

# Evaluation Report

# 317



## Westgo 2220 Row Crop Cultivator

A Co-operative Program Between



# WESTGO 2220 ROW CROP CULTIVATOR

## MANUFACTURER:

Westgo Industries  
Box 547 West  
Fargo, North Dakota

## DISTRIBUTOR:

Robinson Alamo Dist. Ltd.  
1380 Waverley St.  
Winnipeg, Manitoba

## RETAIL PRICE:

\$9,518.00 (April, 1983, f.o.b. Portage la Prairie, Manitoba) 8-row, 36 inch (900 mm) spacing, with floating shields, semi-pneumatic guide wheels, single rib support wheels, offset gang brackets, 4 in (100 mm) sweeps.

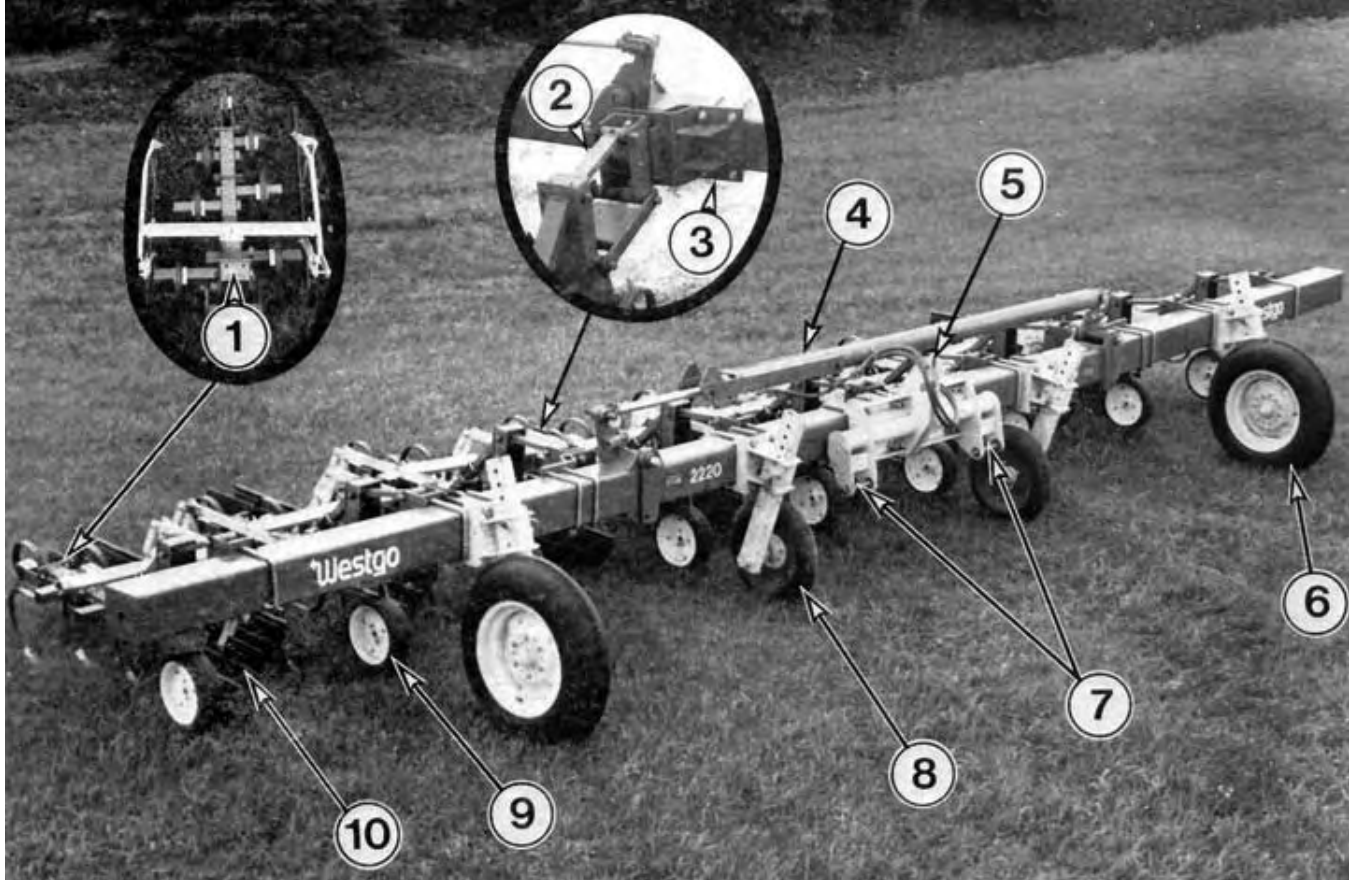


FIGURE 1. Westgo 2220: (1) Gangs, (2) Parallel Linkage, (3) Gang Offset Brackets, (4) Wing Fold Cylinder, (5) Upper Hitch Mast, (6) Support Wheels, (7) Lower Hitch Points, (8) Guide Wheels, (9) Gauge Wheels, (10) Shields.

