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Interseeding Plans for SDSU's New Machine . . . For Better Pasture Production

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Interseeding and plans for SDSU's new machine ...for better pasture production

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Interseeding and plans for

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The majority of South Dakota's land area is in native range (53%) and tame pastures and haylands (5%). Any improvement of these resources would have a large impact on the state's economy.

Interseeding is one way these areas can often be improved. This is a technique where a grass or legume, usually alfalfa, is planted with minimal disturbance of existing vegetation.

In South Dakota interseeding is usually done with machines that open up furrows 5-8 inches wide and 2-4 inches deep. Furrow spacing can vary from 24-48 inches. Seeds are placed in a seedbed prepared in the furrow.

The furrows serve several purposes. They eliminate competition from the existing vegetation long enough to allow seedlings to become established. They also conserve moisture by holding water, especially if interseeding is done on the contour. In addition, the furrow protects young seedlings from being grazed to ground level.

Interseeders that provide such furrows have been developed at South Dakota State University (SDSU). Successful seedings have been accomplished using these machines throughout the state. However, these early interseeders were quite complex, component parts were difficult to obtain, excessive breakdown time was encountered (especially in rocky areas), and they were never produced commercially.

A new interseeder was developed at SDSU in the summer of 1979. This new interseeder is simpler, and is built mainly with readily available, commercial components. The new machine has been successfully tested on more than 500 acres of native range, including rocky sites.

Value of interseeding

Legumes, through their ability to fix atmospheric nitrogen, conserve a significant amount of energy in the form of nitrogen fertilizers. They also increase forage yields. Estimates of the amount of nitrogen fixed annually per acre by type of legume range from 194 lb for alfalfa to 40 lb for beans.[1] During a 3-year irrigation study, W.A. Hubbard and H.H. Nicholson found that forage yield of a pasture of reed canarygrass-ladino clover was not significantly different from that of a pasture of reed canarygrass receiving 268 lb nitrogen per acre per year.[2] Under dryland conditions in Nebraska, alfalfa-bromegrass pastures produced more pounds of animal gain per acre than did smooth bromegrass fertilized with 60 lb nitrogen per acre per year.[3]

Native, interseeded, and tame pasture management systems were compared at Norbeck, South Dakota, during the 1977, 1978, and 1979 grazing seasons. Pounds of animal gain per acre and average daily gain were determined for yearling steers which were receiving three levels of corn supplementation. Animal unit months per acre (the number of cow-calf pairs supported for one month on one acre) were also determined.

Results showed that if a native range is interseeded with 2 lb of alfalfa per acre, pounds of cattle gain can be increased by 60% per acre. Animal unit months

[1] D. Smith. 1975. *Forage management in the north.* 3rd ed. Kendall/Hunt. Dubuque, Iowa.

[2] W.A. Hubbard and H.H. Nicholson. 1968. Reed canarygrass versus grass-legume mixtures under irrigation as pasture for sheep. *Journal of Range Management* 21: 171-174.

[3] W.R. Kehr, E.C. Conrad, M.A. Alexander, and F.G. Owen. 1963. Performance of alfalfa under five management systems. *Nebraska Agricultural Experiment Station Research Bulletin* 211.

SDSU's new machine

...for better pasture production

(AUM) per acre can be increased as well, by 50% (see Table 1).

Table 1. Average pasture production of yearling steers grazing on three forage management systems during the 1977, 1978, and 1979 grazing seasons at Norbeck, South Dakota.[1]

Management system[2]	Pounds Gain/acre	ADG[3]	AUM[4]/acre	Days of grazing season
Native	53	1.47	.85	156
Interseeded	85	1.54	1.28	156
Tame	83	1.49	1.32	178

[1] Data in this table is calculated at a 5% level of significant difference. Thus, a difference of 21 lb of gain per acre between treatments is significant, and a difference of .20 AUMs per acre between treatments is also significant.
[2] Data shown is for average gain across the three levels of corn supplement fed.
[3] Average Daily Gain
[4] Animal Unit Months

Table 2 shows gain and AUMs per acre for each pasture system and corn supplement level. Animals were supplemented daily at 0%, 0.5%, and 1% of body weight. At a 0% level, interseeding increased animal gains 70% per acre and AUM 57% per acre over native range. Interseeding equaled tame pasture gains and AUM per acre at this level. Interseeding with 0% corn supplementation also produced slightly more beef per acre than native range with a 1% level of supplementation. However, this difference is not significant.

Table 2. Pasture production of three grazing systems and grain levels during the 1977, 1978, and 1979 seasons at Norbeck, South Dakota.

