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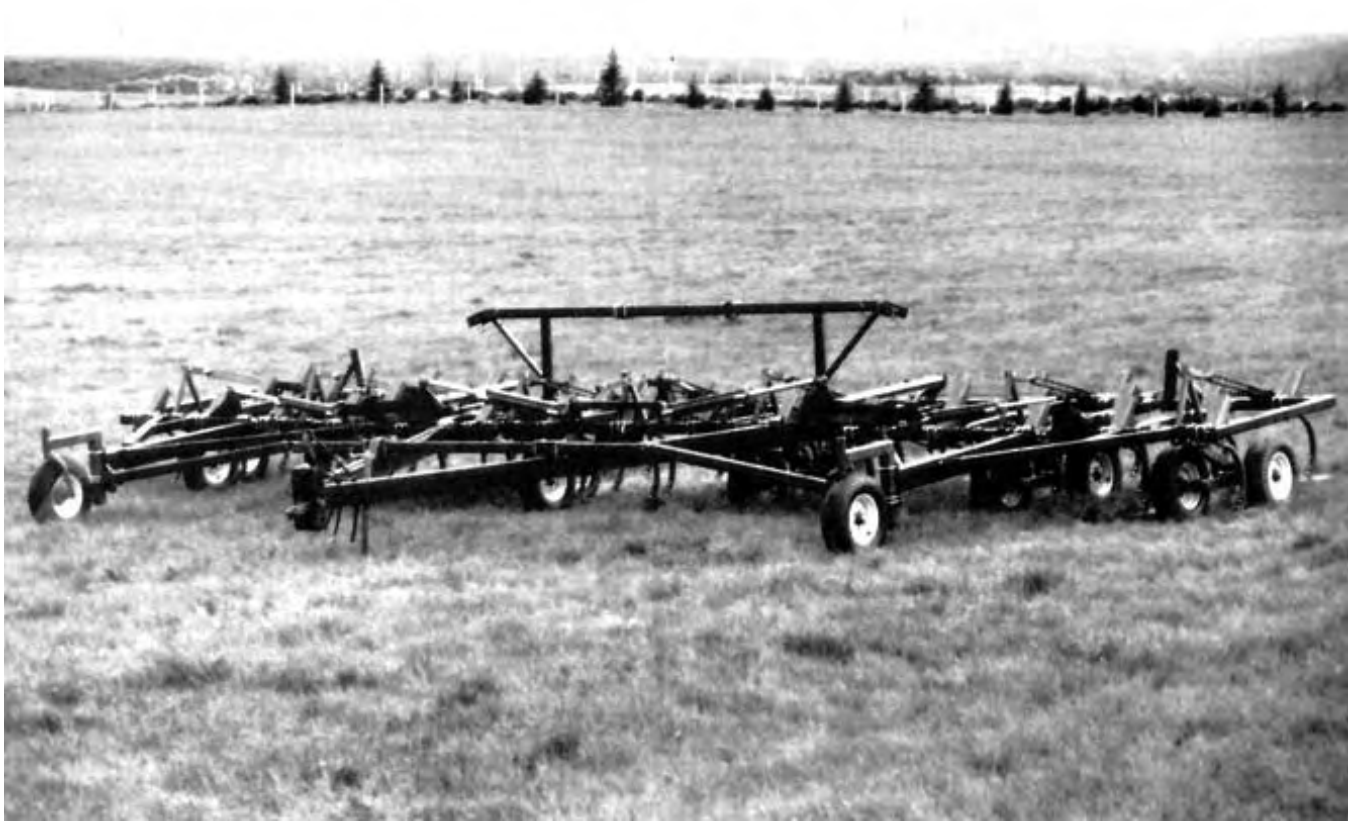

Friggstad C5-43 (13.1 m) Heavy Duty Cultivator

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

FRIGGSTAD C5-43 HEAVY DUTY CULTIVATOR

MANUFACTURER AND DISTRIBUTOR:

Friggstad Manufacturing Ltd.
Frontier, Saskatchewan
S0N 0W0

RETAIL PRICE:

$16,140.00 (May, 1979, f.o.b. Lethbridge, 13.1 metre width).

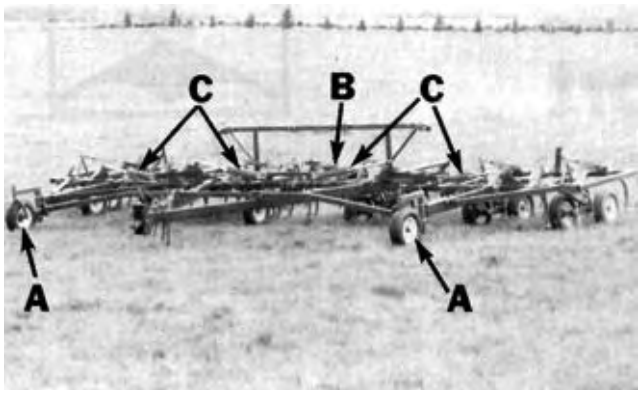

FIGURE 1. Friggstad C5-43: (A) Stabilizer Caster Wheels, (B) Master Cylinder, (C) Wing Lift Cylinders.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Friggstad C5-43 heavy duty cultivator was very good in all working conditions.