## SUMMARY AND CONCLUSIONS

The overall performance of the Westgo 2220 row crop cultivator was good. Weed kill was good with the 4 in (100 mm) sweeps. Penetration was good in average field conditions.

The flexibility of the tines provided a high speed vibrating action, and allowed clearance of large stones. Trash burial in light and moderate trash was good. In areas of heavy trash the gangs on the Westgo 2220 tended to collect the trash, and eventually plug. This caused the gang to push the soil instead of tilling it. Only moderate skewing occurred where soil hardness varied across the machine width.

The wings on the Westgo 2220 could be folded and locked into the 90 degree transport position from the tractor seat. Putting the cultivator into field position required manual removal of the transport lock. The 8 in (200 mm) sweep-to-ground clearance was adequate for normal transport. Transporting on public roads required caution because of the machine's large transport width and height. The Westgo 2220 was stable during field work and in transport.

Tillage depth was usually level across the cultivator width. Fore-and-aft and lateral levelling was accomplished on the three-point hitch of the tractor. One man could hitch or unhitch the Westgo 2220 in about 4 minutes.

Total draft (pull force) under average row crop conditions

at 5 mph (8 km/h) varied from 1850 to 3200 lb (8 to 15 kN) for depths of 2 to 4 in (50 to 100 mm) respectively. Under average soil conditions, at 6.2 mph (10 km/h) and 4 in (100 mm) depth, the draft power requirement was 103 hp (77 kW). A tractor of about 130 hp (98 kW) was required for safe overall operation of the Westgo 2220.

A few mechanical problems developed during the 177 hours of field operation. The leading tip broke off of four sweeps after 114 hours. One parallel linkage hinge bolt broke and the two offset gang brackets bent.

## RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Working with the agricultural industry to make the cultivator more compatible with tractors having high profile tires.
2. Making tine helper springs available as an option to help break up hard packed soil.
3. Reinforcing the offset gang brackets to prevent bending when the cultivator is in transport.

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Project Coordinator - R.R. Hochstein

Project Engineer - D.J. May

## THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. The cultivator is positioned at a distance that we feel optimizes the clearance and minimizes the moment about the rear wheels on the majority of tractors it is used on. On most tractors with rear wheels of 34 in and smaller, there is adequate clearance without the use of a three-point quick attaching coupler. On tractors with 38 in rear wheels, a three-point quick attaching coupler must be used if guide wheels are positioned behind the rear wheels. The only units we are aware of in which there is an interface problem, are those units having 42 in rear wheels and using a guide wheel behind them. Generally, this problem can be overcome by positioning the guide wheels elsewhere on the toolbar.
2. A Model 2225 Row Crop Cultivator is offered, which incorporates a "Penetrator" tine. The toolbar, gangs, and options are the same as those used on the Model 2220 cultivator, however the tines are considerably heavier. It is a tine designed for areas in which the soil proves too heavy for a standard Danish tine. Its force/deflection ratio is approximately 2.2 times that of a standard Danish tine. It accepts a 2 bolt (1 1/4 - 2 1/2 C-C) shovel [field cultivator (47°) or row crop (52°)] rather than Danish tine shovels.
3. We market very few folding cultivators used with 36 in rows and have not previously experienced this problem: It will be reviewed and action will be taken.

## GENERAL DESCRIPTION

The Westgo 2220 is a mounted, folding, eight-row, row crop cultivator suitable for light tillage, and chemical incorporation in row crops of 36 in (900 mm) row spacing (adaptable to a 40 in (1000 mm) maximum row spacing). There are three gangs on the centre section, and three gangs on each of the wings. Each of the inner gangs has seven tines, while the two outer gangs have four tines each. The test machine was equipped with 4 in (100 mm) sweeps and open top floating row shields.