Level of corn supplementation	Management system: Native range Gain[1]/acre	Native range AUM[2]/acre	Interseeded pasture Gain[1]/acre	Interseeded pasture AUM[2]/acre	Tame pasture Gain[1]/acre	Tame pasture AUM[2]/acre
0	39	.74	67	1.12	66	1.24
0.5	56	.88	88	1.27	82	1.28
1.0	63	.92	100	1.43	100	1.45

[1]Gain in pounds
[2]Animal Unit Months

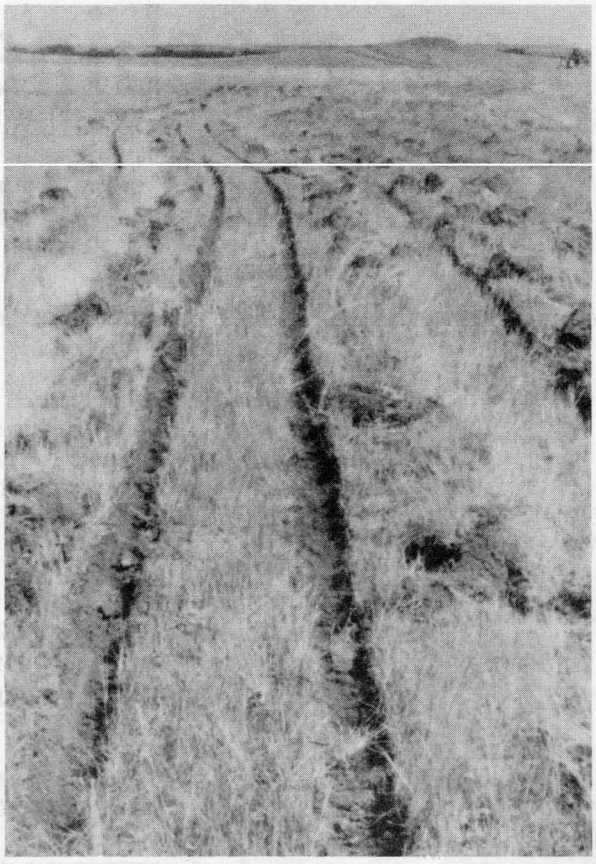
The degree of success interseeding has in increasing forage yields depends on yearly climatic conditions (Table 3). At the beginning of the 1978 and 1979 grazing seasons, interseeding native range increased forage yields 93% and 50%, respectively. The percentage of alfalfa by dry weight in these increased yields was 36% and 65%, respectively. Climatic conditions in the spring of 1979 were dry; less grass was produced. However, production of alfalfa remained constant in 1978 and 1979. Thus, percentage of alfalfa in the forage was higher in 1979 than 1978.

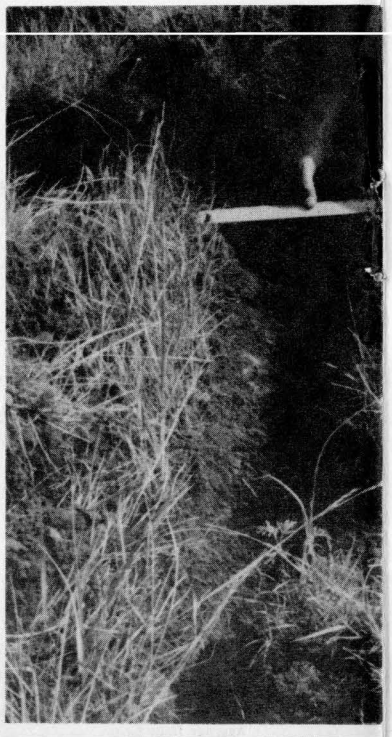
Table 3. Forage yields of three pasture management systems at Norbeck, South Dakota at the beginning of the 1978 and 1979 grazing seasons.

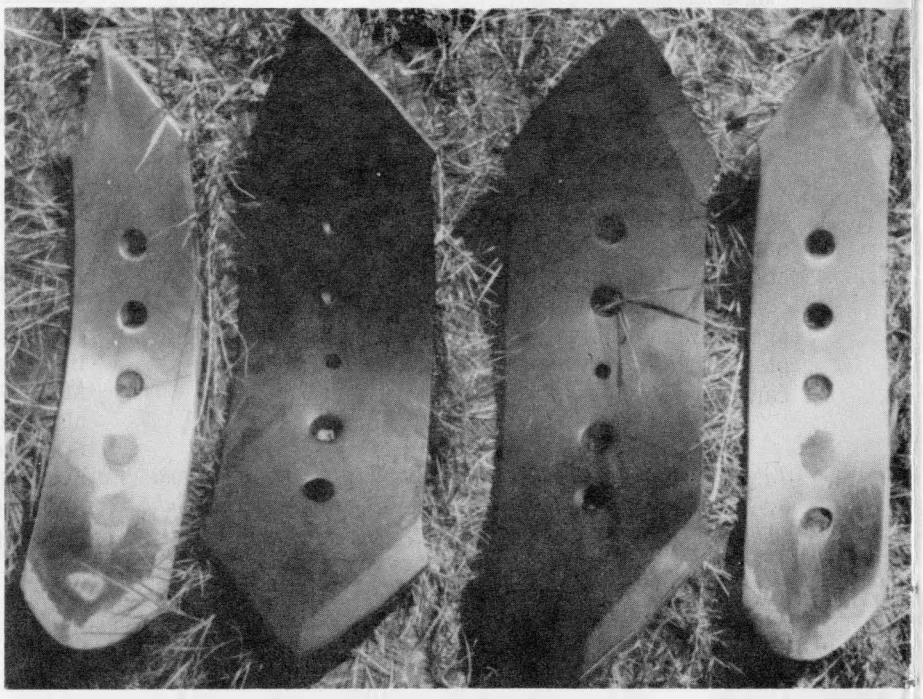
Pasture system	Pounds of forage/acre 1978	Pounds of forage/acre 1979	Percentage of alfalfa[1] 1978	Percentage of alfalfa[1] 1979
Native range	1,448	1,291	—	—
Interseeded	2,794	1,942	36.5	65.6
Tame	3,775	2,300	32.4	32.7

[1] Percentage of alfalfa is figured by dry weight.

