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EVALUATION REPORT 358

International Harvester 800 Cyclo-Air Row Crop Planter

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

INTERNATIONAL HARVESTER 800 CYCLO-AIR ROW CROP PLANTER

MANUFACTURER:

International Harvester Co.
401 North Michigan Ave.
Chicago, Illinois
60611 U.S.A.

DISTRIBUTOR:

International Harvester Co.
District Office
215-1661 Portage Avenue
Winnipeg, Manitoba
R3J 3T7

RETAIL PRICE:

$29,142 Canadian Funds (March 1984, f.o.b.. East Moline, Illinois) 8 rows wide, with Endwise Transport attachment, granular fertilizer hoppers, and Performance Center Monitor.

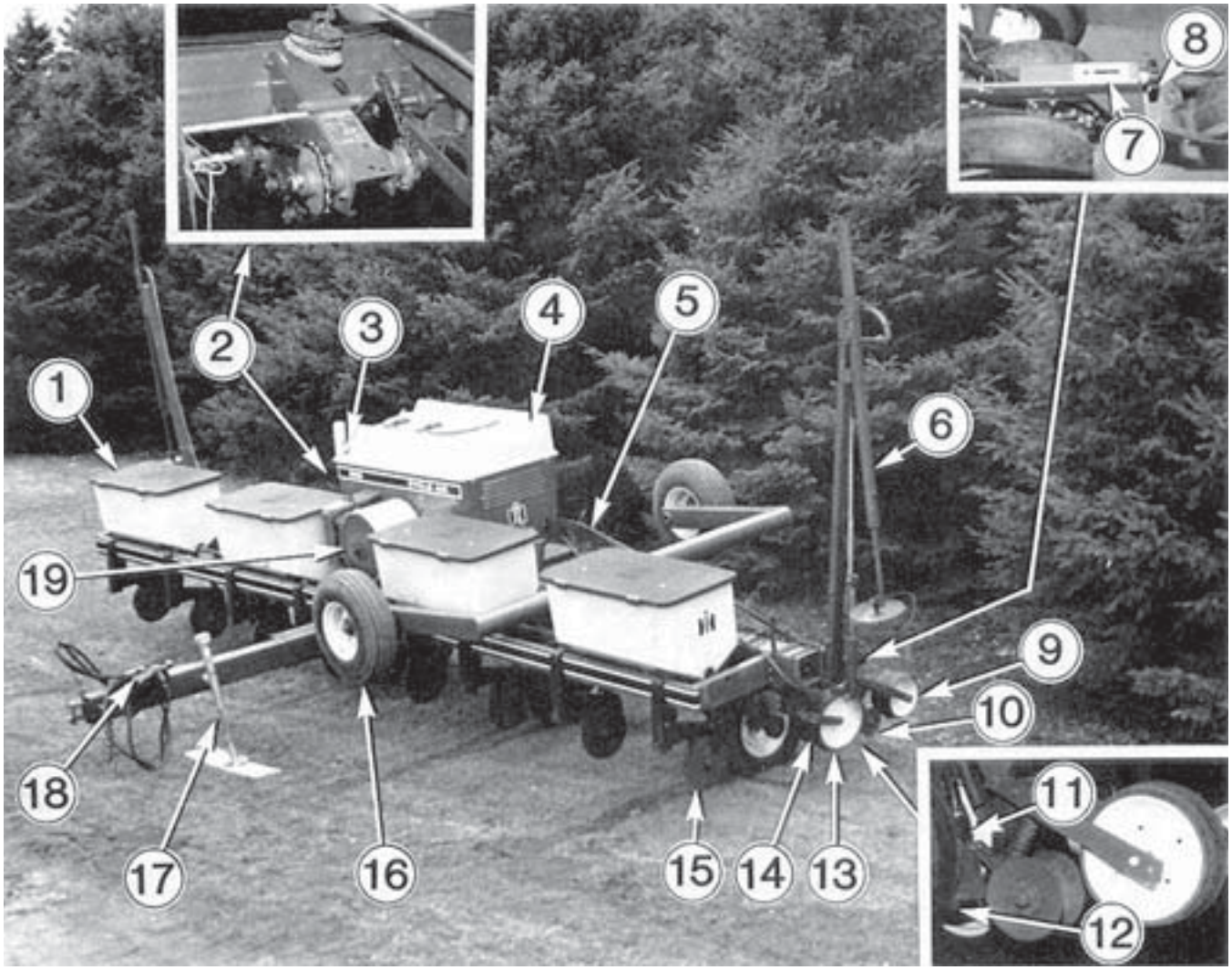


FIGURE 1. International 800 Cyclo-Air: (1) Granular Fertilizer Hoppers, (2) Seed Drive Transmission, (3) Air Pressure Gauge, (4) Seed Hopper, (5) Seed Delivery Tubes, (6) Hydraulic Row Marker, (7) Depth Adjusting Scale, (8) Depth Adjustment Knob, (9) Press Wheel, (10) Closing Wheels, (11) Seed Sensor, (12) Furrow Firming Point, (13) Depth Gauge Wheels, (14) Seed Disk Openers, (15) Fertilizer Disk Openers, (16) Transport Wheels, (17) Safety Stand, (18) PTO Hydraulic Pump.

SUMMARY AND CONCLUSIONS

Functional performance of the International Harvester 800 Cyclo-Air row crop planter was very good.[1]

Seed Metering: The spacing of corn seed at 5 mph (8 km/h) using the seed drum metering system was very good on the centre rows of the planter, particularly when planting round seed. However spacing of flat corn seed and large sunflower seed was only fair, particularly on outside rows. Increases in ground speed also decreased the seed spacing accuracy of this system.

Actual overall population rates were excellent for white beans and soybeans when compared to rates stated in the operator manual.

Operating on 11 degree slopes had no significant effect on the accuracy of the system.

Fertilizer Application: Actual fertilizer rates were only slightly higher than rates stated in the fertilizer chart, for the “high” and “extra high rate” augers. However, actual fertilizer rates for the “low rate” auger was significantly higher than the stated rates.

Penetration: Penetration of the seed disk openers was excellent in all field conditions tested. However, penetration of the fertilizer disk openers was reduced in heavy clay soils.

Soil Finishing: Coverage of seed was excellent and consistent in field conditions tested, particularly at 5 mph (8 km/h).

Soil was pushed on top of the seed by two inverted closing wheels then compacted by the press wheels. Seedlings emerged in the narrow groove left by the rib on the press wheel.

Monitor: The Performance Center monitor supplied with the test machine, provided easy to read information in either Imperial or SI (metric) units of measurement.

The ability of the monitor to detect the number of seeds per drum revolution, drum rpm, drum pressure, and seed hopper