FIGURE 1 shows the location of the major components on the Westgo 2220. Support and guidance is controlled by the two support wheels on the wings and the guide wheels on the centre section. Tillage depth is controlled by the gauge wheels on each gang. The wings fold into transport position by means of one cylinder located above the centre section of the tool bar. A tractor with single remote hydraulic controls, and a category II or III three-point hitch is required to operate the Westgo 2220.

Detailed specifications are given in APPENDIX I.

## SCOPE OF TEST<sup>1</sup>

The Westgo row crop cultivator was operated under field conditions as shown in TABLE 1 for 177 hours, while cultivating 2165 ac (866 ha). It was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety, and suitability of the operator manual.

TABLE 1. Operating Conditions

Field Condition	Operating Hours	Equivalent Field Area*	
		ac	ha
<b>Soil Type</b>			
- sand	47	570	228
- sandy loam	58	710	284
- loam	39	475	190
- clay loam	33	410	164
Total	177	2165	866
<b>Crop</b>			
- corn	164	2005	802
- sunflowers	13	160	64
Total	177	2165	866

\*Equivalent Field Area includes two to three successive cultivations on the same field. Duration between cultivations was about two weeks.

During the test only a few small stones were encountered. They did not have a significant effect on the test. The cultivator was transported over 250 mi (420 km) on paved roads and 160 mi (270 km) on gravelled roads.

<sup>1</sup>Prairie Agricultural Machinery Institute Detailed Test Procedure for Row Crop Cultivators.

## RESULTS AND DISCUSSION

### QUALITY OF WORK

**Tine/Sweep characteristics:** There is a large variation in tine and sweep stem angles (FIGURE 2) on cultivators from different manufacturers. Sweeps and tines must be matched to obtain sufficient sweep pitch to achieve and maintain penetration. To achieve this, manufacturers usually recommend the use of sweeps with a stem angle from 0 to 5 degrees less than the tine stem angle.

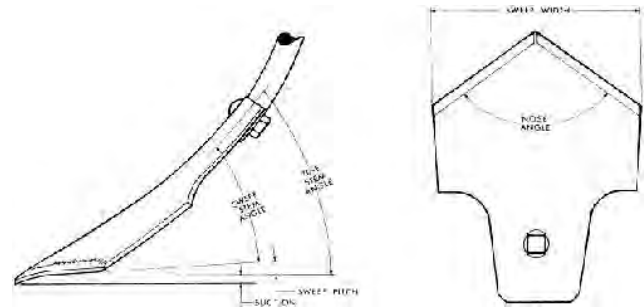


FIGURE 2. Tine and sweep terminology.

Sweep pitch increases in proportion to draft, due to the deflection of the tine (FIGURE 3). A small positive sweep pitch provides uniform tillage depth and a smooth furrow bottom, while excessive sweep pitch causes furrow ridging and rapid sweep wear.

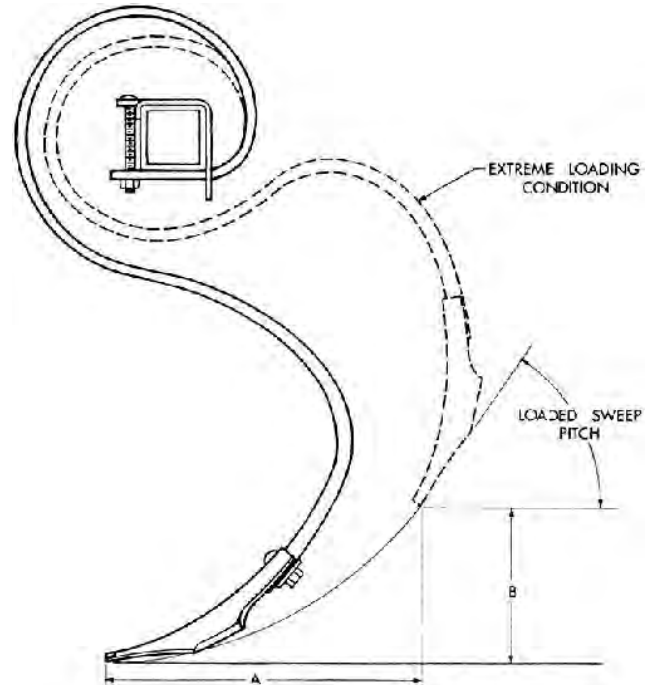


FIGURE 3. Schematic showing the increases in sweep pitch with increase in draft. This also illustrates the relative movement of a tine as it passes over an obstruction. (A) 10 in (250 mm), (B) 5.5 in (140 mm).