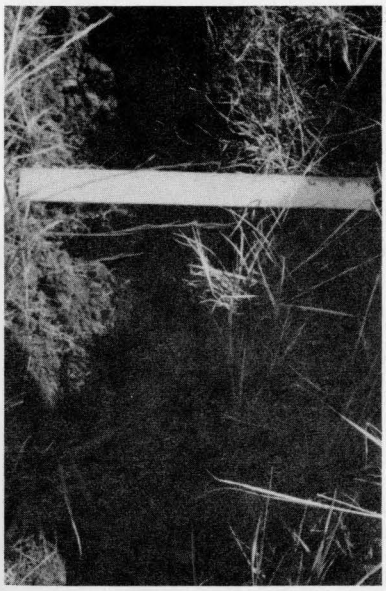
Interseeding has been successful in South Dakota in a wide range of environments. Counties in which successful interseedings have been established include Beadle, Codington, Dewey, Faulk, Hutchinson, Lincoln, Meade, and Pennington. Interseeding failures have also occurred in these areas. Lack of moisture, seedling diseases, root diseases, and nematodes are factors associated with failures. Research is being conducted on the importance of diseases and nematodes in stand establishment.







Pasture interseeding is a tested method for improving native range and tame pastures and haylands. Photos are explained clockwise from bottom right. South Dakota State University (SDSU) has developed this improved pasture interseeder shown at bottom right. Chisel plow shovels, shown bottom left, can be 4 or 6 inches wide. The wider shovel is used in dry areas or in heavy sod. SDSU's pasture interseeder is shown in use at top left. Next is a photo of the furrows made with the 6-inch shovel. In a closer view, these furrows are 8-9 inches wide and 3-5 inches deep. A 12-inch ruler is being held across the furrow. The furrow made by a 4-inch shovel is shown in the next photo. It is 5-6½ inches wide and 3-5 inches deep. Again, a 12-inch ruler is held across the furrow for comparison. An established interseeded native range is shown at top right.




SDSU INTERSEEDER
INTERSEEDER

Instructions for building SDSU's interseeder

The improved pasture interseeder developed by South Dakota State University is built from standard, readily available components, special components available from a limited number of suppliers, and custom-made components. The latter include the main frame, the seed pipes behind the chisel plow shanks, the brackets and plates for mounting the seed boxes, and the parking stands.

Following are lists of these materials needed to build the pasture interseeder.

Standard and special components

Quantity	Description and use
2	4- or 6-inch wide right-hand twisted chisel plow shovel[1]
2	tip for hydraulic hose for connecting to your tractor
4	Gandy 09-M902-PRR-C1 jumbo applicator with 2 straight spouts
1	Gandy 09-077748 hydraulic motor drive for tool bar
4	Gandy 09-074321 connector drive tube for outer rows
2	Category II or III lower hitch point bracket assembly
2	Gauge wheel assembly with crank depth adjustment (chisel plow type) to bolt to 4- by 4-inch frame with 14-or 15-inch wheel and tire
1	3/8-inch diameter cross chain for tractor tire
8	4-inch diameter drag chain link

Quantity	Description and use
2	5-by ½-inch bolt for parking stand
16	6½-by ½-inch bolt to attach seed box bracket to tool bar
8	6-by 7/8-inch bolt to attach bottom hitch bracket to main frame
16	1-by 5/16-inch bolt to attach mounting bracket to seed box
8	2½-by ½-inch plow bolt to attach shovel to shank
2	6-ft length of ½-inch hydraulic hose
1	40-ft length of ¾-inch automotive rubber heater hose
16	1-inch stainless steel radiator hose clamp
4	Chisel plow shank with spring cushion (with ½-inch holes for plow bolts)
2	4- or 6-inch wide left-hand twisted chisel plow shovel[1]

[1] The only known supplier is: Engineering Department, Empire Plow Company, 3140 East 65th Street, Cleveland, Ohio 44127, telephone 216-641-2290.

References to products or supplier in this publication are not intended to be endorsements. Other similar products may be suitable; another supplier may be available.

Steel needed for custom-made components

Part[1]	Quantity	Materials
Ⓐ	2	20 inches of ¾-inch rod
Ⓑ	1	4- by 4- by ¼-inch tubing with one end cut at a 22° angle (one side should be 17 5/8 inches; the other, 19¼ inches)
Ⓒ	2	41 inches of 5- by 3-inch by 11 gauge tubing
Ⓓ	2	12 inches of 3- by ½-inch flat
Ⓔ	1	4- by 4 by- ¼-inch tubing with one end cut at a 22½° angle (at the opposite end 4- by 7-inches should be cut from the short side; 3½- by 3½-inches should be cut from the long side)
Ⓕ	2	128 inches of 4- by 4- by ¼-inch tubing
Ⓖ	1	126 inches of 5- by 3-inch by 11 gauge tubing
Ⓗ	1	35 ¾-inches of 4- by 4- by ¼-inch tubing
Ⓙ	2	8 inches of 3-inch diameter standard pipe
Ⓚ	2	22 inches of 4- by 4- by ¼-inch tubing
Ⓛ	3	14 inches of 4- by 4- by ¼-inch tubing
Ⓜ	2	8 inches of 6- by ¼-inch flat
Ⓝ	2	33¾ inches of 2½-inch diameter standard pipe
Ⓞ	4	16 inches of 2- by 1-by 3/16-inch channel
Ⓟ	4	12 inches of 2-inch diameter standard pipe
Ⓠ	4	2- by ½-inch bolt
Ⓡ	4	3½ inches of ¾- by 3/16-inch flat
Ⓢ	8	5½ inches of 2- by ½-inch flat
Ⓣ	8	17 inches of 2- by 2- by ¼-inch angle
Ⓤ	7	4 inches of 4- by ¼-inch flat
Ⓥ	2	5 inches of 3- by 1/8-inch flat
Ⓦ	4	8 inches of 1½- by ¼-inch flat
Ⓧ	8	6½- by 3-inches of 1/8-inch flat

[1] See Figures 2-9 for diagrams of assemblies for components.

