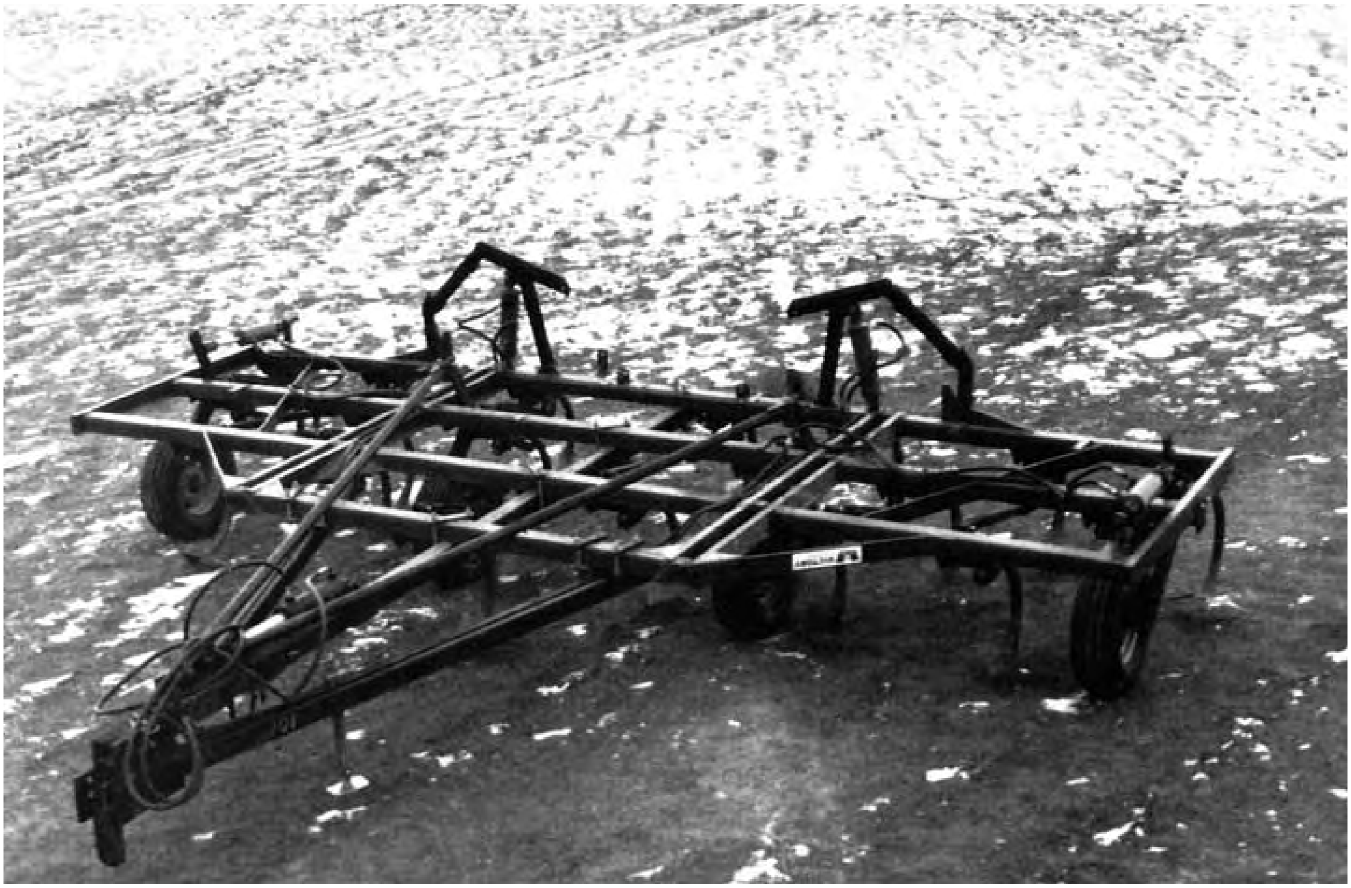
Evaluation Report No. E1377C
Printed: April, 1979
Tested at: Lethbridge
ISSN 0383-3445

Evaluation Report 63



Lely Model S-8-6 (6.6 m) Walking Shank Chisel Plow

A Co-operative Program Between
ALBERTA FARM MACHINERY RESEARCH CENTRE
PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

LELY MODEL S-8-6 WALKING SHANK CHISEL PLOW

MANUFACTURER AND DISTRIBUTOR:
Lely Northwest Limited
Box 1510, Coaldale, Alberta
T0K 0L0

RETAIL PRICE:
$8,993.00 (April, 1979, f.o.b. Lethbridge, 6.6 m width)

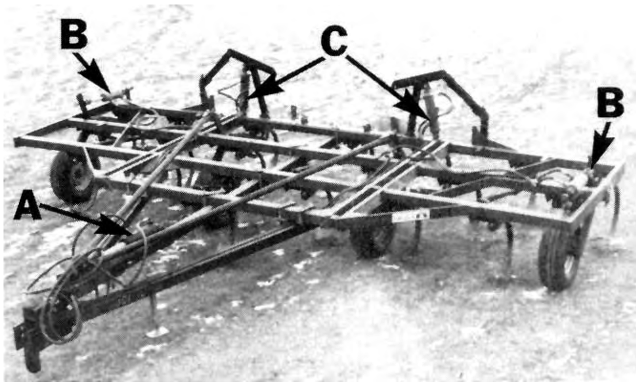


FIGURE 1. Lely S-8-6: (A) Master Cylinder, (B) Slave Cylinders, (C) Wing Lift Cylinders.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Lely S-8-6 Walking Shank Chisel Plow was good in stone-free conditions. Its performance in stony fields was reduced by frame interference on some paired shank assemblies, not permitting all shank releases to be fully operative. Its performance in hard soil arid in heavy trash was very good.