The spring cushioned shanks could lift 254 mm (10 in) to clear stones. When equipped with sweeps having a 50 degree stem angle, sweep pitch varied from 2 to 4 degrees over the range of normal primary tillage draft. With 305 mm (12 in) spacing, shank cushioning spring preload was exceeded at drafts greater than 9.8 kN/m (762 lb/ft), occurring well beyond the range of normal primary tillage drafts.

Penetration was very good in all conditions. The Friggstad C5-43 was very stable and did not skew appreciably. Skewing was never serious enough to affect weed kill. The Friggstad C5-43 followed the contour of rolling land better than most heavy duty cultivators. Weed kill was very good, providing sweeps with sufficient overlap were used. Furrow bottom ridging was only slight with 50 degree sweeps. The Friggstad C5-43 was capable of clearing heavy trash and plugging seldom occurred.

The Friggstad C5-43 could be conveniently placed into transport position in less than five minutes. The 115 m (4.5 in) sweep-to-ground clearance in transport position was usually adequate. The Friggstad towed well at transport speeds up to 32 km/h (20 mph). However, this was unsafe, as the tire loads in transport position exceeded the Tire and Rim Association maximum rating by 30%. Caution had to be observed when towing on public roads due to large transport width and height. The 13.1 m (43 ft) wide test machine had a transport height of 4.5 m (14.75 ft), permitting safe transport under power lines in the three prairie provinces. Some larger models of the Friggstad have transport heights greater than minimum power line heights.

A hitch jack was provided for convenient hitching. Adequate adjustment was provided for both lateral and fore-and-aft levelling. Tillage depth was uniform across the width of the cultivator when the depth control linkages and stabilizer caster wheels were properly adjusted.

Average draft for the 13.1 m (43 ft) wide test machine, in light primary tillage, at 8 km/h (5 mph) varied from 22.3 kN (4910 lb) at 50 mm (2 in) depth to 48.5 kN (10,670 lb) at 125 mm (5 in) depth. In heavy primary tillage at 8 km/h (5 mph), average draft varied from 23.6 kN (5190 lb) at 50 mm (2 in) depth to 85.2 kN (18,740 lb) at 125 mm (5 in) depth.

In light primary tillage, at 10 km/h (6.2 mph) and 75 mm (3 in) depth, a tractor with 158 kW (212 hp) maximum power take-off rating will have sufficient power reserve to operate the 13.1 m (43 ft) wide Friggstad C5-43. In heavy primary tillage, at the same depth and speed a 193 kW (259 hp) tractor is needed.

The Friggstad was equipped with transport lock pins for safe towing. No slow moving vehicle sign was provided. No operator's manual was available.

Only minor mechanical problems occurred during the 210 hours of field operation, the most serious of these being the depth control chains breaking on two occasions.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Equipping the cultivator with tires that comply with the Tire and Rim Association load rating.
2. Modifying the depth control assembly to reduce chain stretching and breakage.
3. Providing a slow moving vehicle sign as standard equipment.
4. Supplying an operator's manual.
5. Working with the agricultural equipment industry to standardize hydraulic quick couplers and hydraulic hose fitting threads.
6. Working with the agricultural equipment industry to standardize shank and sweep stem angles and sweep fastener spacings and sizes.

Chief Engineer. E. O. Nyborg
Senior Engineer: E. H. Wiens
Project Engineer: R. C. Papworth

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. All 'C' model cultivators are now equipped with 11.00 L x 15, 12 ply tires and 8 inch x 15 inch wheels on the centre section.
2. The chain stretching problem has been eliminated by using a higher quality chain and increasing chain size from 1/2 to 9/16 inch links. Roller chain breakage was due to improper splicing in the plant and once detected was discontinued immediately. Connector links are now being used.
3. We will be supplying a bracket for mounting a slow moving vehicle sign.
4. A complete and easy to read operators manual is now available.

5 & 6. We would be more than happy to work with the industry in standardizing hydraulic hoses, fitting threads, quick couplers, shank and sweep stem angles, sweep fastener spacings and any other items which can be standardized.