[1] *See Rating Table APPENDIX II.*

level was very good. Accuracy of the ground speed and area calculations could not be tested because the ground speed sensor failed to function throughout the test.

Ease of Operation and Adjustment: Seeding rates were easy to adjust on the seed drive sprocket transmission. The fertilizer drive transmission was not as convenient.

The central seed hopper was convenient to fill if the planter was in a lowered position. The large fertilizer hoppers were filled using a long spout on a drill fill. The operator usually stood on the tool bar to direct the flow of fertilizer. Latches and holding straps for the hopper lids were handy.

The narrow width of the endwise transport position allowed for safe movement on roads. Caution was necessary when driving through some field approaches because of low ground clearance of the fertilizer disks nearest the tractor hitch.

Power Requirements: A 90 hp (67 kW) tractor with a 540 or 1000 rpm PTO shaft is the minimum tractor size recommended.

Operator Safety: The International Harvester 800 Cyclo-Air row crop planter was safe to operate provided normal safety precautions were observed.

Operator Manual: The operator manual was very good. Clear illustrations and well written text provided instruction on safety, operation and maintenance of the machine. An excellent pocket guide was also provided with helpful hints and suggestions for planting a variety of crops. Seed rate and fertilizer rate charts were also included in the guide.

Mechanical Problems: The ground speed sensor failed at the beginning of the test. The replacement part also failed. Wearability of disk openers, disk scrapers and furrow firming points was very good over the duration of the test.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifying the seed delivery tubes or using a second seed hopper and drum system to improve seed spacing accuracy on rows furthest from the seed hopper.
2. Recalibrating the fertilizer rate chart in the operator guide, for the “low rate” augers.
3. Increasing the amount of downward force that can be exerted by the fertilizer disk openers to improve penetration in heavy clay soils.
4. Improving the stability of the row markers in rough field conditions.
5. Modifying the ground speed sensor to accurately measure ground speed and field area.
6. Modifying the fertilizer rate transmission to improve convenience in fertilizer rate selection and to eliminate interference between the tool bar and the chain.
7. Rerouting or covering monitor wires on the tool bar to protect them from being tread upon by the operator when filling the fertilizer hoppers.
8. Protecting the seed drum speed sensor from dust or providing a sensor that is less sensitive to dust.
9. Providing a fertilizer rate chart in the operator manual.