Performance of the paired shank release assemblies was fair. Maximum shank lifting height, to release stones, varied from 0 to 400 mm (0 to 16 in) depending upon how the shanks were paired. Shanks adjacent to wheels could not release due to rigid frame stops. The geometry of the paired shank arrangement necessitated the cultivator frame to lift during shank movement for stone release. When equipped with sweeps having a 43 degree stem angle, sweep pitch in uniform soils varied from 6 to 14 degrees over the full draft range normally experienced by heavy duty cultivators. Sweep pitch variation, due to pivoting shank action was much greater in non-uniform soils, resulting in both soil surface and furrow bottom ridging. With 330 mm (13 in) spacing, shank pair connecting rod spring preload was exceeded at drafts greater than 3.4 kN/m (240 lb/ft), resulting in greater sweep pitch, at higher drafts, than for most heavy duty cultivators.

Penetration was very good in all conditions. Depth of tillage was even across the cultivator width. The Lely S-8-6 buried large amounts of trash. It was capable of clearing very heavy trash and plugging seldom occurred. The Lely S-8-6 was very stable and did not skew appreciably. It followed the contour of rolling land very well. Weed kill in all conditions was good as long as sweeps with adequate overlap were used.

The Lely S-8-6 could be conveniently placed into transport position in about five minutes. The 240 mm (9.5 in) sweep-to-ground clearance, in transport position, was adequate. The Lely S-8-6 towed well at transport speeds up to 40 km/h (25 mph), however, this was unsafe, as the tire loads in transport position exceeded the Tire and Rim Association maximum rating by 58%. Caution has to be observed when towing on public roads due to large transport width. The 6.6 m (21.7 ft) wide test machine had a transport height of only 3.2 m (10.5 ft), permitting safe transport under power lines in the three prairie provinces. Some large models of the Lely have transport heights greater than minimum power line heights.

Adequate adjustment was provided for both lateral and fore-and-aft levelling. The hitch jack had insufficient lift for hitching in soft fields.

Average draft for the 6.6 m (21.7 ft) wide test machine, in light primary tillage, at 8 km/h (5 mph) varied from 11 kN (2420 lb) at 50 mm (2 in) depth to 24.5 kN (5390 lb), at 125 mm (5 in) depth. In heavy primary tillage at 8 km/h (5 mph), average draft varied from 12 kN (2640 lb) at 50 mm (2 in) to 43 kN (9460 lb) at 125 mm (5 in).

In light primary tillage, at 10 km/h (6.2 mph) and 75 mm (3 in) depth a tractor with 79 kW (106 hp) maximum power take-off rating will have sufficient power reserve to operate the 6.6 m (21.7 ft) wide Lely S-8-6. In heavy primary tillage, at the same depth and speed, a 97 kW (130 hp) tractor is needed.

The Lely S-8-6 was equipped with transport lock pins for safe towing. No slow moving vehicle sign was provided. No operator's manual was available.

Some mechanical problems occurred during the 224 hours of field operation: One shank stop and three shank connecting rods bent. The left slave cylinder anchor lug interfered with the tire when operating at maximum depth. One slave cylinder began to leak internally.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to allow free release movement of all paired shank assemblies.
2. Equipping the cultivator with tires that do not exceed the Tire and Rim Association maximum rating.
3. Modifications to eliminate interference between the left slave cylinder anchor lug and tire.
4. Modifications to increase maximum hitch jack lift height.
5. Providing a slow moving vehicle sign as standard equipment.
6. Providing some means of holding the hitch link in the horizontal position to facilitate one-man hitching.
7. Supplying an operator's manual.
8. Working with the agricultural equipment industry to standardize hydraulic quick couplers and hydraulic hose fitting threads.
9. Working with the agricultural equipment industry to standardize shank and sweep stem angles and sweep fastener spacings and sizes.

Chief Engineer: E. 0. Nyborg
Senior Engineer: E. H. Wiens

THE MANUFACTURER STATES THAT

With regard to recommendations 1 through 9: Since you tested the Lely Plow we have made major changes in our design; both changes recommended in the report as well as others resulting from our own tests. We have in the past and will continue to follow your recommendations.

GENERAL DESCRIPTION

The Lely S-8-6 is a bailing, flexible, three-section heavy duty cultivator suitable for medium and heavy primary tillage operations. It is available in 10 widths, ranging from 6.6 to 15.8 m. The test machine was a 6.6 m model with a 3 m centre frame and two 1.8 m wings. It was equipped with 20 spring cushioned shanks, laterally spaced at 330 mm, arranged in three rows on the wings and in four rows on the centre section.

Pairs of shanks in different rows are joined by cranks and a spring-cushioned connecting rod. The cranks on paired shanks are positioned so that the tillage forces oppose each other. This causes both shanks to stay in the soil, if tillage forces are similar on both, but permits one shank to pivot rearward, while the connected shank pivots forward, should an obstacle be encountered.

The centre frame is carried on two wheels, while each wing is supported by a single wheel. Tillage depth of the centre section is set with a master hydraulic cylinder, controlling mechanical linkages to each wheel. Slaved cylinders, in series with the master cylinder, control each wing wheel.