The South Dakota State University interseeder is shown in this bulletin with four seed boxes. These can be used to plant free flowing grass, legume, or native shrub seeds. The seed boxes can also be utilized to put fertilizer, fungicides, or nematicides in the furrow along with the seeds. The interseeder may be built with five seed boxes to simultaneously put seeds, pesticides, and fertilizer in the furrow. The fifth box should contain four spouts to distribute material to all seed pipes. Research is being done on the value of this fifth box.

Centers of the seed boxes should be 24 and 44 inches on either side of the center of the main frame. Construction of the brackets and plates for mounting the boxes is shown in Figures 2, 3, and 4. Four left-hand and four right-hand brackets are needed.

The hydraulic drive unit should be located to the left of the center of the main frame. However, it should be as close to the center as possible.

Centers of the chisel plow shanks are to be 12 and 60 inches either side of the center of the main frame. Chisel plow shovels should throw soil away from the center of the main frame.

Rubber seed tubes connect the seed boxes to the seed pipes. Eight of these should be cut from the 40-ft length of ¾-inch automotive heater hose. *Sufficient slack must be allowed in the hoses to prevent damage to the bottoms of the seed boxes. Yet care must be taken to maintain at least a 45° slope for all seed tubes so material does not become clogged.* When necessary, a 5/8-inch wide strip of automotive inner tube can be used to tie the hoses up away from the tires.

The seed pipe behind the chisel plow shank should have two small tabs at the top. These are to be used with the radiator hose clamps to attach the seed tubes to the seed pipes. The tabs are to be inserted 1 inch into the seed pipe and welded on. See Figure 8 for diagram of tab. Five links of tractor tire cross chain are to be attached so that they hang from the rear of the seed pipe. The link which is joined to the seed pipe should lie flat. Two large links of regular drag chain should be connected to the bottom link of the tire chain and welded shut. See Figure 9 for diagram of seed pipe.

Centers of the gauge wheels should be 74 inches apart. The frame of the gauge wheel assembly should be toward the outside.

Figure 1 shows the component assembly of the pasture interseeder.

