satisfactory than was possible with conventional methods.

Figure 2.—1948—K. B. Fiske of Woodland, California, combined a Seaman Tiller, John Deere fertilizer applicator, listing shovels, bed roller, and Milton panters.

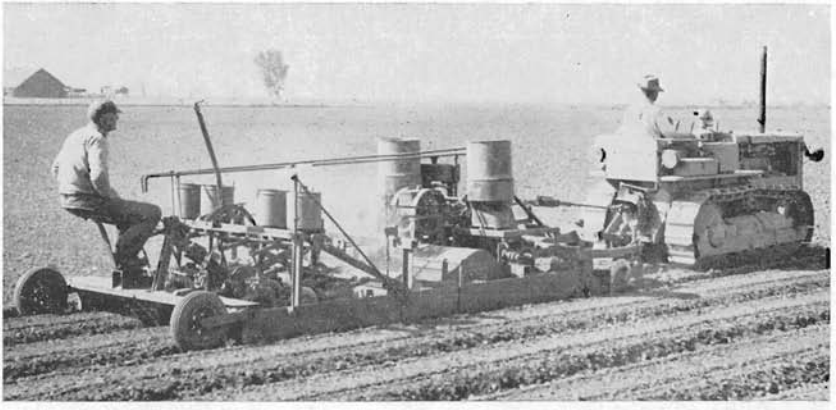

Figure 3.—1949—Tadock & Orrick of Woodland, California, built this 4-row sled which carried lister shovels, John Deere fertilizer applicators, Rototillers, rollers, and John Deere panters. Power supplied from tractor P.T.O.; hydraulic lift raised sled onto rubber tired ground wheels at rear.

There was, however, one overpowering fault. This was the need for doing as many as six operations simultaneously, whereas the demands made by soil conditions, weather conditions and other circumstances would have led to superior cultural practice if certain time intervals were to elapse between operations.

This inherent fault of the planting combine was recognized by certain individuals, probably not consciously, but was nevertheless a factor in the evolution of a sequential system of semi-

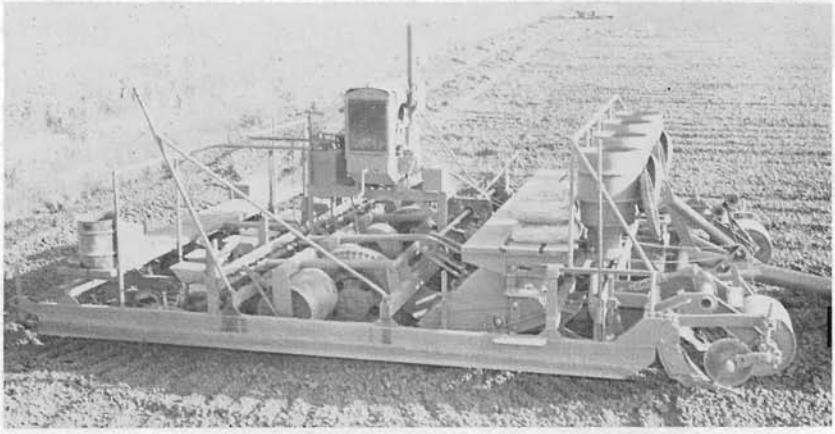

Figure 4.—1954—Heidrick Brothers of Woodland, California, built this 8-row sled which carried lister shovels, IHC fertilizer applicators, rotary tillers, rollers, and Milton planters. Power was supplied by 40 H.P. auxiliary engine; hydraulic lift raised sled for transport on rubber-tired, centrally located ground wheels which minimized turning radius.

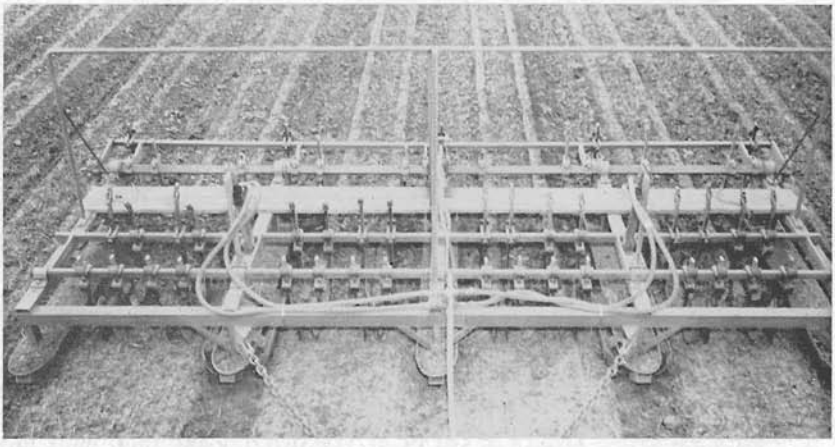

Figure 5.—1956—Arnold Collier built this "Cultivating sled" in which the furrow-following characteristics was acomplished with boat-shaped runners.

automation in cultural operations. As is so frequent with so-called "inventions" the idea occurred to several people without each other's knowledge, and at least two systems were independently developed—one by K. C. Welding, Inc. at El Centro; the other by Mr. Arnold Collier, a sugar beet grower at Dixon, California (See Figures 5 and 6).