The wings fold into upright transport position with two hydraulic cylinders connected in parallel. A tractor with dual remote hydraulic controls is needed to operate the Lely S-8-6.

Detailed specifications are given in APPENDIX I while FIGURE 1 shows the location of major components.

SCOPE OF TEST

The Lely S-8-6 was operated in the field conditions shown in TABLE 1, for 224 hours, while cultivating about 1330 ha. It was evaluated for quality of work, ease of operation and adjustment, power requirements, safety and suitability of the operator's manual.

TABLE 1. Operating Conditions

FIELD CONDITIONS	HOURS	FIELD AREA (ha)
Soil Type		
- loam	164	924
- clay loam	50	297
- clay	10	59
TOTAL	224	1330
Stoney Phase		
- stone free	36	214
- occasional stones	151	897
- moderately stony	31	184
- vey stony	6	35
TOTAL	224	1330

RESULTS AND DISCUSSION

QUALITY OF WORK

Shank Characteristics: There is a large variation in shank and sweep stem angles (FIGURE 2) on cultivators from different manufacturers. Sweeps and shanks must be matched to obtain sufficient sweep pitch to achieve and maintain penetration. Usually manufacturers recommend sweeps with a stem angle from 0 to 5 degrees less than the shank stem angle to result in a slightly positive no-load sweep pitch. Sweep pitch increases in proportion to draft due to shank flexing and, depending on shank stiffness and cushioning spring preload, may become excessive in normal tillage, on some cultivators. A slightly positive sweep pitch results in uniform tillage depth and a smooth furrow bottom while excessive sweep pitch causes furrow bottom ridging and rapid sweep tip wear. Shanks which maintain a relatively constant sweep pitch, over the normal range of tillage forces, are desirable.

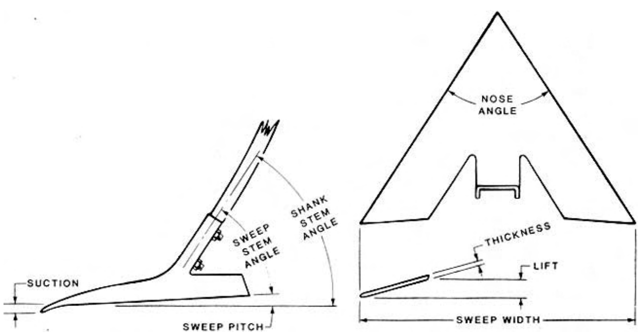


FIGURE 2. Shank and Sweep Terminology.

The Lely S-8-6 was equipped with unique shank holders. Pairs of shanks, in different rows were joined by cranks and a spring cushioned connecting rod (FIGURE 3). During operation, tillage forces on the paired shanks oppose each other, maintaining both sweeps at about the same pitch, if tillage forces on both shanks are similar. If one shank encounters an obstacle, it has to overcome the tillage force on the paired shank, causing the paired shank to pivot forward, before it can pivot back to release the obstacle.

During the test, the Lely S-8-6 was used with 457 mm wide Edwards sweeps with 43 degree stem angle, giving a no load sweep pitch of 6 degrees. FIGURE 4 shows pitch characteristics of a single Lely shank, when both paired shanks are operating in identical, uniform soil conditions. Pitch variation, over the full draft range is somewhat greater than for most other heavy duty cultivators. The cushioning spring on the connecting rod acts similarly to a cushioning spring on a conventional shank holder assembly, however the preload is exceeded at a lower draft level.

The low end of the pitch curve results from shank flexing, while the steeper upper part of the curve occurs when draft is large enough to overcome connecting rod spring preload. Sweep pitch varied 8 degrees over the full range of draft normally experienced by a heavy duty cultivator. When equipped with 43 degree sweeps, as used during the test, sweep pitch varied from 6 to 14 degrees over this draft range. Connecting rod spring preload was exceeded at drafts greater than 3.4 kN/m. In typical variable soil conditions, much greater sweep pitch variations can be expected, since the paired shanks move in opposing directions, to equalize tillage forces.

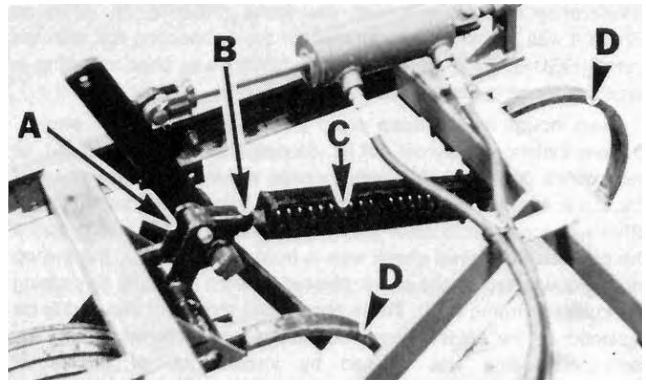


FIGURE 3. Paired Shank Holder Assembly: (A) Crank, (B) Connecting Rod, (C) Cushioning Spring, (D) Paired Shanks.

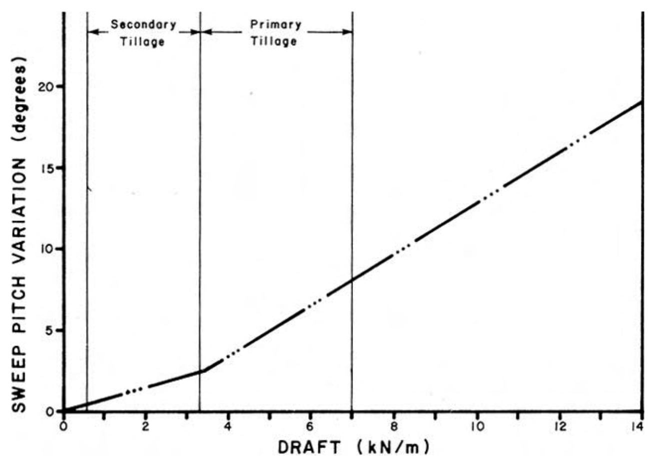


FIGURE 4. Sweep Pitch Variation over a Normal Range of Draft (330 mm shank spacing).