Senior Engineer: G.M. Omichinski

Project Engineer: C. W. Bolton

THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. Modifications of seed tubes and materials have shown no improvement. Seed spacing accuracy is a result of the air pressure, brush setting, ground speed, size, shape and uniformity of seed. Population accuracy is the major objective.
2. Rates tend to vary from one auger to another due to density and flowability of fertilizer.
3. Present design is for conventional and minimum tillage operation. Consideration will be given to providing increased penetration in future developments. Present design is comparable to our major competitor.
4. Heavier material components were released for 83 service and 84 production.
5. No modifications are required to accurately measure ground and field area when sensor is working. We will investigate why the sensor did not function.
6. We will investigate demand for additional sprockets for the basic attachment.
7. Fertilizer hopper is low enough to fill from ground level. We recommend the unit be lowered to the ground when filling hoppers.
8. A more sensitive sensor was released and the tape was removed from the bottom of the sensor to prevent dirt from collecting in the sensor.
9. Fertilizer and chemical rate charts will be added to the new manual.

GENERAL DESCRIPTION

The eight-row wide International Harvester 800 Cyclo-Air tested (FIGURE 1) is a trailing, row crop planter designed to plant crops such as corn, sunflowers, beans, sugar beets and sorghum.

The seed is fed from the centralized, 15 bu (546 L) seed hopper under air pressure through the seed delivery chute to the seed drum (FIGURE 2). The air pressure can be changed by adjusting the tractor rpm or adjusting the flow control valve on the hydraulic pump. The levelling bar maintains 2 to 3 inches of seed in the bottom of the seed drum. As the seed drum rotates, seeds are picked up in the perforated pockets of the seed drum. The speed at which the seed drum rotates is determined by ground speed and the sprocket combination selected on the seed drive transmission. The seed is held in place by a positive air pressure within the drum. The seed cut-off brush removes excess seed from the pockets. The seed deflector screen prevents the excess seed from entering the seed manifold. The seed release wheels then block the perforations allowing the seed to be drawn into the seed manifold and then into the seed delivery tubes. The seeds, forced by air, travel through the seed delivery tubes to the individual row units.

The eight seed units spaced 36 in (91 cm) apart are mounted on the back of the tool bar. Each unit consists of two offset seed disk openers, two depth gauge wheels, a furrow firming point, seed delivery tube, two closing wheels and a press wheel. The 14 in (36 cm) offset seed disk openers cut a narrow furrow in the soil. The depth of this furrow is controlled by the equalizing depth gauge wheels. The furrow firming point firms the bottom of the furrow. The seed is then deposited from the seed delivery tube and quickly covered with soil by the two 8 in (20 cm) inverted covering disks. A wide press wheel compacts the soil overtop of the seed.

The test machine is equipped with four 9.6 ft³ (270 L) optional fiberglass, granular fertilizer hoppers. Fertilizer is placed in the ground by spring loaded double disk openers. The rate of application is determined by selecting one of three augers and the desired sprocket combination on the fertilizer drive transmission.

The monitor, supplied with the test machine, is the Performance Center (FIGURE 3) with a ground speed sensor. In addition to the visual display windows, planting malfunctions are also signalled by an alarm. Parameters of the monitor included monitoring the seed tubes, seed hopper level, seed drum speed, drum pressure, and ground speed. The seeds per drum revolution can be displayed for a selected row or indicate the row giving the highest and lowest seeding rates. Field area, area per hour, seeds per area, and total area can also be calculated by the monitor.

The test machine was equipped with an “end-wise” transport attachment.

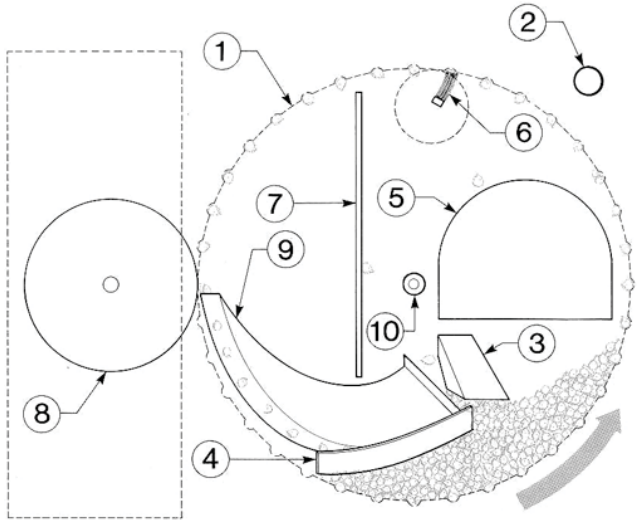
Detailed specifications are given in APPENDIX I.