As with the planting combine, the basic mechanization of the sequential system was a substantial sled. This sled was provided with hydraulically lifted tool bars to which could be attached the necessary tools for bed shaping, fertilizer placement, seed bed preparation, planting and rolling, and with the additional potential of accommodating tools for mechanical thinning and cultivation (See Figure 7).

By performing all of these operations in sequence with an optional time interval elapsing between operations, it became possible to perform each operation at a time best indicated by cultural environmental factors such as weather and soil conditions. The automation factor (which is not particularly self evident) lay in the fact that a sled, when drawn across a field in furrows which itself has formed, will retrace with startling accuracy its original path (See Figure 8). This accuracy of retracing is not effected by intervening irrigations or rainfall, nor by weed and crop growth on the beds or in the furrows. Further, the retracing characteristic does not require accurate tractor steering. And this in turn makes possible a substantial increase in tractor speeds.

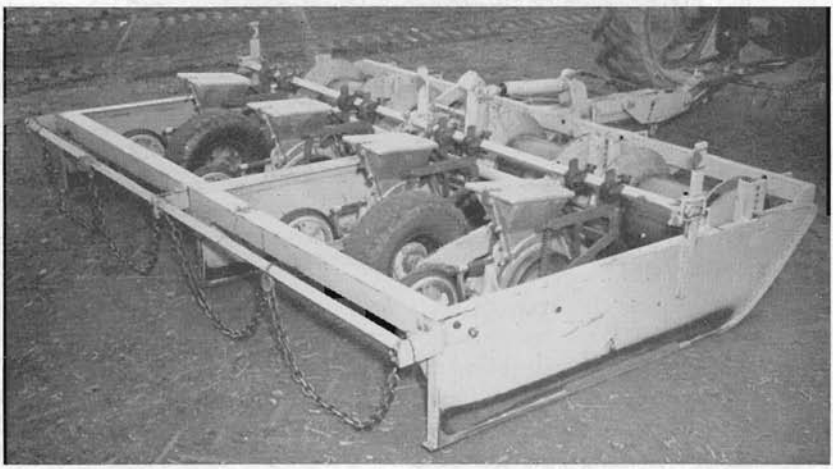

Figure 6.—1956—K. C. Welding, Inc. of El Centro, California, built this furrow-following sled with hydraulic lift raising sled onto rubber-tired ground wheels. Spool-like rollers assisted sled runners to follow corrugations; tool bar accommodated in succession Milton planters, cultivating tools, and Silver thinner cutters.

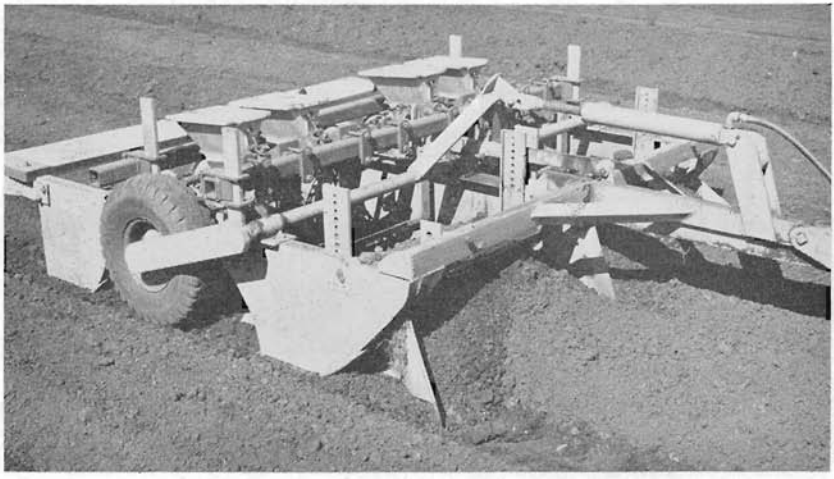

Figure 7.—1957—A later version of the K. C. sled omitted the "spools" and relied on the sled-runners alone to follow the furrow-centers.

Figure 8.—1957—The second and subsequent cultivations by the Collier sled required no accurate tractor steering; the sled runners followed the original furrows and gave accurate lateral positioning of cultivator tools.

In summary, the sequential system permits marked increases in both speed of operation and accuracy of tool placement with respect to the crop row. Here then is a new system which, rather than achieving speed at the expense of precision, achieves speed together with increased precision. The magnitude of speed increase is surprisingly large—a doubling of down-the-row speed being claimed by most users of the equipment, for all operations (planting excepted because of the limitations of planter performance as a function of speed).