FIGURE 5 shows the theoretical shank lifting pattern of a set of paired shanks, when one shank encounters an obstacle. For a shank to pivot rearward to release an obstacle, it has to overcome the tillage force on its paired shank, causing it to pivot forward.

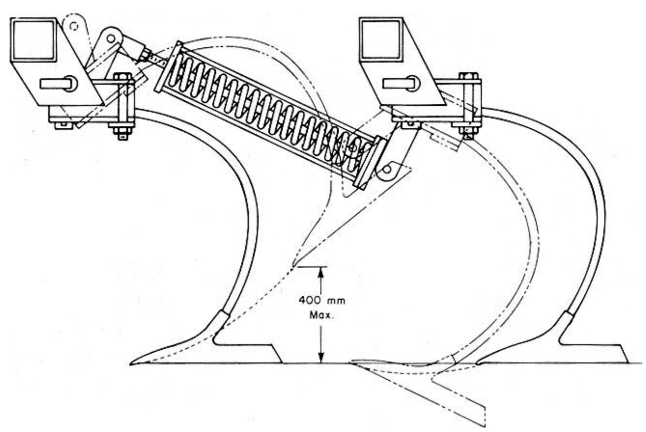


FIGURE 5. Theoretical Shank Lifting Pattern.

Maximum lift height varied from 0 to 400 mm depending on how the shanks were paired. Shanks adjacent to the wheels could not release as a stop bar (FIGURE 6) prevented forward movement of one of the paired shanks, to prevent sweep and tire interference. Maximum lift height of shank pairs, without stop bars, varied from 305 to 400 mm. Lift height on some shanks was limited by interference of the crank with the frame (FIGURE 7), while on others it was limited by interference of the connecting rod with the frame (FIGURE 8). In general, quality control was poor, resulting in large variations in the maximum lift height.

Even though most shanks could theoretically lift to clear stones, in many instances they did not lift. Stones often were pulled out, or the shanks deflected sideways to pass around them. Because of the shank arrangement, the counteracting force on the paired shank often was too great to allow the other shank to trip backward. Since the pivot on the paired shank was in front of the sweep, the sweep moved downward as the shank pivoted forward (FIGURE 5) causing the cultivator frame to lift. Three connecting rods bent and had to be replaced in the limited stony conditions encountered during the testing. Bending was caused by interference of cranks or connecting rods with the cultivator frame.

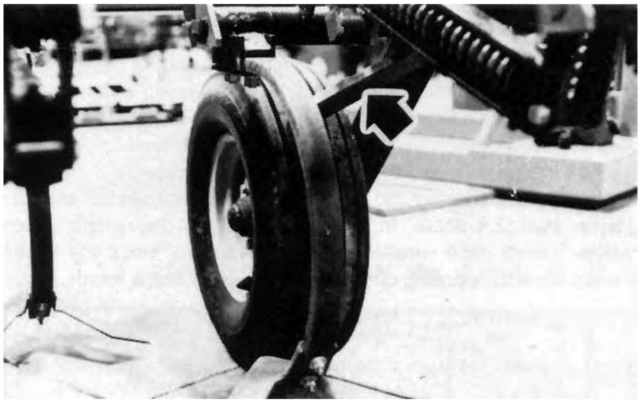


FIGURE 6. Stop Bar Preventing Release of Shanks Adjacent to the Wheels.

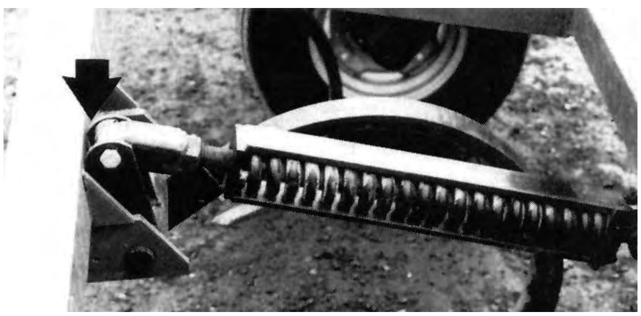


FIGURE 7. Shank Lift Height Limited by Crank and Frame Interference.

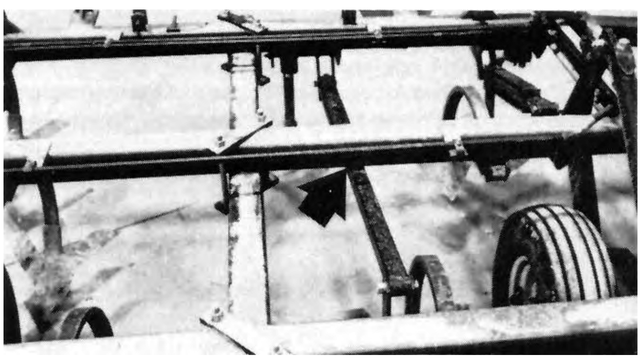


FIGURE 8. Shank Lift Height Limited by Connecting Rod and Frame Interference.