The force/deflection characteristics of the S-tine on the Westgo 2220 are presented in FIGURE 4. In general, the high speed vibrating action of the S-tines provided effective weed kill, crust shattering, and soil levelling.

**Penetration:** Overall penetration was good under average field conditions, but was not always uniform across the cultivator width. The cultivator tines behind the tractor and implement wheels tended to ride on top of hard soil, which had been packed by these wheels. It is recommended that the manufacturer consider making available optional tine helper springs to provide extra penetration force where required.

Uniform penetration also depended on the levelness of the cultivator. The wings could be kept rigid with the centre section by means of locking pins at the hinges, or left to float when operating on hilly land permitting the gangs to operate at the proper working height.

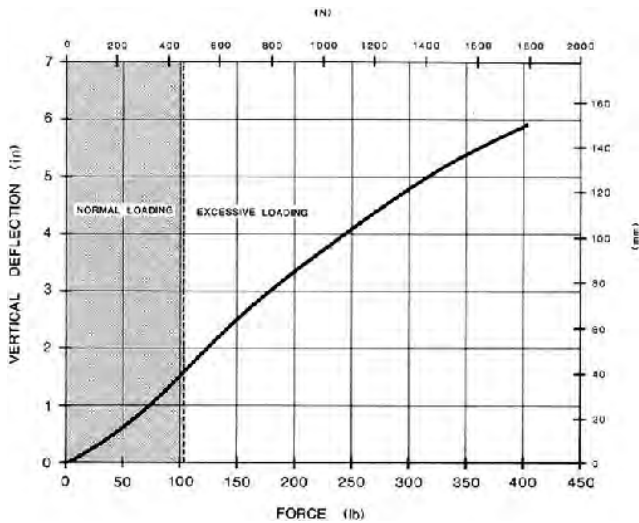


FIGURE 4. Tine deflection characteristics. (Excessive loading can occur in very hard soil or when contacting obstructions such as rocks).

**Trash Effects:** In row crop conditions of moderate or light trash (residue corn stalks and weeds) the Westgo 2220 plugged occasionally, and in areas of heavy trash it plugged continually. This problem was partially alleviated by reducing the number of tines, and spreading out the remaining tines on each gang. This lessened the weed kill effectiveness when using 4 in (100 mm) sweeps.

Another method of reducing plugging was to use a different sweep pattern. By forming an inverted "V" with the tines (FIGURE 5) trash was pushed to the outside of each gang instead of collecting in the natural funnel formed by the regular pattern. The square tubing, to which the tines were bolted, was removable making the inverted pattern easy to assemble. The inverted tine pattern had no effect on the hilling action and presented no problem with respect to crop damage.

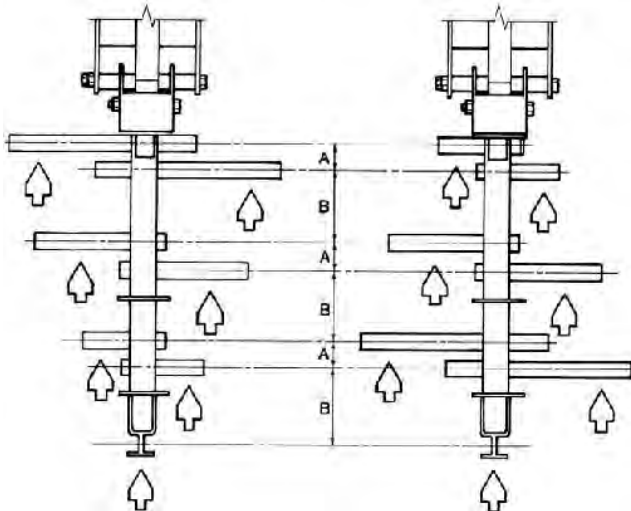


FIGURE 5. Tine configuration: (Left) Regular Pattern, (Right) Inverted Pattern, (A) 3 in (75 mm), (B) 10 in (255 mm).

Trash and weed burial was good with the Westgo 2220. In heavy trash conditions the dry, lighter stalks were left on top of the soil, while the moist, heavy ones were tilled under.

**Field Surface:** In normal row crop conditions, the field surface was left quite smooth with a small furrow between the rows and the soil slightly hilled towards the row (FIGURE 6). Open top shields were used during the first cultivation where crop height was about 2 to 12 in (50 to 300 mm). These provided young plants with very good protection.