SCOPE OF TEST[2]

The International Harvester 800 Cyclo-Air row crop planter was operated in various field conditions (TABLE 1) for about 100 hours while seeding 610 ac (247 ha) of corn and 140 ac (57 ha) of sunflowers. It was evaluated for quality of work, ease of operation and adjustment, rate of work, power requirements, operator safety and suitability of the operator manual.

In addition to field testing, the seed and fertilizer metering system were tested in the laboratory for accuracy on level and sloped operating conditions.

[2] *Prairie Agricultural Machinery Institute Detailed Test Procedure for Row Crop Planters*



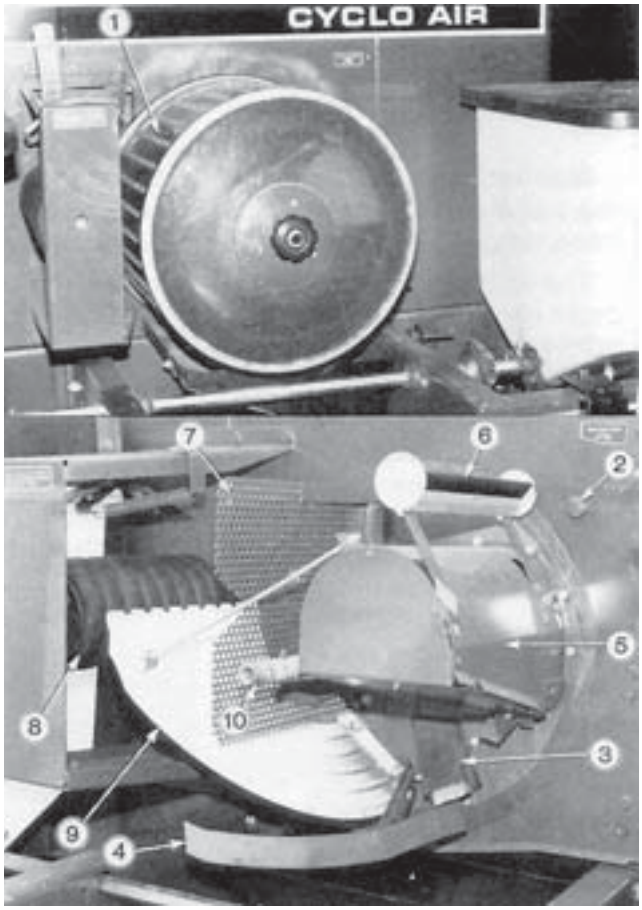


FIGURE 2. Seed Drum Metering System: (1) Seed Drum, (2) Seed Delivery Chute Shut-off Control Knob, (3) Seed Delivery Chute, (4) Levelling Bar, (5) Air Director, (6) Seed Cut-off Brush, (7) Seed Deflector Screen, (8) Seed Release Wheels, (9) Seed Manifold, (10) Seed Drum Shaft.

FIGURE 3. Performance Center Monitor.

TABLE 1. Operating Conditions

FIELD CONDITIONS	HOURS	FIELD AREA	
		ac	ha
Soil type:			
-- clay	6	40	16
-- clay loam	19	140	57
-- sandy loam	20	150	61
-- sand	55	420	170
Total:	100	750	304
Trash cover:			
-- heavy	27	195	79
-- light	52	395	160
-- none	21	160	65
Total:	100	750	304

RESULTS AND DISCUSSION

QUALITY OF WORK

Seed Metering: Accuracy of the seed drum metering system was tested in the laboratory using eight different samples of corn and a sample of large sunflowers. The ground speeds selected were 5 mph (8 km/h), considered an average planting speed and 8 mph (13 km/h), the maximum speed recommended by the manufacturer for the crop and seeding rate being tested.

The results were recorded in terms of a Quality of Feed Index[3]. This index represents the percentage of seeds from the samples that were planted within the range of 0.5 to 1.5 times the desired seed spacing. TABLE 2 shows the Quality of Feed Index of eight different corn samples at a seeding rate of 22,150 seeds/ac (55,380 seeds/ha) on a level surface. The results varied significantly on different rows. An index of 95% or better was considered to be excellent.