Penetration: The penetration was very good in all conditions. Constant movement of the paired shanks may have contributed to penetration ability. In each paired Shank set, the shank encountering the hardest soil, such as front row shanks, would operate at a greater sweep pitch than the paired shank operating in softer soil, contributing to good penetration.

Penetration was uniform across the cultivator width. Although no floatation problems occurred during the test, the centre wheels carried considerably more weight than the wing wheels and sinking of the centre section could be expected in very wet, soft fields. The wheels were positioned so that each centre section wheel supported about 35% of the cultivator weight while each wing wheel supported about 15%. In addition, each centre section wheel supported about 31% of the total tillage suction force while each wing wheel supported about 19%. For good flotation, it is desirable to have wheels sized and positioned so that each supports equivalent weight and similar tillage suction force.

Depth differences between the front and rear rows of shanks were slight once the frame had been properly levelled. In all conditions, the frame remained relatively level with insignificant twisting of the wing frames.

The Lely S-8-6 followed gently rolling field contours very well. The centre section was only 3 m wide, while each wing was only 1.8 m wide, resulting in fairly uniform penetration across cultivator width in rolling fields. As with most wing cultivators, large variations in tillage depth could occur in fields with abrupt contour changes.

Plugging: Trash clearance was excellent. The Lely S-8-6 was capable of clearing very heavy trash. Minimum plugging occurred at wing wheels in large dead weeds and in heavily buckwheat infested areas.

Trash Burial and Surface Condition: The Lely S-8-6 buried a large amount of trash. FIGURE 9 shows the amount of trash buried by the Lely as compared to that buried by a blade cultivator in similar trash conditions. Higher speeds caused increased trash burial.

The resulting soil surface was very ridged. Ridging was most severe at slow speeds with new sweeps. Surface ridging was most evident behind the tractor wheel tracks.

FIGURE 9. Trash Burial of the Lely S-8-6 (left) Compared to that of a Blade Cultivator (right).

Furrow Bottom Ridging: In all fields, furrow bottom ridging (FIGURE 10) was at least 25 mm. Ridging resulted from high sweep pitch (FIGURE 4). In addition, the paired shanks constantly moved in opposing directions while attempting to reach equilibrium in varying soil conditions. As a result, sweep pitch constantly changed, with some sweeps always operating at excessive pitch.

FIGURE 10. Typical Furrow Bottom Ridging.

Skewing and Stability: The Lely S-8-6 was very stable and did not skew sideways in normal field conditions. Momentary skewing occurred in stony fields, as the shanks sometimes did not trip and the cultivator skewed sideways to bypass stones.

The shank pattern (FIGURE 11) was symmetrical.and did not impose any resultant side forces on the cultivator during normal tillage. When equipped with 457 mm sweeps, the Lely S-8-6 has to skew more than 3 degrees to miss weeds. Skewing never was serious enough during the test to cause weeds to be missed.

Weed Kill: Weed kill was good with 457 mm sweeps. The standard sweep spacing of 330 mm resulted in 125 mm sweep overlap. Considerable sweep wear could occur before weeds were missed.