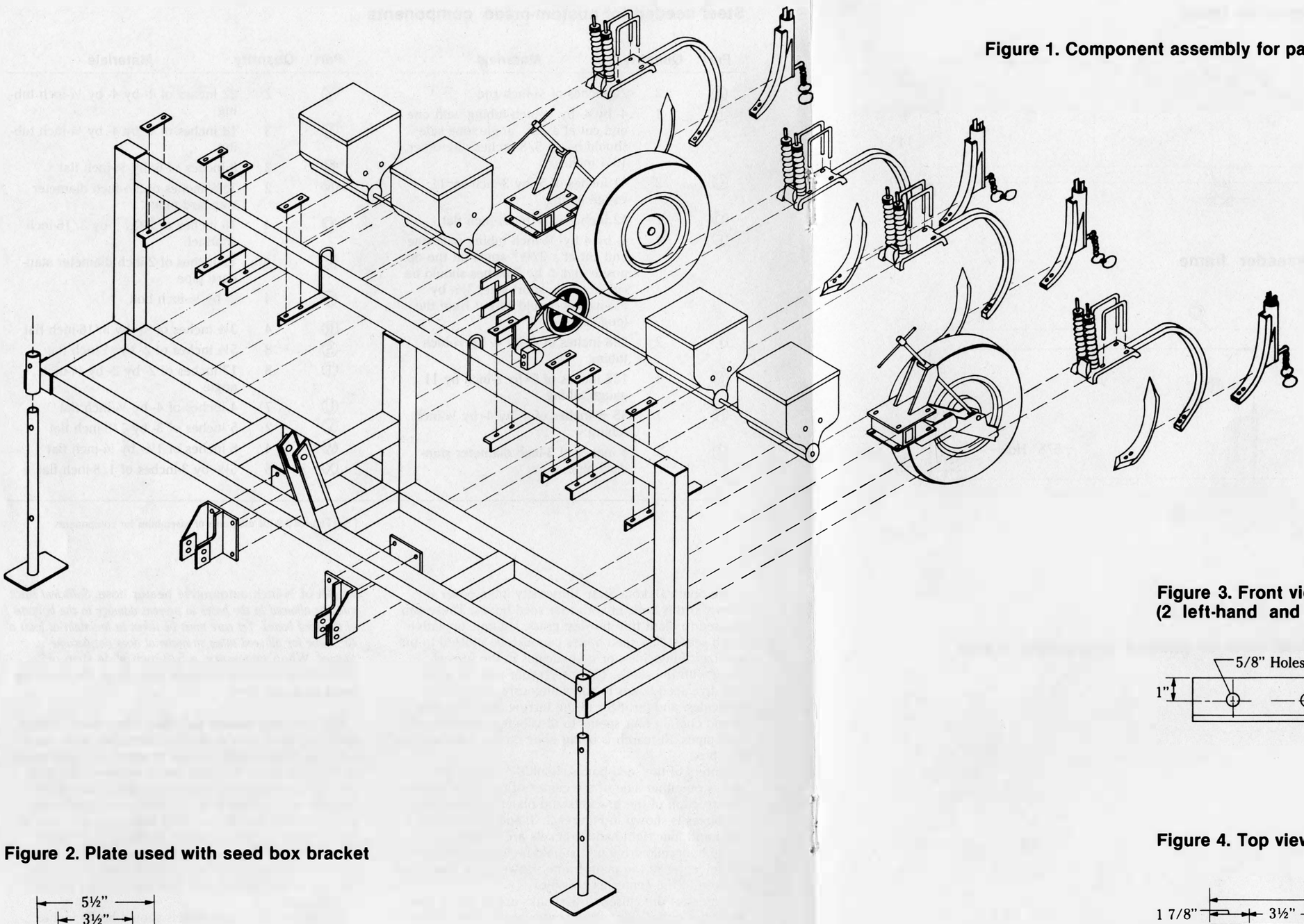


Figure 1. Component assembly for pasture interseeder

Figure 2. Plate used with seed box bracket

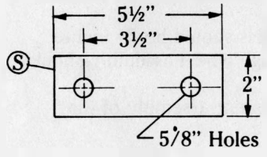


Figure 3. Front view of seed box bracket (2 left-hand and 2 right-hand brackets are needed)