TABLE 2. Quality of Feed Index Results for Corn

Corn Size	Quality of Feed Index					
	5 mph (8 km/h)			8 mph (13 km/h)		
	Center Row %	Outside Row %	Average %	Center Row %	Outside Row %	Average %
Small, Round	99	94	96	96	78	87
Small, Plateless	98	88	93	94	73	84
Medium, Flat	96	89	93	93	72	83
Medium, Round	97	88	92	92	70	81
Large, Round	94	83	89	88	62	75
Large, Plateless	95	79	87	86	61	74
Large, Flat	89	79	84	85	60	72
Small, Flat	85	71	78	82	59	71

The most accurate results were achieved using small round seed. At 5 mph (8 km/h) all seed samples except the large flat and small flat seed had a Quality of Feed Index of 95% or greater for the centre row. However, the results were less than 95% for all seed samples on the outside rows. Test showed that the Quality of Feed Index decreased for each row farther from the hopper i.e. the row units with longer seed delivery tubes. The overall seed population was not affected, however, indicating that the seed drum was metering the seed accurately and that the seed spacing problems were being caused in the seed delivery tubes.

It is recommended that the manufacturer consider modifying the seed delivery system or using a second seed hopper and drum system to improve seed spacing accuracy for the rows farthest from the seed hopper.

When ground speed was increased to 8 mph (13 km/h) the Quality of Feed Index dropped 3% to 7% on the centre rows and 12% to 21% on the outside rows. Again, the overall seed population was not significantly affected for any of the rows.

The Quality of Feed Index for large sunflower seed at 5 mph (8 km/h) ranged from 85% for the centre rows to 70% on the outside rows. The seed spacing accuracy of the outside row was considered to be unsatisfactory. Overall population counts indicated that the problem of seed spacing was again caused in the seed delivery tubes.

The 72 hole edible bean seed drum was used for planting white beans. Actual overall population rates, on all rows, at 5 mph (8 km/h) were within 5% of the rates stated in the operator manual. This was the highest speed recommended for planting beans 2 in (5 cm) apart with this seed drum.

When using the 144 hole soybean seed drum, the overall

[3]*International Organization for Standardization ISO/DIS 7256/1 Sowing Equipment-Method of the Test-Part 1: Single Seed Drills (Precision Drills).*

population rates for soybeans were very close to rates stated in the manual at 5 mph (8 km/h) but differed by 5% to 10% when the speed was increased to 8 mph (13 km/h).

On uphill slopes greater than 5°, the seed would not reach the end of the seed drum, thus causing the planter to under populate on rows fed by the holes at the end of the seed drum. On 11° uphill slopes, no seed was planted in the last three rows of the seed drum.

Downhill slopes and sidehill slopes of 11° had no effect on the Quality of Feed Index.

Fertilizer Application: The three fertilizer augers were tested for metering accuracy in the laboratory. The application rates in the operator manual (based on 62 lb/ft³) were adjusted slightly to compensate for the difference in density of the test sample (55 lb/ft³). TABLE 3 shows the actual application rates for the "high" and "extra high" augers were very good, being less than 10% higher than the manufacturers stated rates. However, application rates were 31% to 38% higher when using the "low rate" augers. It is recommended that the manufacturer consider recalibrating the fertilizer chart for the low rate fertilizer augers.

TABLE 3. Fertilizer Rates at 5 mph (8 km/h)

Auger	Sprocket Setting	Machinery Institute		Manufacturer		% Difference
		lb/ac	kg/ha	lb/ac	kg/ha	
Low	20-30	54	61	39	44	+38
Low	34-24	113	128	84	95	+35
Low	36-16	174	197	133	150	+31
High	20-30	108	122	102	115	+6.1
High	34-24	228	258	216	244	+5.8
High	36-16	346	391	344	389	+0.4
Extra high	20-30	148	167	142	160	+4.0
Extra high	34-24	320	362	303	342	+5.7
Extra high	36-16	524	592	481	544	+9.0

Operating up and down 11° slopes had no significant effect on fertilizer rates. However, when compared to operating on level ground, operating on 11° side slopes caused 10% to 35% more fertilizer to be delivered to downspouts at the lower end of the hoppers and 10% to 15% less fertilizer delivered to downspouts at the higher end of the hoppers.

Penetration: Penetration of the seed disk openers was excellent in all field conditions tested. In sandy clays and loam, the penetration of the fertilizer disks was very good. However in heavy clay soils, penetration was greatly reduced. In the heavy soil position, the vertical force of the fertilizer disk openers was 300 lbs (1335 N).