MANUFACTURER'S ADDITIONAL COMMENTS

The following problems mentioned in the mechanical history have now been corrected:

1. The hitch link pin now has a head welded on it and is threaded so it is locked in place with a nut and lock washer.
2. The pin joining the wing section and the main frame now has a head welded on it and is locked with a 1/2 inch, grade 8, fine threaded bolt, instead of a 3/8 inch roll pin.
3. The depth stop has now been redesigned to decrease the force on the front support. All welding on the frame is now done with MIG welders, resulting in much stronger joints.
4. The solid shaft used as main frame bumper pins have now been replaced with rollers equipped with bronze bushings.

GENERAL DESCRIPTION

The Friggstad C5-43 is a trailing, flexible, five-section heavy duty cultivator suitable for medium and heavy primary tillage operations. The five-section model is available in nine widths ranging from 13.1 to 18 m. The test machine was a 13.1 m model with a 4.6 m centre frame, two 2.75 m inner wings and two 1.5 m outer wings. It was equipped with 43 spring cushioned shanks, laterally spaced at 305 mm, arranged in three rows.

The cultivator is carried on 14 wheels. Two sets of tandem wheels support the centre frame while single tandem wheel sets support each wing section. In addition, two caster wheels, placed in front of the wing sections, act as wing stabilizers. Tillage depth is controlled by a master cylinder, through chains and connector linkages to each tandem wheel set. Four hydraulic cylinders connected in series, fold the inner wings into an upright position and the outer wings in towards the centre, for transporting. A tractor with dual remote hydraulic controls is needed to operate the Friggstad C5-43.

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

SCOPE OF TEST

The Friggstad C5-43 was operated in the field conditions shown in TABLE 1 for 210 hours while cultivating about 1785 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		
- sand	53	450
- loam	81	688
- clay	48	408
- clay loam	28	239
TOTAL	210	1785
Stony Phase		
- stone free	32	272
- occasional stones	135	1147
- moderately stony	29	247
- very stony	14	119
TOTAL	210	1705

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.

The Friggstad C5-43 was equipped with adjustable, spring cushioned shank holders. During the test, the Friggstad C5-43 was used with 405 mm wide Edwards sweeps with a 50 degree stem angle, giving a no-load sweep pitch of 2 degrees and with 406 mm wide Edwards sweeps having a 47 degree stem angle, giving a no-load sweep pitch of 5 degrees.

FIGURE 3 shows pitch characteristics of the Friggstad shank assembly. 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 cushioning spring preload. Sweep pitch varied 2 degrees over the full range of draft normally occurring in primary tillage. When equipped with 50 degree sweeps, as used during the test, sweep pitch varied from 2 to 4 degrees over this draft range, while with 47 degree sweeps, sweep pitch varied from 5 to 7 degrees over this draft range. Cushioning spring preload was exceeded at drafts greater than 9.8 kN/m, occurring well beyond the normal draft range, indicating that the Friggstad C5-43 was well suited for heavy primary tillage.

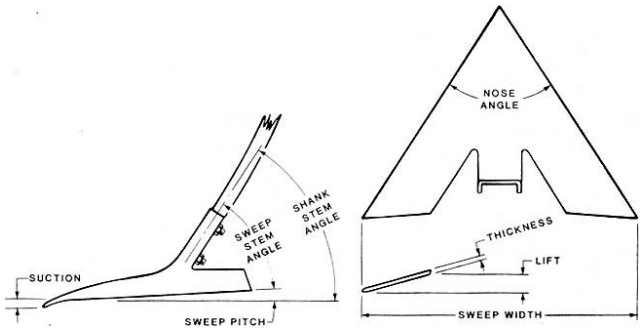

FIGURE 2. Shank and Sweep Terminology.

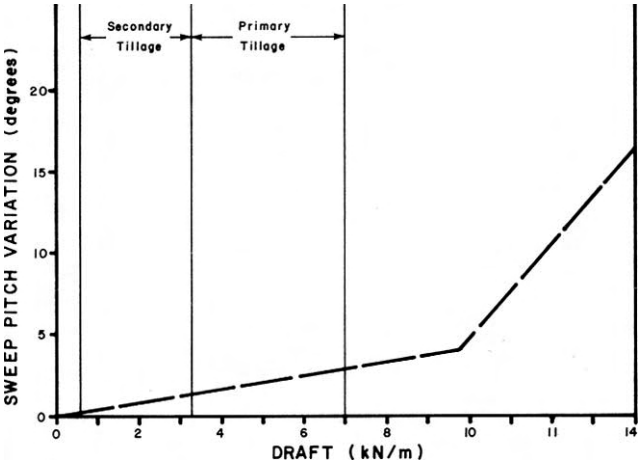

FIGURE 3. Sweep Pitch Variation over a Normal Range of Draft (305 mm shank spacing)

FIGURE 4 shows the lifting pattern when shanks encounter stones or field obstructions. Maximum lift height was 254 mm. The shank assemblies performed very well throughout the test. No shank damage occurred.