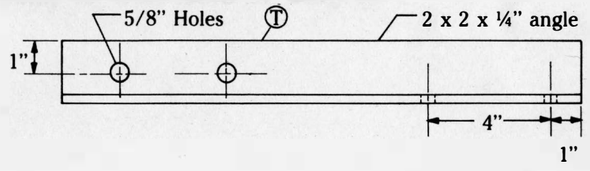


Figure 4. Top view of seed box bracket

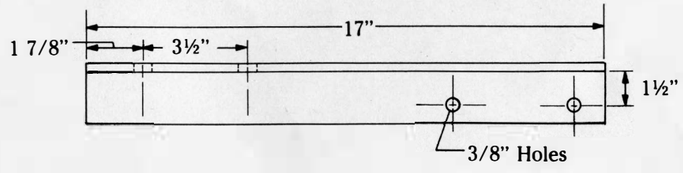


Figure 5. Top view of pasture interseeder frame

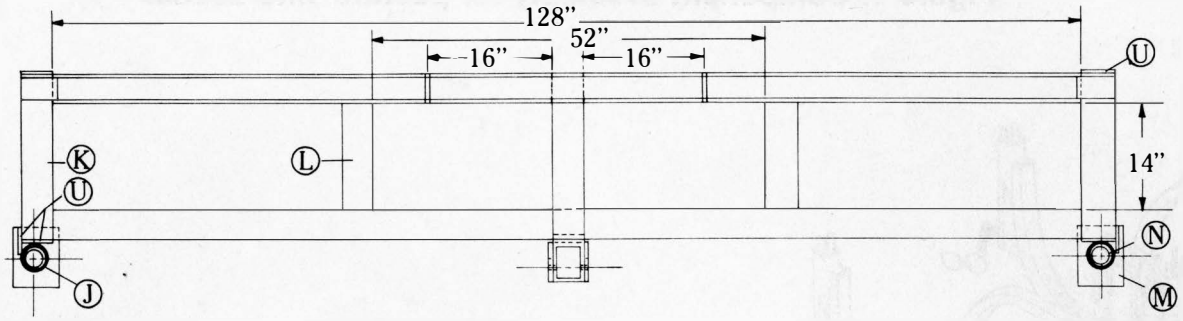


Figure 6. Front view of pasture interseeder frame

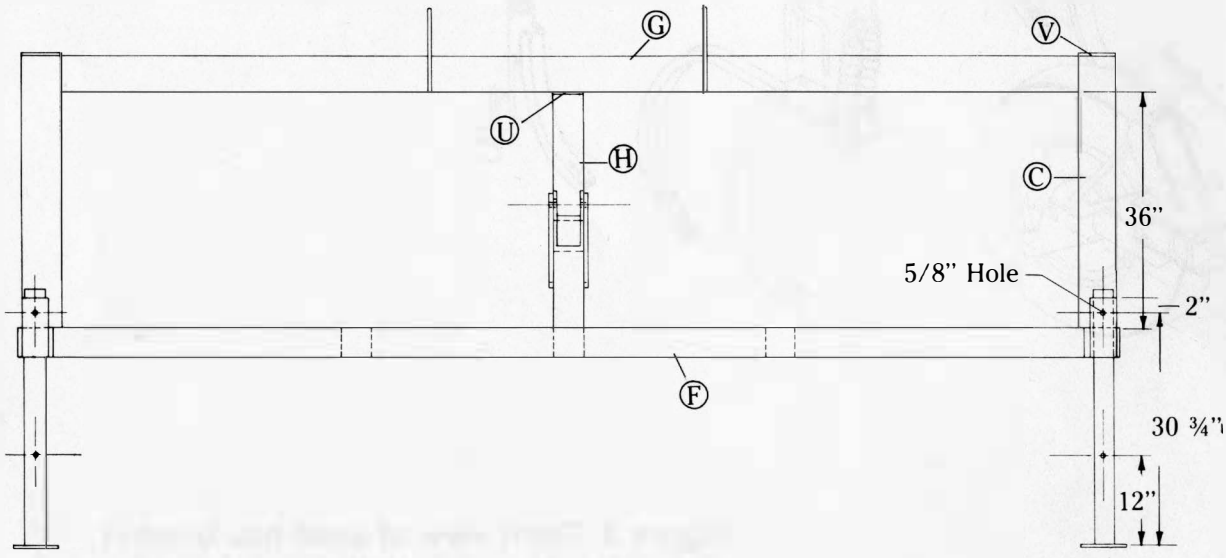


Figure 7. Side view of pasture interseeder frame

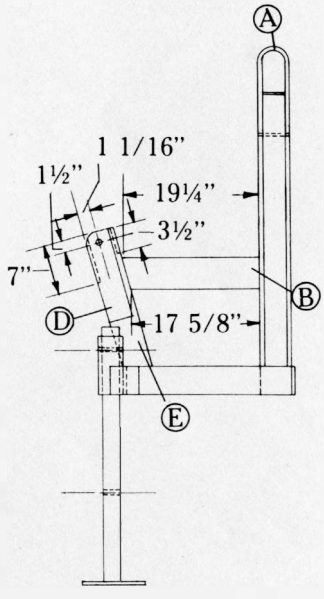


Figure 8. Tab for attaching rubber tube

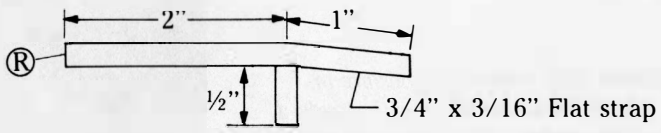
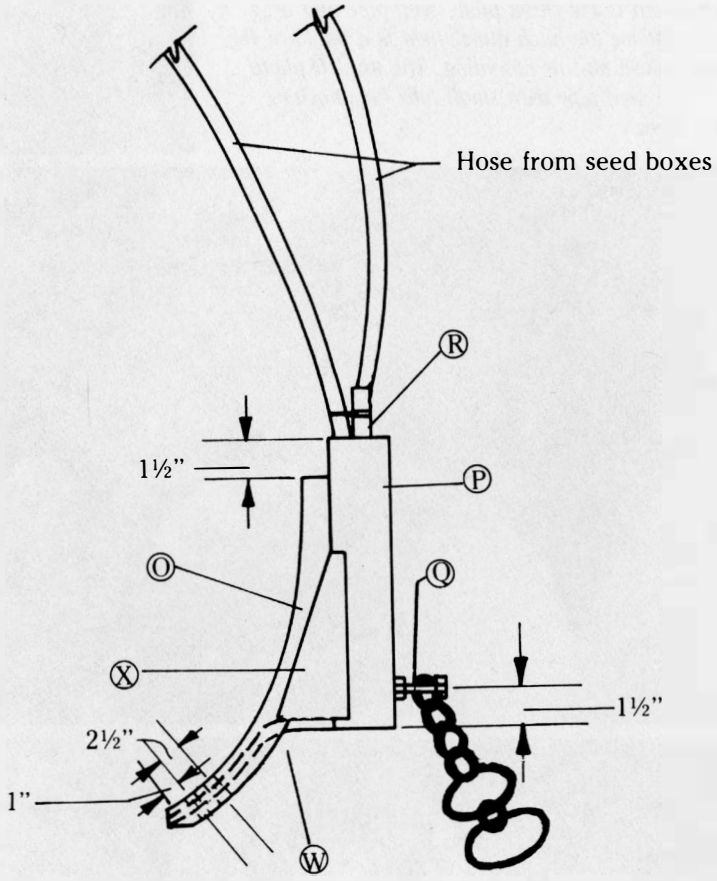