EASE OF OPERATION AND ADJUSTMENT

Transporting: The Lely S-8-6 was easily placed in transport

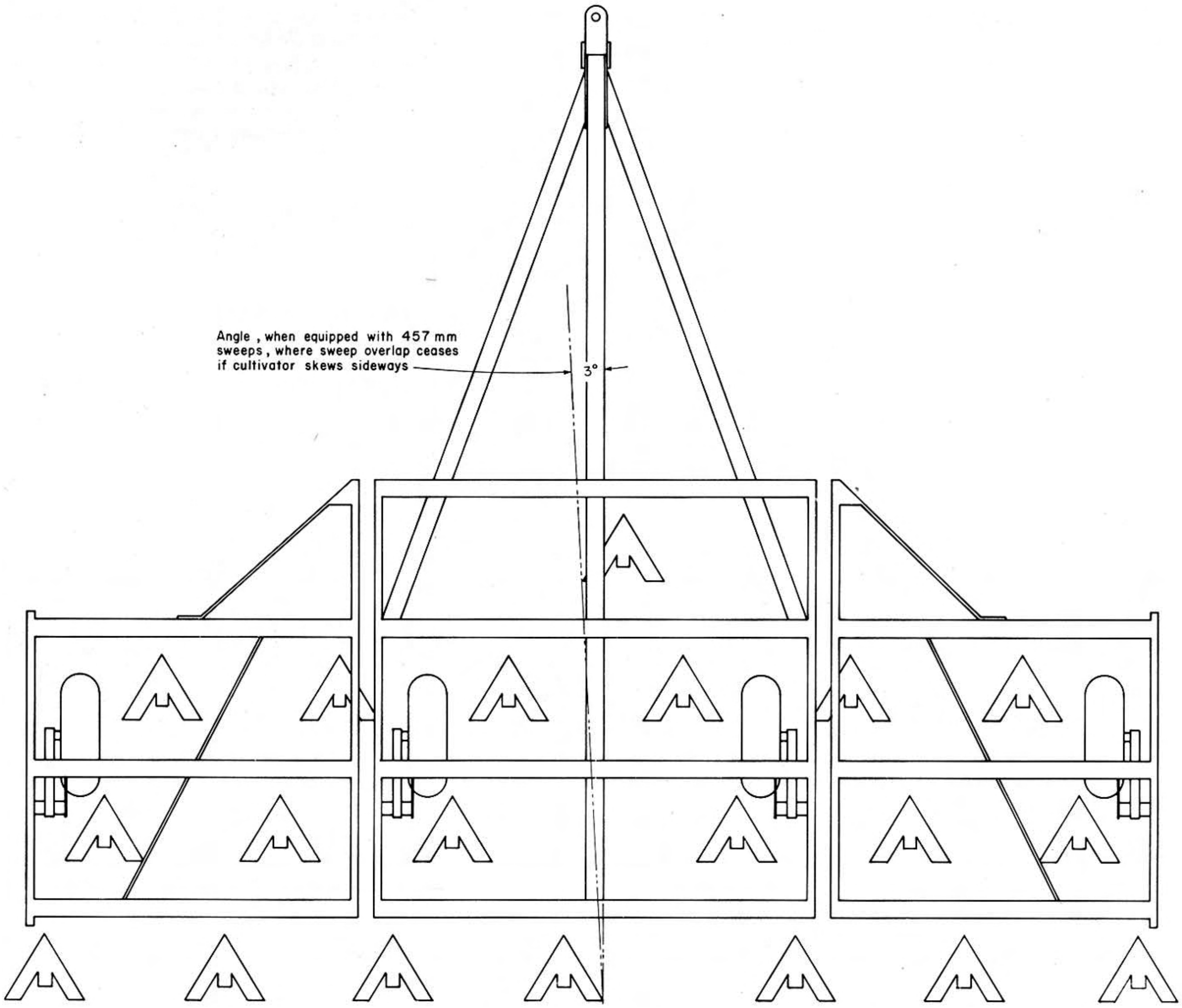


FIGURE 11. Sweep Pattern (330 mm shank spacing).

position (FIGURE 12) using the hydraulic wing lift system supplied as standard equipment. Transport lock pins were provided for both the wings and centre section lift. Raising or lowering, which depended on the tractor hydraulic system, took one man less than five minutes.

FIGURE 12. Transport Position.

Transport width was 4.8 m while transport height was 3.2 m. Extreme care was needed when transporting on public roads, through gates, over bridges and beneath power or telephone lines, The Lely S-8-6 towed well at transport speeds up to 32 km/h. Hitch weight, in transport position, was 270 kg, making the Lely S-8-6 very stable during towing. Sweep-to-ground clearance in transport position was 240 mm while transport wheel tread was 2 m, providing ample ground clearance.

Hitching: Hitch weight was 155 kg in field position and 270 kg in transport position. The hitch jack had insufficient lift for some tractors, especially in soft fields.

The hitch link swivelled downward when not hitched to a tractor (FIGURE 13). One-man hitching would have been greatly facilitated if the hitch link remained horizontal. It is recommended that the manufacturer modify the hitch jack and hitch link to facilitate easier hitching.

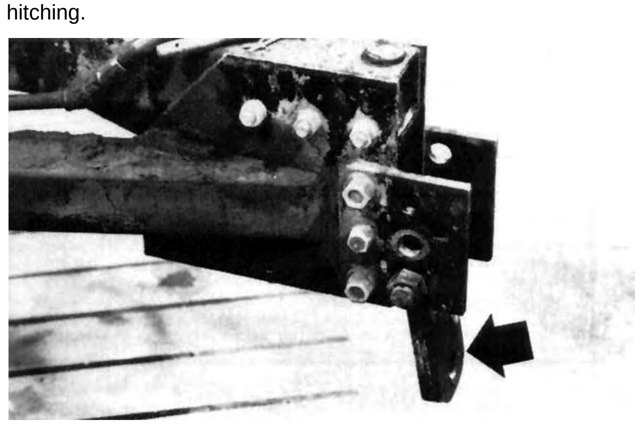


FIGURE 13. Hitch Link in Vertical Position.

The hitch height could be adjusted 150 mm in three increments by removing one bolt. This range was adequate to allow fore-and-aft frame levelling with all tractors used during testing.

Frame Levelling: Adequate lateral levelling adjustments were provided for both the centre and wing sections. The centre frame was levelled by adjusting the threaded link from the master cylinder to the wheels. The wing sections were levelled with a threaded adjustment at each cylinder anchor end.

Depth of Tillage: Tillage depth is controlled with three hydraulic cylinders connected in series. Centre section depth is controlled with the master cylinder, mounted near the front of the hitch pole and connected through a sliding sleeve and link bars to each centre section wheel. Wing depth is controlled through individual slave cylinders on each wing wheel. As is common with series hydraulic systems, to maintain the centre and wing frames at the same height, periodic synchronization of the cylinders, by completely extending them to fully raised position, was necessary.

Sweep Installation: It took one man about one and one-half hours to remove and replace the 20 sweeps on the Lely S-8-6. The ends of the sweep bolts protruded 10 mm beyond their nuts. As a result, in stony soil, the bolt ends burred, making removal difficult. This problem may be corrected by using shorter sweep bolts.

Shank Installation: Individual shanks could be easily replaced in less than five minutes by removing two bolts.