**Furrow Bottom Ridging:** Furrow bottom ridging<sup>2</sup> was apparent wherever the ground was hard packed such as behind the tractor tire or in soils with a hard subsurface layer.

<sup>2</sup>Ridges left by ground tool in hard surface or subsurface soil.



FIGURE 6. Normal surface left by cultivator.

**Skewing and Stability:** The Westgo 2220 was stable and did not skew sideways under average field conditions. The symmetrical sweep pattern on each gang (FIGURE 5) did not impose any side forces on the cultivator during normal tillage. Some skewing did occur where soil hardness varied across the machine width despite the three-point hitch rigid mounting. No crop loss occurred due to skewing of the cultivator.

The Westgo used a parallel linkage with a wide stance lower link. The bolts through the parallel linkage occasionally loosened, causing side play in the gangs. To prevent skewing of the individual gangs, these bolts had to be tightened regularly, to the manufacturer's recommended torque of 60 lb-ft (80 N-m).

**Weed Kill:** Weed kill was good with the 4 in (100 mm) sweeps. The vibrating tine action increased weed kill by breaking lumps and exposing small weeds. Larger deep rooted weeds sometimes slipped past the sweeps without being cut off. In areas of heavily infested weeds the manufacturer recommends larger sweeps to permit greater overlap.

#### EASE OF OPERATION AND ADJUSTMENT

**Hitching:** One person could hitch or unhitch the cultivator in about 4 minutes. Bushings were provided to permit hitching the cultivator to tractors with a category II or III three-point hitch. As with all rear mounted implements, careful backing of the tractor was required to hitch the cultivator quickly. Care should be taken if more than one person is hitching the cultivator.

**Frame Levelling:** Levelling of the cultivator was achieved by shortening or lengthening the linkage on the three-point hitch. The two bottom links controlled the lateral levelling while the top link controlled the fore-and-aft levelling. The links were adjusted until all of the sweeps touched the ground at the same time. Some adjustments on the levelness could also be made at the support wheels.

**Tillage Depth:** Tillage depth was controlled by a gauge wheel at the front of each gang. There were no markings on the gauge wheel arms, making accurate depth control difficult. Raising the gauge wheel lowered the gang, thus increasing the tillage depth. The lower links on the three-point hitch had to be adjusted low enough to allow the cultivator to float at the required tool bar working height.

**Maneuverability:** Maneuvering the Westgo 2220 was convenient due to the three-point hitch rigid mount. Cultivating with the outer tines of each gang set close to the rows, required extra operator alertness to keep skewing loss to a minimum. The heavy cultivator weight required ballasting of the tractor front end, in order to retain tractor stability.

**Transporting:** The Westgo 2220 row crop cultivator was easily placed into transport position (FIGURE 7) by one person from the tractor seat in about two minutes. A self-locking transport lock kept the wings in the 90 degree position during transport. Caution should be observed when folding or unfolding the wings even though they move at a moderate speed.

Transport width of the test machine was 15.8 ft (4.8 m) while

transport height was 11.9 ft (3.6 m). Care was required when transporting on public roads, through gates, over bridges and beneath power lines.

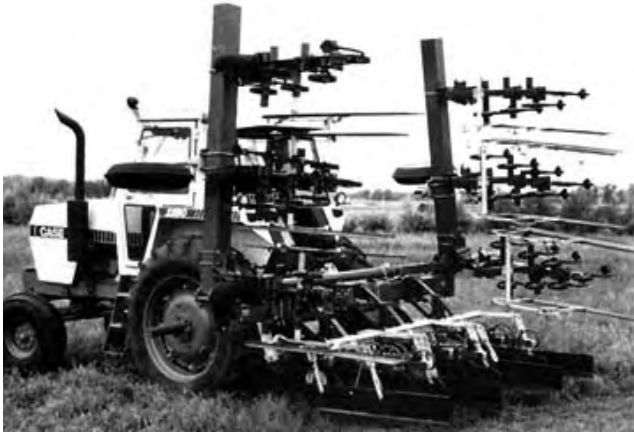


FIGURE 7. Transport position.

The Westgo 2220 transported well without sway at normal transport speeds. The transport sweep-to-ground clearance of 8 in (200 mm) was adequate on slopes and rough terrain. Care should be taken not to engage the clutch too quickly as the front tractor tires may tend to lift off of the ground, even when front end ballast is used.