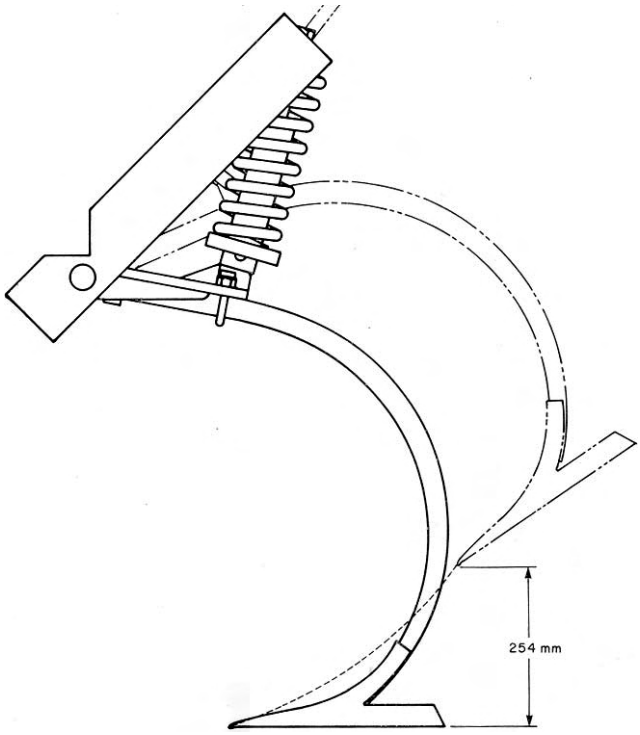

FIGURE 4. Shank Lifting Pattern.

Sweeps wore very evenly when the cultivator was equipped with 50 degree sweeps. With 47 degree sweeps the sweep nose wore much more rapidly than the wings due to increased sweep pitch.

Penetration: Penetration was very good in all soil conditions when equipped with either 50 or 47 degree sweeps.

Penetration was uniform across the cultivator width provided all depth control linkages were properly set. Tires were adequately sized to provide good flotation in all soil conditions. The wheels were positioned so that each centre section wheel supported about 13% of the total cultivator weight, each inside wing wheel 7%, each outer wing wheel 4% and each stabilizer wheel 2%. In addition, each centre section wheel supported about 11% of the total tillage suction force while each inside wing wheel supported about 8.5% and each outer wing wheel about 5.5%. For good flotation and uniform tillage depth across the cultivator width, it is desirable to have wheels sized and positioned so that each supports equivalent weight and a similar tillage suction force.

Depth differences between the front and rear rows of shanks

were slight, once the hitch and stabilizer caster wheels had been properly adjusted to level the frame. In all conditions, the frame remained relatively level with very little twisting of the wing frames.
The wing sections were attached to the centre frame at one point and were supported by the stabilizer caster wheels, allowing the wing sections to pivot relative to the centre frame. This design allowed the Friggstad to follow rolling field contours extremely well, maintaining very uniform depth across its entire width.
Plugging: Trash clearance was excellent. The Friggstad C5-43 was capable of clearing large amounts of trash. Minimum plugging occurred at the shanks next to the wheels in heavy, damp trash and in heavily buckwheat infested areas.
Trash Burial and Field Surface: With 50 degree sweeps at 75 mm tillage depth, the Friggstad C5-43 left most stubble standing upright, at speeds below 6 km/h (FIGURE 5) The amount of trash buried increased at speeds above 6 km/h and at depths greater than 75 mm. Slightly more trash was buried with the 47 degree sweeps than with 50 degree sweeps.
Surface ridging with 50 degree sweeps was from 25 to 50 mm (FIGURE 6). With 47 degree sweeps, ridging increased slightly.
Furrow Bottom Ridging: The Friggstad C5-43 left a very smooth, even furrow bottom. Furrow bottom ridging with 50 degree sweeps was always less than 10 mm. With 47 degree sweeps, ridging was

FIGURE 5. Trash Burial with 50 Degree Sweeps at 6 km/h and 75 mm Depth.

FIGURE 6. Field Surface Condition.

Skewing and Stability: The Friggstad C5-43 was very stable and sideways skewing occurred only in very hilly conditions. The shank forces on the cultivator during normal tillage. When equipped with 406 mm sweeps, the Friggstad had to skew more than 3 degrees to miss weeds. Skewing never was serious enough to cause weeds to be missed.