It is recommended that the manufacturer consider increasing the amount of force that can be exerted by the fertilizer disk openers.

Seeding Depth: Seed placement was very good in most field conditions. At 5 mph (8 km/h) nearly all the seed was placed within 0.5 in (13 mm) of the average seeding depth. At higher speeds and deeper seeding depths a slight increase in variation occurred.

Soil Finishing: Placement and covering of seed with this system was considered to be excellent. Two inverted closing wheels covered the seed with soil from the sides of the seed furrow. A wide press wheel then gently compacted the soil on top of the seed. The amount of force exerted by these press wheels was adjustable. The rib in the centre of the press wheel left a very small groove in the soil. Nearly all the seedlings emerged in this small groove.

Drive Chains: In trashy field conditions, stalks and debris sometimes wrapped around the sprockets on the drive wheel causing the drive chain to come off or break. The optional drive chain guards, which were not tested, might eliminate this problem.

Row Markers: The hydraulic row markers worked well in most field conditions tested. However, in some conditions the motion of the markers was jerky and uneven. It is recommended that the manufacturer brace or slightly increase the weight of the row markers to improve stability.

Monitor and Control Systems: The Performance Center Monitor (FIGURE 3) and ground speed unit were supplied with the test machine. Several functions and calculations could be done in either Imperial or SI units of measurement.

The ability of the monitor to measure seeds per drum revolution in crops tested, drum rpm, drum pressure and seed hopper level was very good. The ground speed and area calculations could not be used because the ground speed sensor failed to function. It is recommended that the manufacturer consider modifying the ground speed sensor to accurately measure ground speed and field area.

Performance of the control box to manually or automatically select the desired row marker was very good.

EASE OF OPERATION AND ADJUSTMENT

Hitching: When hitching the planter to the tractor drawbar, it was important that the planter frame was level and 20 in (51 cm) above the ground. The hydraulic pump was mounted on the PTO shaft and anchored to the drawbar. Hitching was completed by securing the safety chain and connecting one set of hydraulic hoses and two electrical pin connectors for the monitor, and row marker control console.

Application Rates: Planting rates were very easy to change on the seed drive transmission, conveniently located on the back of the tool bar. Loosening two chain tightener brackets and removing two klik pins and two spacers allowed the operator to quickly change the combination of sprockets being used. Unused sprockets were stored on the tool bar close to the seed drive transmission.

One hundred and twenty-five different sprocket combinations were possible, allowing the seed population to vary from 11,850 to 93,120 seeds/ac (29,280 to 230,110 seeds/ha) when using a 36 hole seed drum.

Once the seeding rates and the seed to be planted had been selected, the operator had to "fine tune" the planter for accurate seed spacing. Air pressure could be adjusted by either changing the tractor rpm or the needle valve on the hydraulic pump. Also, the seed cut-off brush could be adjusted up or down. A very small change in the brush height had a noticeable effect on the number of doubles or misses.

It was also important that seed drum speeds not exceed 35 rpm.

The fertilizer drive transmission was more awkward to adjust. Two triple-sprocket clusters were used in conjunction with three different augers in the fertilizer hoppers. This arrangement gave nine combinations for each auger. The operator sometimes had to change augers in the field because changes in the sprocket combinations did not provide a small enough change in the rate. The fertilizer hoppers had to be nearly empty in order to change the augers. An optional triple sprocket cluster was available allowing seven more combinations per auger. If the operator changed sprocket clusters, the rate could be adjusted by small increments without changing the auger. It is recommended that the manufacturer consider combining the sprocket combinations and reduce the overlap of feed rates of the augers.

When using the largest sprockets of the sets, the drive transmission chain rubbed on the tool bar. When the two smallest sprockets were used, the chain rubbed against itself. It is recommended that the manufacturer consider modifying the system to eliminate this interference.

The range of adjustment stated in the operator handbook was 37 to 538 lb/ac (42 to 608 kg/ha) based on a fertilizer with a density of 62 lb/ft³ (993 kg/m³).

Depth Adjustment: Planting depth was controlled by the equalizing depth gauge wheels. With the planter raised, the depth adjustment knob could be turned easily. At the beginning of the test all depth gauge scales on the row units were zeroed, then during planting all rows could be quickly adjusted to the same depth.

Lubrication: Access to most lubrication points was very good with the planter in field position. Only 24 pressure grease fittings required servicing daily or weekly. Graphite had to be sprayed or brushed on the area where the seal on the seed drum rotated against the seed hopper. A service schedule was provided in the operator manual.