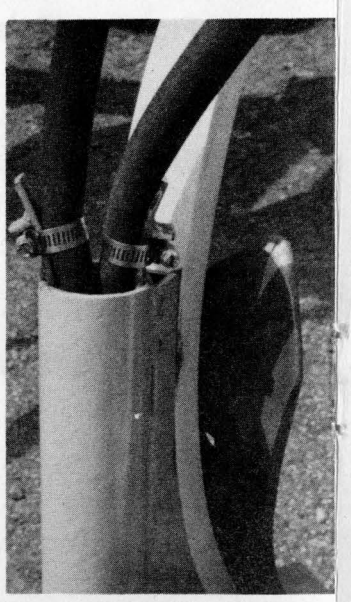
Figure 9. Seed pipe

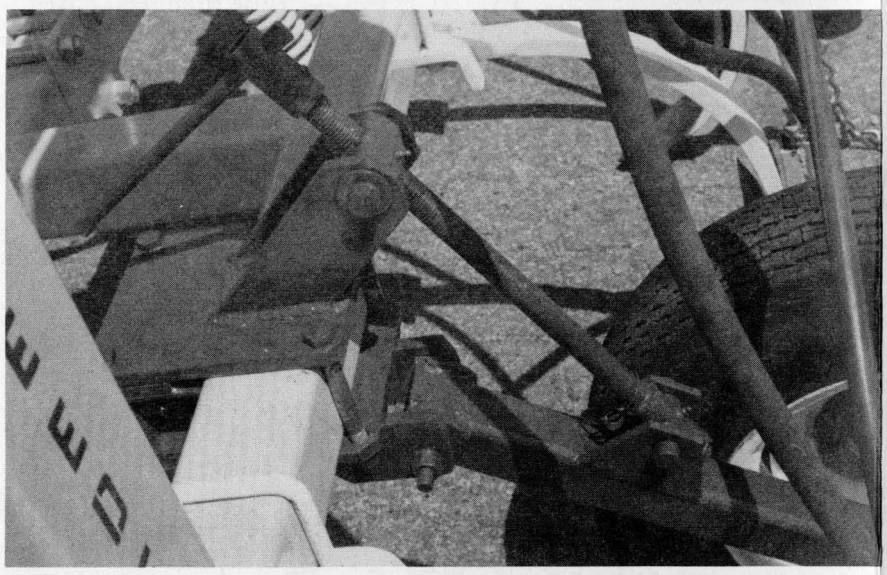


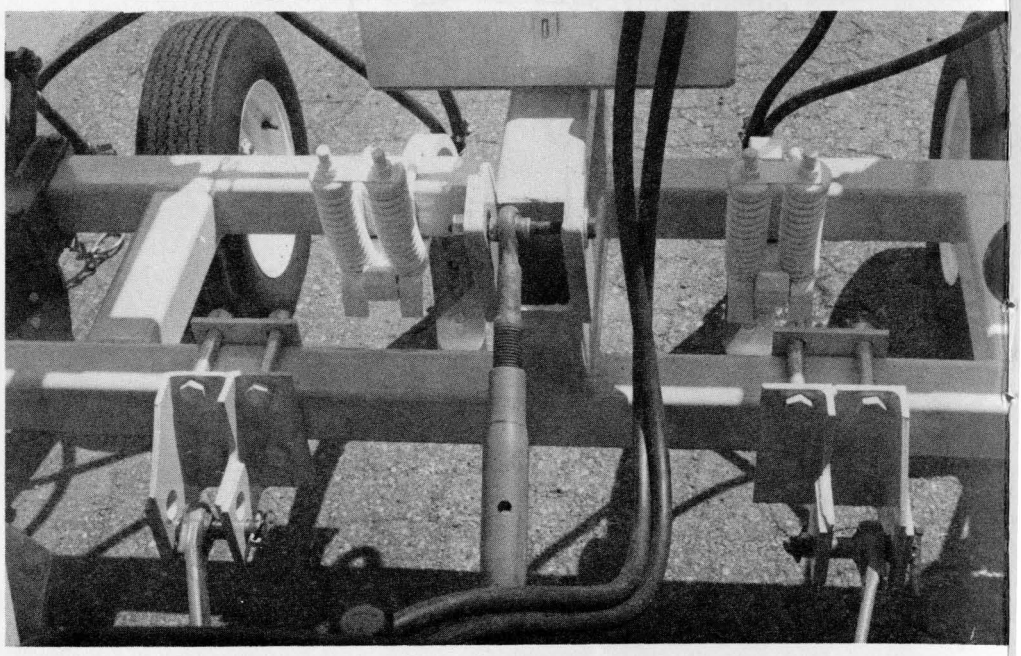
Notes:

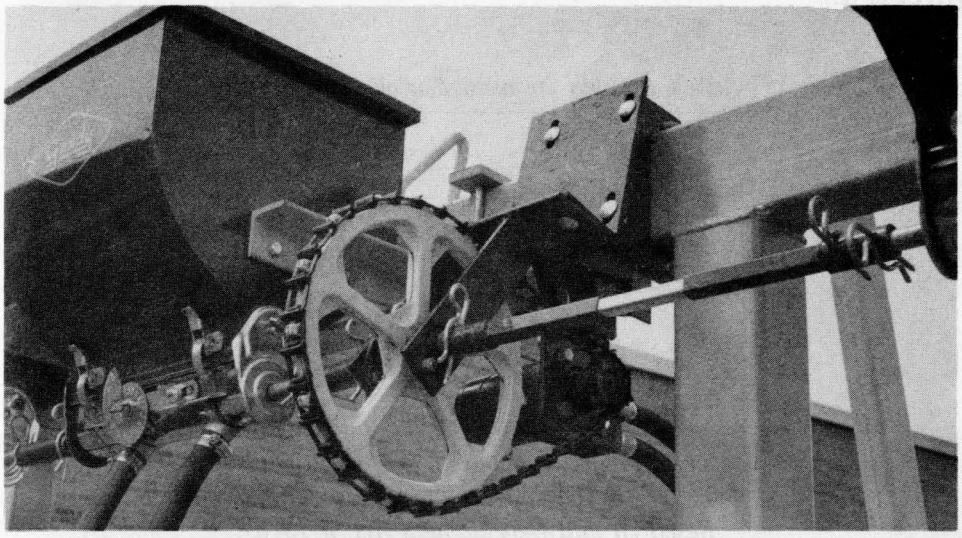
1. Bending arc and drilled holes of part Ⓞ should conform to the arc and holes of the chisel plow shank.
2. Gusset Ⓧ should be trimmed to fit.