Weed Kill: Weed kill was very good when equipped with 406 mm sweeps. The standard sweep spacing of 305 mm resulted in 101 mm sweep overlap. Considerable sweep wear could occur before weeds were missed. When sweeps wore to 330 mm, larger weeds could work their way between the sweeps and be missed.

EASE OF OPERATION AND ADJUSTMENT

Transporting: The Friggstad C5-43 was easily placed in transport position (FIGURE 8) using the hydraulic wing lift system supplied as standard equipment. Two pins, which had to be inserted by hand, were provided to lock the wings during transport. A mechanical transport lock was also supplied for the depth control cylinder. Raising or lowering, depending on the tractor hydraulics, took one man less than five minutes. Transport width was 8 m while transport height was 4.5 m. Extreme care was needed when transporting on public roads, through gates, over bridges and beneath power and telephone lines. The hitch weight, in transport position, was 630 kg making the Friggstad very stable while towing.

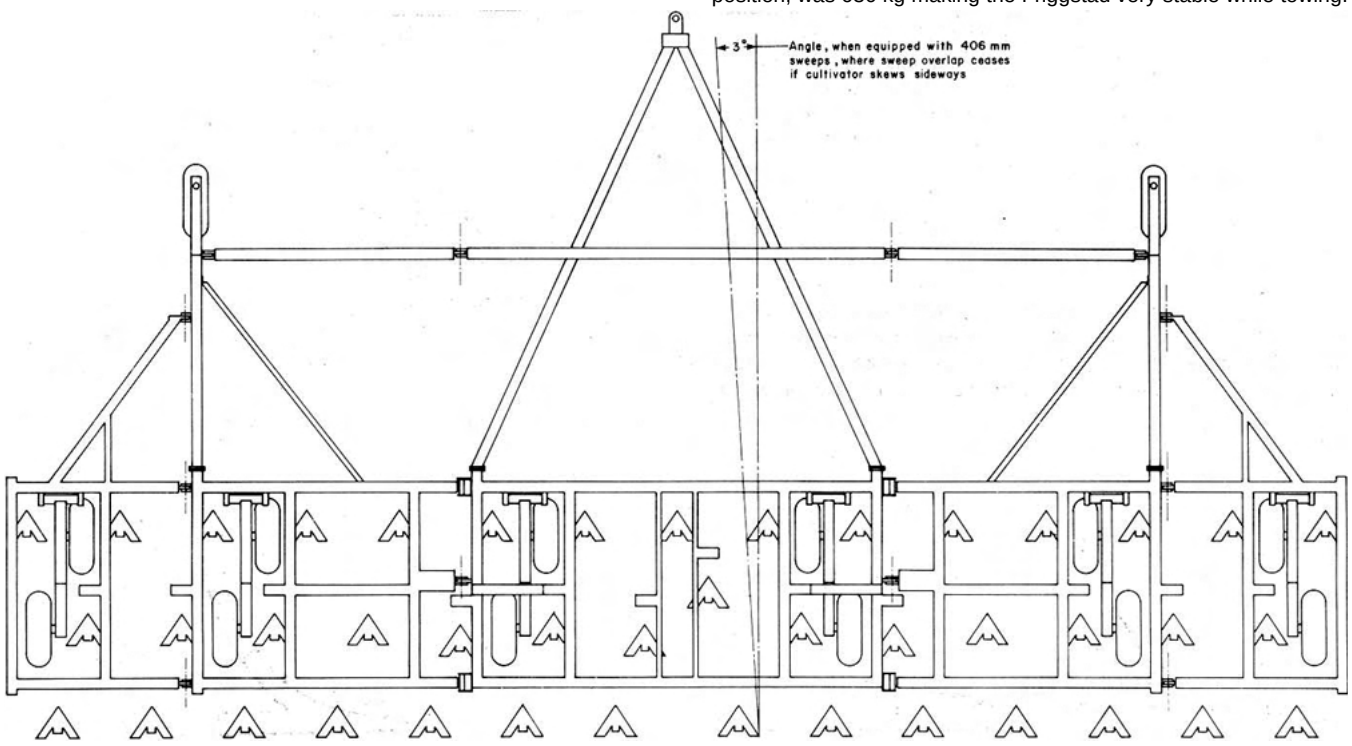

FIGURE 7. Sweep Pattern (305 rnm Shank Spacing).

It towed well at transport speeds up to 32 km/h. Sweep-to-ground clearance during transport was 115 mm, while transport wheel tread was 3.4 m. This usually provided ample ground clearance.