**Sweep Installation:** The 57 sweeps could be changed by one person in about one hour. The sweep bolts were short enough to have their threaded ends completely covered by the retaining nuts, preventing thread damage during tillage. Sweep-to-ground clearance of 8 in (200 mm) was adequate for easy sweep removal.

**Tine Installation:** The tines were easily removed or adjusted by loosening one bolt and sliding them along the cross members.

#### POWER REQUIREMENTS

**Draft Characteristics:** FIGURE 8 shows draft requirements per row for the Westgo 2220 under average field conditions at a speed of 5 mph (8 km/h) in moist clay loam. It should be noted that variation in soil conditions affect draft much more than variation in machine make, usually making it difficult to measure significant draft differences between different makes of row crop cultivators.

Increasing speed by 0.6 mph (1 km/h) increased draft by about 22 lb/row (100 N/row). This represents a draft increase of about 180 lb (800 N) for the eight-row test machine.

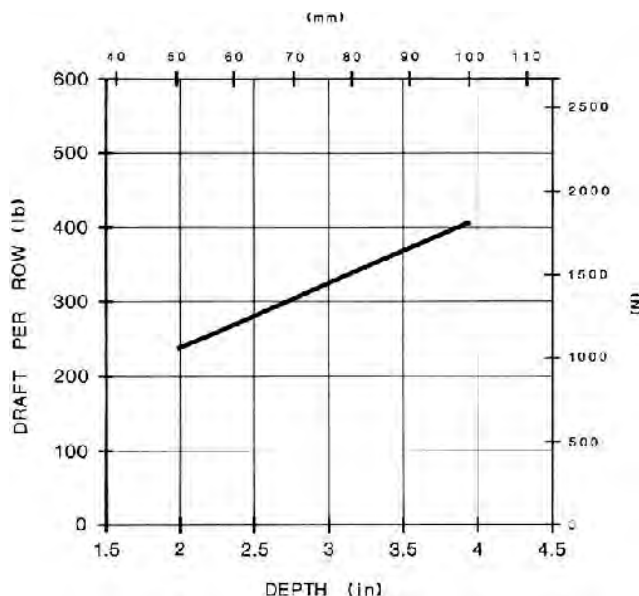


FIGURE 8. Typical draft requirements for Westgo 2220 at 5 mph (8 km/h), under average conditions.

Actual draft power requirements for the Westgo 2220 at the 4 in (100 mm) depth varied from 84 to 117 hp (63 to 87 kW) for

speeds of 4.3 to 7.5 mph (7 to 12 km/h) respectively.

**Tractor Size:** Tractor size was dictated by the stability requirements for this eight-row test cultivator. A tractor (with front ballasting) of about 130 hp (98 kW) was suitable.

#### OPERATOR SAFETY

Power lines may be as low as 15 ft (4.6 m) in the three prairie provinces. With a transport height of 11.9 ft (3.6 m) the Westgo 2220 was safely transported under power and telephone lines.

The test machine was 15.8 ft (4.8 m) wide in transport position. This necessitated caution when transporting on public roads, over bridges and through gates. A slow moving vehicle sign was not provided by the manufacturer.

The cultivator could be safely hitched to a tractor by one person. If additional personnel are involved with hitching the cultivator, they should stand behind the cultivator, away from the tractor, for maximum safety.

#### STANDARDIZATION

**Hitching:** During the test some difficulty was encountered with hitching the cultivator to some tractors. The hitch pins were so close to the cultivator frame that high profile tractor tires would sometimes rub on the cultivator guide wheels (FIGURE 9). More standardization is needed in this area. It is recommended that the manufacturer work with the agricultural equipment industry to make the cultivator more compatible with tractors having high profile tires.



FIGURE 9. Interference between tractor tire and cultivator.

#### OPERATOR MANUAL

The operator manual included instructions on set up, operation, maintenance, and safety. It was well written and clearly illustrated.

#### DURABILITY

The intent of this evaluation was a measure of general performance. An extended durability evaluation was not conducted.

The following is a discussion of the mechanical history of the Westgo 2220 during 177 hours of field evaluation while tilling about 2165 ac (866 ha).