POWER REQUIREMENTS

Draft Characteristics: FIGURE 14 shows draft requirements for heavy duty cultivators in typical primary tillage at a speed of 8 km/h. This figure gives average requirements based on tests of 10 makes of heavy duty cultivators in 40 different field conditions. Attempting to compare draft requirements of different makes of heavy duty cultivators usually is unrealistic. Draft requirements for the same cultivator, in the same field, may vary by as much as 30% in two different years, due to changes in soil conditions. Variation in soil conditions affect draft much more than variation in machine make, usually making it impossible to measure any significant draft differences between different' makes of heavy duty cultivators. In light primary tillage, average draft per metre of width, at 8 km/h, varied from 1.7. kN at 50 mm depth to 3.7 kN at 125 mm depth. For the 6.6 m width Lely S-8-6, this corresponds to a total draft ranging from 11 kN to 24.5 kN. In heavy primary tillage, average draft per metre of width, at 8 kin/h, varied from 1.8 kN at 50 mm depth to 6.5 kN at 125 mm depth, corresponding to a total draft from about 12 to 43 kN for the 6.6 m test machine. Increasing speed by I km/h, increased draft by about 90 N per metre of width. For the 6.6 m wide test machine, this represents a draft increase of about 0.6 kN for a 1 km/h speed increase.

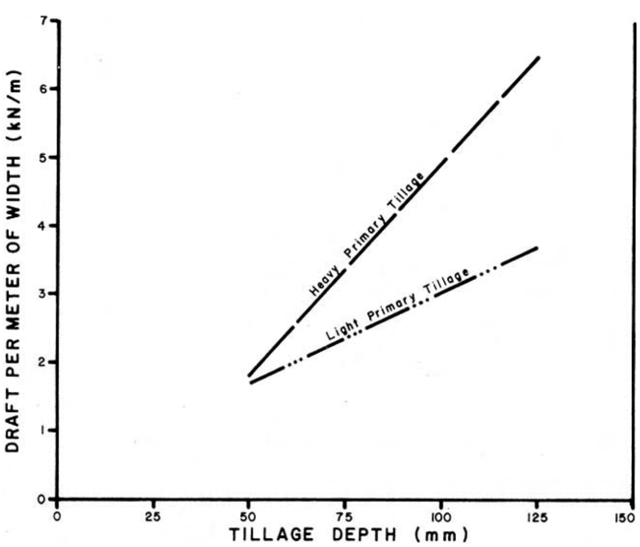


FIGURE 14. Average Draft Requirements for Heavy Duty Cultivators at 8 km/h.

Tractor Size: TABLES 2 and .3 show tractor sizes needed to operate the 6.6 m wide Lely S-8-6 in light and heavy primary tillage. Tractor sizes have been adjusted to include tractive efficiency and represent a tractor operating at 80% of maximum power on a level field. The sizes presented in the tables are the maximum power take-off rating, as determined by Nebraska tests or as presented by the tractor manufacturer. Selected tractor sizes will have ample power reserve to operate the Lely S-8-6 in the stated conditions.

Tractor size may be determined by selecting the desired tillage depth and speed from the appropriate table. For example, in light primary tillage at 75 mm depth and 10 km/h, a 79 kW tractor is needed to operate the Lely S-8-6. In heavy primary tillage, at the same depth and speed, a 97 kW tractor is needed.

TABLE 2. Tractor Size (Maximum Power Take-Off Rating, kW) to Operate the 6.6 rn wide Lely S-8-6 in Light Primary Tillage.

DEPTH mm	SPEED km/h					
	7	8	9	10	11	12
50	34	42	50	58	67	77
75	49	59	69	79	91	102
100	64	76	88	101	114	128
125	79	93	107	122	138	154

TABLE 3. Tractor Size (Maximum Power Take-Off Rating, kW) to operate the 6.6 m wide Lely S-8-6 in Heavy Primary Tillage.

DEPTH mm	SPEED km/h					
	7	8	9	10	11	12
40						
50						
75						
100						

OPERATOR SAFETY

Extreme caution is needed in transporting most folding cultivators to avoid contacting power lines. Minimum power line heights vary in the three prairie provinces. In Saskatchewan, the energized line may be as Iow as 5.2 m over farm land or over secondary roads. In Alberta and Manitoba, the neutral ground wire may be as low as 4.8 m over farm land. In all three provinces, feeder lines in farmyards may be as low as 4.6 m.

Transport height of the 6.6 m wide Lely S-8-6 was only 3.2 m, permitting safe transport under prairie power lines. On the other hand, transport height of some of the wider models of the Lely, is high enough for contact with many prairie power lines. The legal responsibility for safe passage under utility lines rests with the machinery operator and not with the power utility or the machinery manufacturer. All provinces have regulations governing maximum permissible equipment heights on public roads. If height limits are exceeded, the operator must contact power and telephone utilities before moving.

The Lely S-8-6 was 4.8 m wide in transport position, necessitating caution when towing on public roads, over bridges and through gates.

No slow moving vehicle sign or mounting bracket were provided. It is recommended that a slow moving vehicle sign be supplied as standard equipment.

Pins were provided to lock both the centre frame lift cylinder and the wings in transport position.

The Lely S-8-6 towed well at speeds up to 40 km/h (25 mph). However, this was unsafe as the tires were overloaded. Centre section tire loads, in field position, exceeded the Tire and Rim Association maximum rating, for 9.5L x 14, 6 ply tires by 15%. In transport position the entire weight of the cultivator was supported by the two main frame wheels and individual tire loads exceeded the Tire and Rim Association maximum rating of 58%. This tire overload was considered unsafe and hazardous, especially at high transport speeds. It is recommended that the cultivator be equipped with tires having suitable load ratings.

STANDARDIZATION

Hydraulics: During the test, considerable difficulty was encountered due to differences in hydraulic couplers on various tractors. The difficulty was in the lack of standardization both in couplers and in hose threads. More standardization is needed in this area. To illustrate this point, the two sets of hydraulic hoses supplied with the test machine both had different thread styles at the supply end.