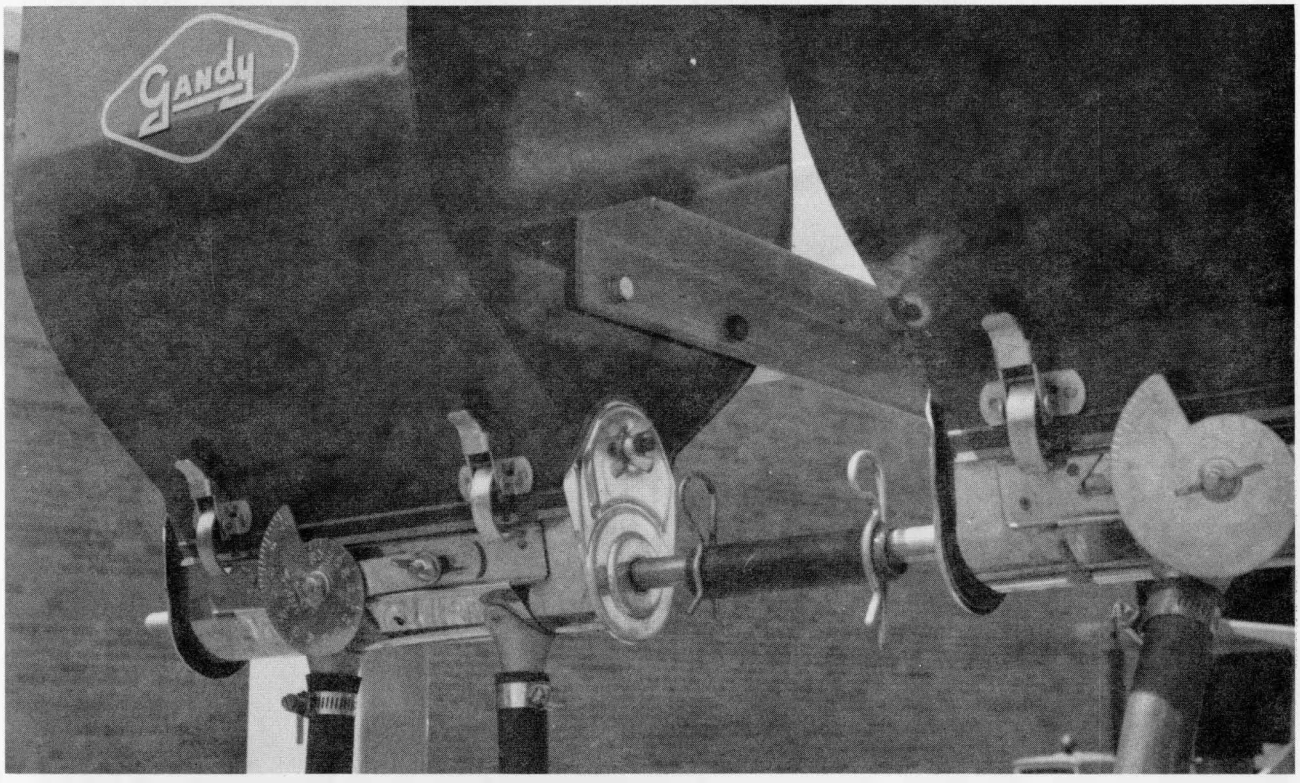
South Dakota State University's pasture interseeder is a custom-made frame with standard and special components. These photos of various parts are identified clockwise from top right. The interseeder's hydraulic drive mechanism is shown top right. The next photo shows the seed box and the connection between seed boxes. Bottom right is the seed box mounting bracket. The three-point hitch attachment is visible in the next photo. At bottom left is the chisel plow, seed pipe, and drag chain. Above the hitch attachment is a photo of the gauge wheel and its mounting. The top left photo is of the seed pipe with small tabs for attaching seed tubes.

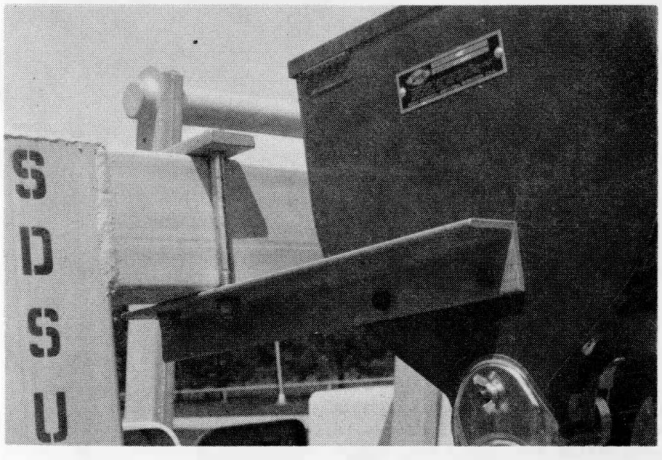









Gandy



Set up procedure for pasture interseeder

1. Decide on a ground speed for the tractor.
2. Choose a gear and determine engine rpm to give desired ground speed.
3. Set engine at specified rpm.
4. Set interseeder drive shaft at 20 rpm (or between 15-25 rpm).
5. Consult Table 4 for seed box setting. This table is valid only for planting alfalfa seed.

Table 4. Seed box for interseeding alfalfa.

Pounds alfalfa per acre	Seed box setting — Tractor ground speed		
	3 mph	4 mph	5 mph
.5	9	10	11
1.0	11	13	14
2.0	15	17	19
3.0	18	21	22

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