**Sweeps:** Of the 57 sweeps, the seven located behind each tractor tire and the rearmost sweep of each gang wore the quickest, and had to be replaced regularly [about 70 hours or 850 ac (340 ha)]. The remaining sweeps were replaced as they were worn [about 150 hours or 1835 ac (735 ha)]. Six sweeps broke across the leading tip at 114 hours or 1395 ac (560 ha). This did not represent a serious problem since the sweeps were appreciably worn and required replacement.

**Gangs:** One parallel linkage hinge bolt broke. Over tightening or a large lateral force are possible causes. These bolts often required tightening throughout the test.

**Gang Offset Brackets:** The gang offset brackets used to mount the gangs directly behind the frame hinges, tended to bend from the weight of the gang (FIGURE 10) when the cultivator was moved in transport position (FIGURE 7). This problem continued to the point where the two gangs were no longer parallel with the crop rows. It is recommended that the manufacturer consider reinforcing the offset

brackets to prevent bending when the cultivator is in transport.

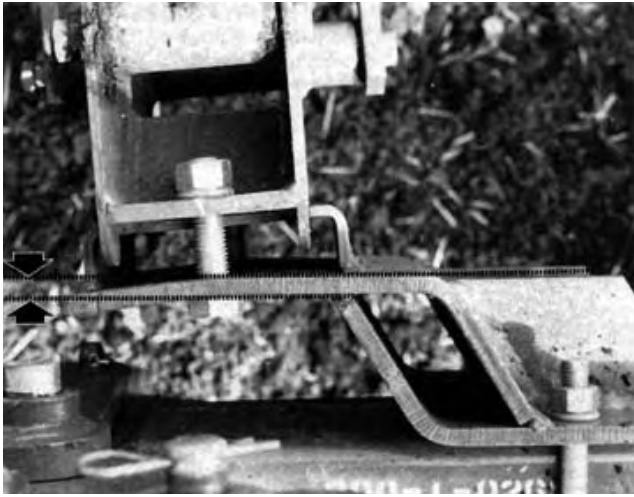


FIGURE 10. Bent gang offset brackets, left (top view).

**APPENDIX I  
SPECIFICATIONS**

<b>MAKE:</b>	Westgo	
<b>MODEL:</b>	2220, eight-row, 36 inch spacing	
<b>DIMENSIONS:</b>	<b>FIELD POSITION</b>	<b>TRANSPORT POSITION</b>
	<b>ft (m)</b>	<b>ft (m)</b>
-- width	27.8 (8.5)	15.8 (4.8)
-- length (from lower hitch point to rear of cultivator)	6.4 (2.0)	6.1 (1.9)
-- height	3.7 (1.1)	11.7 (3.6)
-- ground clearance		0.7 (0.2)
<b>TINES:</b>		
-- number	57	
-- trash clearance (frame to sweep tip)	15 in (390 mm)	
-- number of tine rows	7	
-- longitudinal distance between tine rows		
- first-second	3 in (75 mm)	
- second-third	10 in (255 mm)	
- third-fourth	3 in (75 mm)	
- fourth-fifth	10 in (255 mm)	
- fifth-sixth	3 in (75 mm)	
- sixth-seventh	10 in (255 mm)	
-- tine cross section	1.3 x 0.4 in (33 x 10 mm)	
-- sweep bolt size	3/8 x 1-1/8 in UNC	
<b>TINE TREES:</b>		
-- number of tines per gang	7	
-- weight with shields (seven tines)	233 lb (106 kg)	
-- weight without shields	176 lb (80 kg)	
-- gauge wheel adjustment	10 in (260 mm)	
-- gauge wheel angle	20°	
-- maximum width of cut per tree	30 in (760 mm)	
<b>HITCH AND DEPTH CONTROL:</b>		
-- three-point hitch	Category II and III	
<b>FRAME:</b>		
-- type	90° folding wings	
-- tool bar	7 in (178 mm) square tubing, 0.2 in (6 mm) wall	
-- tine tree	2 in (51 mm) square tubing, 0.1 in (3 mm) wall	
<b>SUPPORT WHEELS:</b>		
-- adjustment	10 in (255 mm)	
-- tire	two, 6.00 x 16, 4-ply	
<b>GUIDE WHEELS:</b>		
-- adjustment	10 in (255 mm)	
-- tires	two, 4.50 x 20 High Peak Point	
<b>NUMBER OF LUBRICATION POINTS:</b>	36 grease fittings	
<b>HYDRAULIC CYLINDERS:</b>		
-- wing lift	one, 4 in x 23 in (100 mm x 585 mm)	
<b>WEIGHTS:</b>		
-- overall with shields	3690 lb (1680 kg)	
-- overall without shields	3230 lb (1470 kg)	
<b>OPTIONAL EQUIPMENT:</b>		
-- tunnel, rolling or open shields		
-- dual disc/dual knife combinations		
-- guide coulters		
-- gauge and guide wheels		