Filling: The central seed hopper was easy to fill if the planter was in a lowered position. An optional second step is available for easier access to the seed hopper if the planter is to be filled when in a raised position.

The four granular fertilizer hoppers were easy to fill from the back of the machine when the operator used a long drill-fill spout and stood on the tool bar to direct the flow of fertilizer. However, it was difficult to avoid treading on the wires laying on top of the tool bar. It is recommended that the manufacturer consider rerouting or covering these wires to protect them.

While filling the hoppers, the lids were held in front of the

hoppers by rubber straps. This prevented the lids from becoming lost or damaged and was convenient for the operator.

Cleaning: The sensors in the seed tubes were cleaned daily using a small round brush and mild detergent and water. The sensor used to monitor the seed drum rpm had to frequently be removed and cleaned. It is recommended that the manufacturer consider covering the seed drum rpm sensor or using a sensor that is less sensitive to dust.

The seed hopper was very easy to clean out. A shut-off gate was provided in the seed chute in the bottom of the seed hopper. After closing the shut-off gate and removing the seed drum, the shut-off gate was reopened allowing the seed to flow out into a pail or sack.

To clean the fertilizer hoppers, the operator had to disconnect the couplers to the fertilizer augers and the fertilizer downspout hoses. After removing two hopper support pins at the rear of each hopper, the hoppers were then tipped forward and the fertilizer removed. One of the hoppers could not be tipped forward when the planter was in the field position, because of the location of one of the transport wheels.

Transporting: The 800 Cyclo-Air had excellent stability at 20 mph (32 km/h) on smooth roads. One person could put the planter in transport position (FIGURE 4) from field position in 15 to 20 minutes if the procedure in the operator manual was correctly followed. Transport width was 10.8 ft (3.3 m) and transport height was 11.0 ft (3.4 m), which allowed for safe movement on roads.

Caution was needed when driving through field approaches because the fertilizer disks nearest the tractor hitch came very close to the ground in these areas.

Also, the fertilizer hoppers were kept less than half full to prevent front-end instability of the tractor and excessive loading on the planter frame.

FIGURE 4. Transport position.

Power Requirements: Power requirements depended upon soil conditions, seeding depth and ground speed. Draft tests showed that a tractor with at least 90 hp (69 kW) maximum power take-off rating, based on the Nebraska tractor test data, should be used to operate this machine.

OPERATOR SAFETY

The International Harvester 800 Cyclo-Air row crop planter was safe to operate and service if normal safety precautions were observed.

Care was necessary when handling the seed drums because the edges of the holes were very sharp. Also, the seed hopper lid should not be opened if the system is pressurized because dust and chemical dispersed into the air may be hazardous to the operator.

OPERATOR MANUAL

The operator manual supplied with the test machine was very good. Many photographs and illustrations were included with the text, providing useful, easy to understand information on maintenance, adjustment, service and safe operation of the machine.

Both Imperial and SI units of measurement were used in the manual.

An excellent pocket size guide with helpful hints, seeding rate and fertilizer rate charts was also provided. A fertilizer rate chart was not included in the operator manual. It is recommended that the manufacturer provide a fertilizer rate chart in the operator manual.

DURABILITY

TABLE 4 outlines the mechanical history of the International 800 Cyclo-Air row crop planter during 100 hours of operation while seeding 750 ac (304 ha).

TABLE 4. Mechanical History

ITEM	OPERATING HOURS	FIELD AREA ac	FIELD AREA ha
-Ground speed sensor replaced at (replacement also failed)	0	0	(0)
-Short hydraulic connector hose ruptured	15	110	(45)
-Realigned drive chain sprockets replaced at	21	152	(62)
-Replaced one seed tube sensor at	55	420	(170)

All disk opener scrapers were in very good condition at the end of the test. The seed furrow firming points had an estimated half-life remaining.

The intent of the test was evaluation of functional performance. An extended durability evaluation was not conducted.