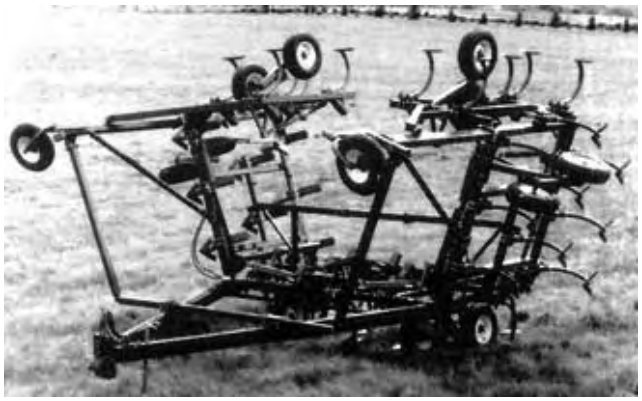

FIGURE 8. Transport Position.

Hitching: The Friggstad C5-43 was equipped with a suitable hitch jack, which permitted easy hitching.

The hitch link swivelled slightly downward when not hitched to a tractor (FIGURE 9). One man hitching would have been greatly facilitated if the hitch link remained horizontal.

The hitch height could be adjusted 356 mm in six increments by removing one pin. This range was adequate to allow fore-and-aft cultivator frame levelling with all tractors used during testing.

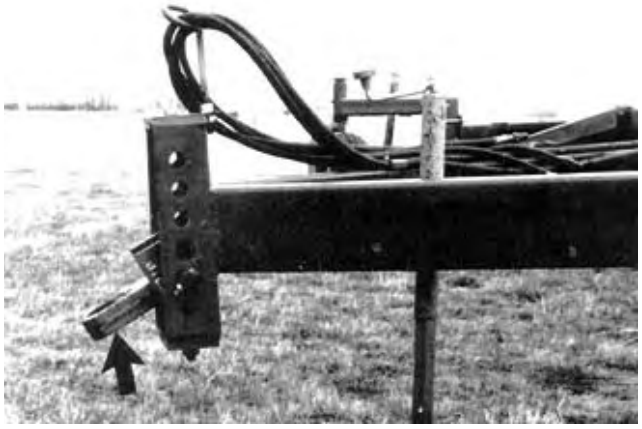

FIGURE 9. Hitch Link Swivelled Downward.

Frame Levelling: Adequate lateral levelling adjustments were provided for the centre and all wing sections. All frame sections were levelled by means of threaded connectors. Adjustments were easily made by lowering the machine, removing the pin and adjusting the clevis as required.

The chains linking the threaded connectors to the master depth control cylinder stretched twice, necessitating frame levelling.

Depth of Tillage: Tillage depth is controlled by one hydraulic cylinder linked to each tandem wheel set by chains and connector links. A depth stop, consisting of an eccentric block positioned in an appropriate hole between the depth control bars, (FIGURE 11) provided depth adjustment. This adjustment required the use of wrenches. Uniform tillage depth across the cultivator width could usually be obtained with the tractor hydraulics, without using the depth control stop.

Sweep Installation: It took one man about 2 hours to remove and replace the 43 sweeps on the Friggstad C5-43. The sweep bolts were short enough to have their ends protected by the nuts, thereby preventing thread damage during tillage. High frame clearance permitted easy movement underneath the cultivator.

Shank Installation: A shank could be replaced, without having to remove the complete shank holder assembly from the frame, in less than 10 minutes

POWER REQUIREMENTS

Draft Characteristics: FIGURE 10 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 difference 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 13.1 m wide Friggstad C5-43, this corresponds to a total draft ranging from 22.3 to 48.5 kN. In heavy primary tillage, average draft per metre of width at 8 km/h, varied from 1.8 kN at 50 mm depth to 6.5 kN at 125 mm depth, corresponding to a total draft from 23.6 to 85.2 kN for the 13.1 m test machine. Increasing speed by 1 km/h, increased draft by about 90 N per metre of width. For the 13.1 metre wide test machine, this represents a draft increase of about 1.2 kN for a 1 km/h speed increase.

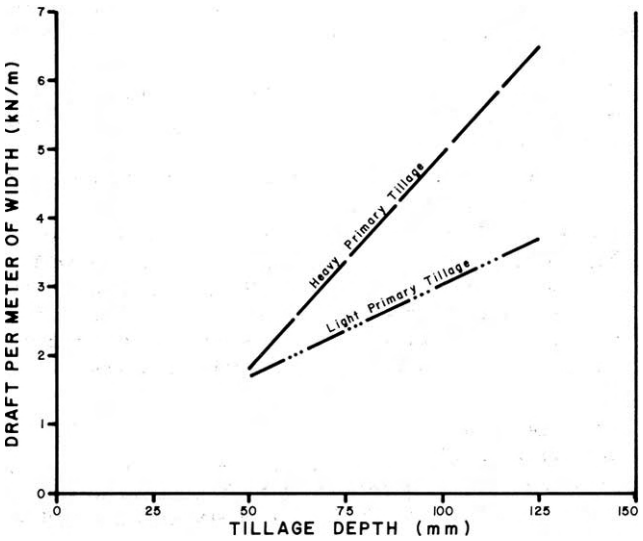

FIGURE 10. Average Draft Requirements for Heavy Duty Cultivators at 8 km/h.