Sweep Bolt Holes: The bolt hole size and spacing on cultivator sweeps and shanks, as well as stem angles, should similarly be standardized to provide some degree of interchangability of sweeps.

OPERATOR'S MANUAL

No operator's manual was supplied with the Lely S-8-6. It is recommended that a suitable operator's manual be provided.

DURABILITY RESULTS

TABLE 4 outlines the mechanical history of the Lely S-8-6 during 224 hours of field operation while tilling about 1330 ha. The intent of the test was evaluation of functional performance. The following mechanical problems represent those which occurred during the functional testing. An extended durability evaluation was not conducted.

TABLE 4. Mechanical History

ITEMS	OPERATING HOURS	EQUIVALENT FIELD AREA ha
Sweeps and Shanks		
- One sweep was lost and many sweep bolts were loose. The 7/16 in sweep bolts were replaced with 1/2 in bolts at	32	190
- Worn sweeps behind the cultivator and tractor wheel tracks were replaced at	85	505
- Complete sets of worn sweeps were replaced at	136, 220	808, 1307
Frame		
- The left wing tire was slightly damaged by interference with the hydraulic cylinder anchor lug at	100	594
- One shank stop bent and was straightened at	153	909
- Shank connecting rods bent and were replaced at	173, 186, 189	1028, 1105, 1123
- The cotter pin retaining a wing section hinge pin was worn through and replaced at	173	1028
Hydraulics		
- Adaptor fittings were required for one set of hydraulic supply hoses to match thread types at	Beginning of Test	
- The left hydraulic slave cylinder began leaking internally at	189	1123

DISCUSSION OF MECHANICAL PROBLEMS

SWEEPS AND SHANKS

Sweep Bolts: The sweep attaching bolts supplied with the cultivator were 7/16 in. This was an assembly error as the bolts should have been 1/2 in. This resulted in one sweep being lost and many other sweeps loosening. After installing the proper bolts, no further problems were encountered.

Sweep Wear: As is common with most cultivators, rapid, non-uniform wear occurred On the sweeps which followed the cultivator and tractor wheel tracks. Complete sweep sets needed replacement twice in 224 hours. Sweep wear rate depends on the type and abrasiveness of the soil. Great variation can be expected.

FRAME

Tire Interference: When the cultivator operated at maximum depth, interference occurred between the left slave cylinder anchor lug and the tire (FIGURE 15). Prolonged use at maximum depth would cause eventual tire failure.

Shank Connecting Rods: Three shank connecting rods bent in stony conditions. Bending was the result of a crank or connecting rod striking the frame during shank release (FIGURES 7 and 8). Since the connecting rods are tension members, they cannot bend unless frame interference restricts their movement. It is recommended that the manufacturer consider modification to permit free release movement of all paired shank assemblies. It should be noted that the Lely S-8-6 was tested in only limited stony conditions. Continued use in stony fields would probably have resulted in further damage.

APPENDIX I

SPECIFICATIONS
MAKE: Lely Walking Shank Chisel Plow
MODEL: S-8-6 (6.6 m size)
SERIAL NUMBER: 101
MANUFACTURER: Lely Northwest Limited
Coaldale, Alberta
T0K 0L0

DIMENSIONS	FIELD POSITION	TRANSPORT POSITION
- width	8604 mm	4760 mm
- length	5900 mm	5900 mm
- height	840 mm	3190 mm
- maximum ground clearance	240 mm	240 mm
- wheel tread	5950 mm	1980 mm

SHANKS:	
- number	20
- lateral spacing	330 mm
- trash clearance (frame to sweep tip)	500 mm
- number of shank rows	
- centre section	4
- wings	3
- distance between rows	810 mm
- shank cross section	25 x 47 mm
- shank stem angle	49°
- sweep hole spacing	57 mm
- sweep bolt size	13 mm
HITCH:	
- vertical adjustment range	150 mm
DEPTH CONTROL:	hydraulic
FRAME:	102 mm square tubing
TIRES:	
- centre section	2, 9.5L x 14, 6 ply
- wings	2, 9.SLx 14, 6 ply
NUMBER OF LUBRICATION POINTS:	none
HYDRAULIC CYLINDERS:	
- main frame, depth control master	1, 102 x 305 mm
- wings, depth control slave	2, 102 x 203 mm
- wing lift	2, 102 x 203 mm

WEIGHTS:	FIELD POSITION	TRANSPORT POSITION
- right wheel	386 kg	
- right centre whee	1890 kg	1219 kg
- left centre wheel	890 kg	1219 kg
- left wheel	386 kg	
- hitch	154 kg	288 kg
TOTAL	2706 kg	2706 kg

OPTIONAL EQUIPMENT:
- ten width options from 6.6 to 15.8 m

APPENDIX II

MACHINE RATINGS
The following rating scale is used in PAMI Evaluation Reports:

(a) excellent	(b) very good
(c) good	(d) fair
(e) poor	(f) unsatisfactory

APPENDIX III

METRIC UNITS
In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used:

1 hectare (ha)	= 2.47 acres (ac)
1 kilometre/hour (km/h)	= 0.62 mile/hour (mph)
1000 millimetres (mm) = 1 metre (m)	= 39.37 inches (in)
1 kilowatt (kW)	= 1.34 horsepower (hp)
1 kilogram (kg)	= 2.20 pounds mass (lb)
1 newton (N)	= 0.22 pounds force (lb)
1 kilonewton (kN)	= 220 pounds force (lb)
1 kilonewton/metre (kN/m)	= 70 pounds force/foot (lb/ft)

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