APPENDIX I
SPECIFICATIONS

MAKE:	International Harvester
MODEL:	800 Cyclo-Air
SERIAL NUMBER:	0970749u013264
DIMENSIONS:	
-- Transport	
-width	10.8 (3.3)
-height	11.0 (3.4)
-- Effective planting width	24.0 (7.3)
SEEDING SYSTEM:	
-- type	Air
-- number of rows	8
-- number of seed hoppers	1
-- row spacing	36 in (91.4 cm)
-- seed hopper capacity	15 bu (546 L)
-- type of drive	chain driven from ground wheel
-- type of adjustment	sprocket combinations
-- air pressure range	0-14 oz/in² (0-6.0 kPa)
-- seed disk opener diameter	14 in (36 cm)
-- depth gauge wheel size	4.5 x 16 in (11 x 41 cm)
-- closing wheel diameter	8 in (20 cm)
-- press wheel size	6.5 x 12 in (17 x 31 cm)
-- seed disk opener range of vertical force	65-270 lb (290-1200 N)
-- press wheel range of vertical force	70-100 lb (310-445 N)
-- type	Auger
-- number of rows	8
-- number of fertilizer hoppers	4
-- each fertilizer hopper capacity	9.6 ft³ (270 L)
-- type of drive	chain driven from ground wheel
-- type of adjustment	auger and sprocket combinations
-- fertilizer disk opener diameter	14 in (36 cm)
-- fertilizer disk opener maximum applied vertical force	300 lb (1335 N)
TIRES:	
-- number -field	4
-transport	2
-- size	7.6 x 15, 6-ply
NUMBER OF LUBRICATION POINTS:	
-- pressure grease fittings	24
-- graphite lubrication points	1
-- oil points	6
-- hydraulic oil pump filters	1
-- sealed wheel bearings	6
NUMBER OF CHAIN DRIVES:	7
NUMBER OF HYDRAULIC CYLINDERS:	7

OPTIONAL EQUIPMENT:
- -- liquid fertilizer tanks
- -- granular insecticide and herbicide hoppers
- -- special seed grower seed hoppers
- -- tine tooth attachment
- -- disk furrowers
- -- V-wing attachment
- -- row unit disk blade
- -- rock guards
- -- drive wheel covers
- -- chain guards
- -- two other monitors

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

Acre (ac) x 0.405	= Hectare (ha)
Foot (ft) x 0.305	= Metre (m)
Inches (in) x 25.4	= Millimetres (mm)
Horsepower (hp) x 0.746	= Kilowatt (kW)
Miles/Hour (mph) x 1.61	= Kilometres/Hour (km/h)
Pounds Mass (lb) x 0.454	= Kilogram (kg)
Pounds Mass/Cubic Foot (lb/ft^3) x 16.02	= Kilograms/cubic metre (kg/m^3)
Pounds Force (lb) x 4.45	= Newton (N)
Pounds Force/Foot (lb/ft) x 14.6	= Newton/Metre (N/m)
Pounds Force-Feet (lb-ft) x 1.36	= Newton-Metre (N-m)
Pounds Force/Square Inch (psi) x 6.89	= Kilopascal (kPa)
Cubic Feet (ft^3) x 28.6	= Litres (L)
Bushel (bu) x 36.4	= Litres (L)
Pounds/Acre (lb/ac) x 1.13	= Kilograms/Hectare (kg/ha)
Seeds/Acre (seeds/ac) x 2.5	= Seeds/Hectare (seeds/ha)

SUMMARY CHART

INTERNATIONAL 800 CYCLO-AIR ROW CROP PLANTER

RETAIL PRICE: $29,142 Canadian Funds (March 1984, f.o.b. East Moline, Illinois) 8 row wide, with Endwise Transport attachment, granular fertilizer hoppers, and Performance Center Monitor.

OVERALL PERFORMANCE	Very Good	
QUALITY OF WORK	Good	-small round seeds gave the best results at planting speeds of 5 mph (8 km/h). -seed spacing accuracy decreases to outside rows
Fertilizer Application	Very Good	-rates 0% to 10% higher than stated in the operator manual, on “high” and “extra high” augers
Penetration	Excellent	-penetration of fertilizer disk openers reduced in clay soils.
Soil Finishing	Excellent	-consistent coverage.
Monitor	Very Good	-problems with ground speed sensor.
EASE OF OPERATION AND ADJUSTMENT		
Application Rates	Very Good	-central transmission. -fertilizer rate changes somewhat inconvenient.
Filling	Very Good	-central hopper. -convenient lid latches and holding straps
Transporting	Good	-narrow width.
POWER REQUIREMENTS		-90 hp (67 kW) minimum.
OPERATOR SAFETY	Good	-avoid opening pressurized seed hopper.
OPERATOR MANUAL	Very Good	-well written and clearly illustrated. -handy pocket guide was also provided.
MECHANICAL PROBLEMS		-faulty ground speed sensor.

CAUTION

This summary chart is not intended to represent all of 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.

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