Tractor Size: TABLES 2 and 3 show tractor sizes needed to operate the 13.1 m wide Friggstad C5-43 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 Friggstad C5-43 in the stated conditions.

TABLE 2. Tractor Size (Maximum Power Take-off Rating, kW) to Operate the 13 1 m Wide Friggstad C5-43 in Light Primary Tillage.

DEPTH (mm)	SPEED (km/h)					
	7	8	9	10	11	12
50	68	83	98	115	133	152
75	98	117	136	158	180	203
100	128	151	175	200	227	254
125	157	185	213	243	273	305

TABLE 3. Tractor Size (Maximum Power Take-off Rating, kW) to Operate the 131 m Wide Friggstad in Heavy Primary Tillage.

DEPTH (mm)	SPEED (km/h)					
	7	8	9	10	11	12
50	64	78	92	107	124	142
75	124	146	169	193	218	244
100	184	214	246	278	312	346
125	243	282	322	363	406	449

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 158 kW tractor is needed to operate the Friggstad C5-43. In heavy tillage, at the same depth and speed, a 193 kW tractor is needed.

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 low as 5.2 m over farmland or over secondary roads. In Alberta and Manitoba, the neutral ground wire may be as low as 4.8 m over farmland. In all three provinces, lines in farmyards may be as low as4 6m.

Transport height of the 13.1 m wide test machine was 4.6 m, permitting transport under prairie power lines. On the other hand, transport height of the 18 m wide model of the Friggstad cultivator is 5.7 m, which 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 various types of public roads. If height limits are exceeded, the operator must contact power and telephone utilities before moving.

The Friggstad C5-43 was 8 m wide in transport position. This necessitated 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 Friggstad C5-43 towed well at speeds up to 32 km/h. Centre section tire loads, in transport position, exceeded the Tire and Rim Association maximum rating for 9.5 L x 15, 8 ply tires by 30%. 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.

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

Set-up and assembly instructions were supplied but no operator's manual was available. It is recommended that a suitable operator's manual be provided.

DURABILITY RESULTS

TABLE 4 outlines the mechanical history of the Friggstad C5-43 during 210 hours of field operation while tilling about 1785 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.

DISCUSSION OF MECHANICAL PROBLEMS

SWEEPS AND SHANKS

Sweep Wear: As is common with most cultivators, rapid, non-uniform wear occurred on sweeps following the cultivator and tractor wheel tracks. The front row of sweeps wore faster than the rear rows. Sweep wear was more rapid with 47 degree than 50 degree sweeps. All sweeps were replaced when worn down to a 330 mm width. Complete sweep sets needed replacement twice in 210 hours. Sweep wear rate depends on the type and abrasiveness of the soil. Great variation can be expected.

TABLE 4. Mechanical History

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA (ha)
Sweeps and Shanks		
- Worn sweeps behind the tractor tires were replaced at	38	323
- The two outside sweeps were replaced at	71	604
- Complete sets of worn sweeps were replaced at	98, 166	633, 1581
Frame		
- The hitch link pin fell out at	135	1148
- The pin joining the wing section and main frame was partially out and was put back in at	30	255
- The depth control chain broke and was repaired at	38, 166	323, 1411
- The frame required levelling due to chain stretching at	38, 75, 166, 191	323, 638, 1411, 1624
- A flat tire occurred at	192, 208	1632, 1768
- The spindle nuts on the main frame wheels required tightening at	192	1632
- The weld on the hydraulic depth stop post cracked and was rewelded at	210	1785
- The main frame bumper pins were worn at	End of Test	
Hydraulics		
- The hydraulic hose ends were pulled off due to the hitch link pin coming out and were replaced at	13	111

FRAME

Frame Levelling: The frame required relevelling four times during the test; twice due to the depth control chain breaking and twice due to the chain stretching. It is recommended that the manufacturer modify the depth control chain to reduce this problem.

Depth Control Stop: The weld on the front upright of the depth control stop bracket (FIGURE 11) cracked and had to be rewelded. Since the entire weight of the cultivator in transport position is supported by this bracket, adequate welding should be provided.

Bumper Pins: At the end of tests there was considerable wear on the bumper pins located between the main frame and first wing sections (FIGURE 12). The rockshaft arms pivot and slide on the pins when raising the wings for transport, causing pin wear.