**APPENDIX II  
MACHINE RATINGS**

The following rating scale is used in Machinery Institute Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

**APPENDIX III  
CONVERSION TABLE**

<b>IMPERIAL UNITS</b>	<b>MULTIPLY BY:</b>	<b>SI UNITS</b>
Acre (ac)	0.405	Hectare (ha)
Foot (ft)	0.305	Metre (m)
Inches (in)	25.4	Millimetres (mm)
Horsepower (hp)	0.746	Kilowatt (kW)
Miles/Hour (mph)	1.61	Kilometre/hour (km/h)
Pounds Force (lb)	4.45	Newton (N)
Pounds Force/Foot (lb/ft)	14.6	Newton/Metre (N/m)
Pounds Force-Feet (lb-ft)	1.36	Newton-Metre (N-m)
Pounds Force/Square inch (psi)	6.89	Kilopascal (kPa)
Pounds Mass (lb)	0.454	Kilogram (kg)

# SUMMARY CHART

## WESTGO 2220 ROW CROP CULTIVATOR

QUALITY OF WORK	<u>EVALUATION</u>	<u>COMMENTS</u>
Penetration	<b>Good</b>	reduced in hard packed soil
Trash Clearance	<b>Fair</b>	plugging in trashy conditions
Trash Burial	<b>Good</b>	moist, heavy stalks well buried
Field Surface	<b>Good</b>	generally left smooth and flat no hilling capability
Weed Kill	<b>Good</b>	with 4 inch sweeps
<b>EASE OF OPERATION AND ADJUSTMENT</b>		
Hitching	<b>Very Good</b>	about 4 minutes for Category III
Frame Levelling	<b>Good</b>	additional adjustment at support & guide wheels
Tillage Depth	<b>Fair</b>	no markings on gauge wheel arms
Maneuverability	<b>Very Good</b>	three point hitch rigid mount
Transporting	<b>Good</b>	large width and height self locking transport lock
Sweep Installation	<b>Good</b>	adequate sweep-to-ground clearance
Tine Installation	<b>Very Good</b>	easily slid along cross member
<b>OPERATOR SAFETY</b>	<b>Good</b>	large transport width and height caution decals provided
<b>OPERATOR MANUAL</b>	<b>Good</b>	well written and clearly illustrated
<b>POWER REQUIREMENTS</b>	Per Row	Total
Draft at 5 mph (8 km/h)	310 lb (1.4 kN)	2,500 lb (11.1 kN) in clay loam
Draft increase per mph (1.6 km/h)	35 lb (0.2 kN)	280 lb (1.3 kN)
Minimum Overall Tractor Size		130 hp (98 kW) for cultivator stability
 <b>CAUTION:</b> This summary chart is not intended to represent the final conclusions of the evaluation report. The relevance of the ratings is secondary to the information provided in the full text of the report. It is not recommended that a purchase decision be based only on the summary chart.		

 <p><b>ALBERTA FARM MACHINERY RESEARCH CENTRE</b></p>	<p><b>Prairie Agricultural Machinery Institute</b>            Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0            Telephone: (306) 682-2555</p>		
<p>3000 College Drive South            Lethbridge, Alberta, Canada T1K 1L6            Telephone: (403) 329-1212            FAX: (403) 329-5562  <a href="http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html">http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html</a></p>	<table style="width: 100%;"> <tr> <td style="width: 50%;">           Test Stations:            P.O. Box 1060            Portage la Prairie, Manitoba, Canada R1N 3C5            Telephone: (204) 239-5445            Fax: (204) 239-7124         </td> <td style="width: 50%;">           P.O. Box 1150            Humboldt, Saskatchewan, Canada S0K 2A0            Telephone: (306) 682-5033            Fax: (306) 682-5080         </td> </tr> </table>	Test Stations: P.O. Box 1060 Portage la Prairie, Manitoba, Canada R1N 3C5 Telephone: (204) 239-5445 Fax: (204) 239-7124	P.O. Box 1150 Humboldt, Saskatchewan, Canada S0K 2A0 Telephone: (306) 682-5033 Fax: (306) 682-5080
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