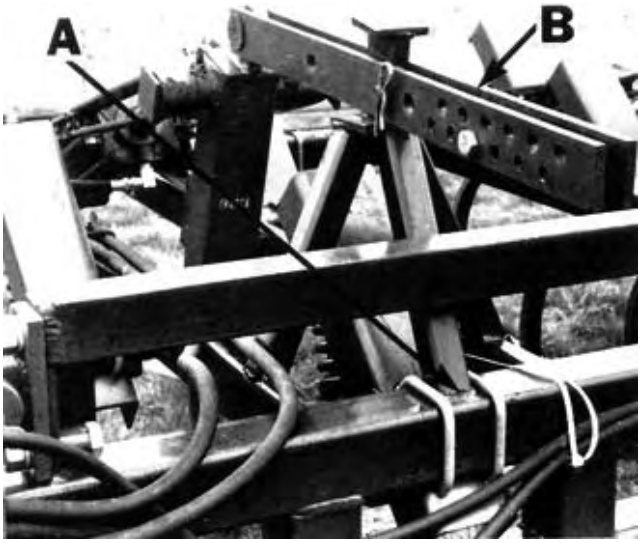

FIGURE 11. Weld Failure on Depth Control Upright: (A) Weld Failure, (B) Depth Control Bars.

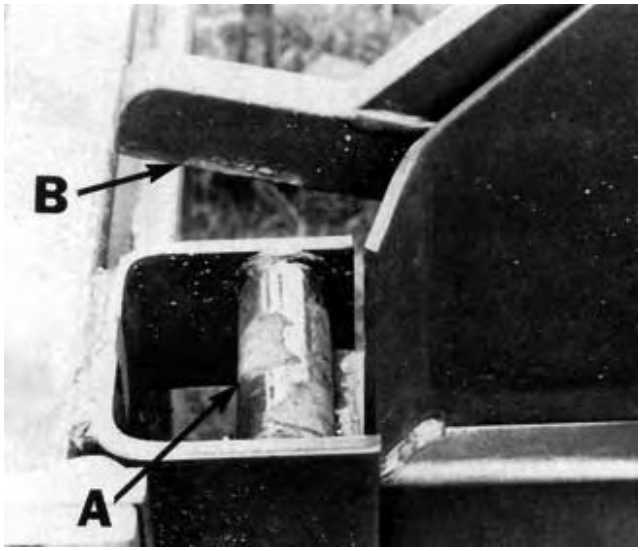

FIGURE 12. Worn Bumper Pin: (A) Bumper Pin, (B) Rockshaft Arm.

APPENDIX I

SPECIFICATIONS
MAKE: Friggstad Heavy Duty Cultivator
MODEL: C5-43
SERIAL NUMBER: C-78-75
MANUFACTURER: Friggstad Manufacturing Ltd.
Frontier, Saskatchewan
S0N 0W0

DIMENSIONS:	**FIELD POSITION**	**TRANSPORT POSITION**
-width	13,300 mm	8050 mm
-length	7190 mm	7190 mm
-height	2100 mm	4500 mm
-maximum ground clearance	115 mm	115 mm
-wheel tread	12,560 mm	3390 mm

SHANKS:	
-number	43
-lateral spacing	305 mm
-trash clearance (frame to sweep tip)	730 mm
-number of shank rows	3
-distance between rows	1016 and 914 mm
-shank cross section	32 x 51 mm
-shank stem angle	52°
-sweep hole spacing	57 mm
-sweep bolt size 1	1 mm
HITCH:	
-vertical adjustment range	356 mm
DEPTH CONTROL:	hydraulic
FRAME:	
-cross section	100 mm square tubing, 6.4 mm thick
TIRES:	
-centre section	4, 95L x 15, 8ply
-wings	8, 95L x 15, 6ply
-wing stabilizers	2, 9.5L x 15, 6 ply
NUMBER OF LUBRICATION POINTS:	
	4 grease fittings, 10 hour service
	12 wheel bearings, annual service
HYDRAULIC CYLINDERS:	
-main frame, depth control	1, 127 x 406 mm
-wing lift	2, 127 x 762 mm
	2, 100 x 610 mm

WEIGHTS:	**FIELD POSITION**	**TRANSPORT POSITION**
right stabilizer caster wheel	223 kg	
right outer wing wheels	445 kg	
right inner wing wheels	818 kg	
right centre wheels	1532 kg	2923 kg
left centre wheels	1532 kg	2923 kg
left inner wing wheels	818 kg	
left outer wing wheels	445 kg	
left stabilizer caster wheel	223 kg	
hitch	439 kg	629 kg
TOTAL	6475 kg	6475 kg

OPTIONAL EQUIPMENT:
-nine width options in the five section model varying trom 13 1 to 18 m

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

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