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Evaluation Report 421

Amazone NT 375 No-Till Grain Drill

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

AMAZONE NT 375 NO-TILL GRAIN DRILL

MANUFACTURER AND DISTRIBUTOR:

Amazone Farm Machinery Ltd.
P.O. Box 1316
Brandon, Manitoba
R7A 6N2

RETAIL PRICE:

$21,120 (August, 1985 f.o.b. Portage la Prairie, Manitoba) 12.3 ft (3.8 m) width.

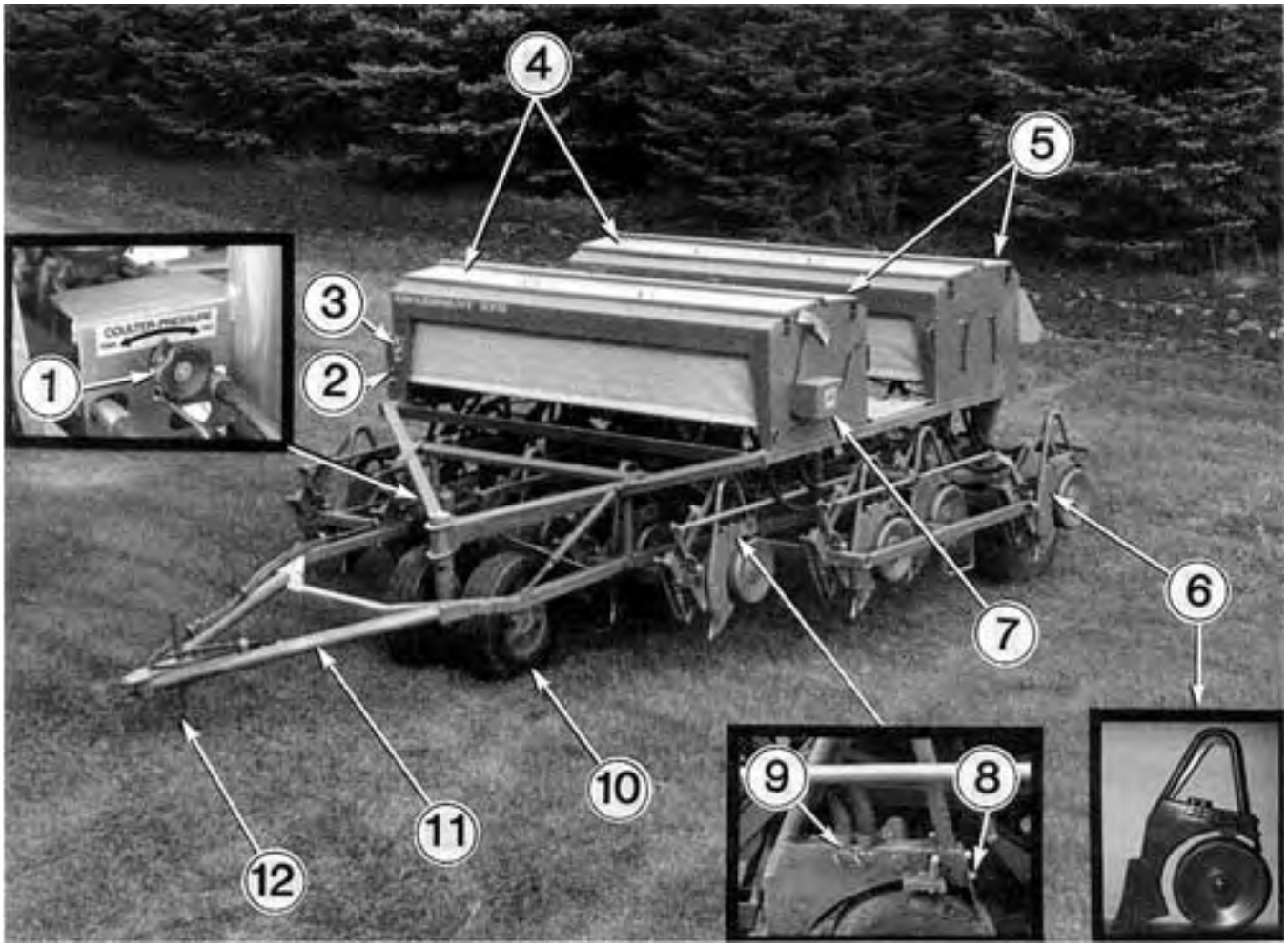

FIGURE 1. Amazone NT 375 No-Till Grain Drill: (1) Coulter Pressure Adjustments, (2) Feedshaft Rotation Indicators, (3) Box Level Indicators, (4) Seed Boxes, (5) Fertilizer Boxes, (6) Hoe Openers, (7) Gearbox, (8) Mud Scrapers, (9) Seed and Fertilizer Placement Adjustment, (10) Castor Wheels, (11) Hitch, (12) Hitch Stand.

SUMMARY

Quality of Work: Penetration was excellent[1] when seeding directly into moist stubble fields and very good when seeding into dry stubble fields. The ability of the hoe opener to cut through surface residue was very good in all conditions. The press wheels provided adequate compaction in most soils encountered.

The accuracy of the seed metering system was very good in wheat and rapeseed with a wide range of settings. The variation in seeding rates between seed runs was insignificant. The seeding rates of all crops were relatively unaffected by field roughness, ground speed or level of grain in the grain box. The seeding rate of wheat increased by about 7% when travelling down a 15° slope. A grass seeding attachment was not available for the Amazone NT 375. Small seed could be metered with very good accuracy through the main seed box.

The accuracy of the fertilizer metering device was very good. Variation in application rates between runs was insignificant. Application rates were not affected by field roughness, ground speed or level of fertilizer in the fertilizer box. The rate increased by as much as 8.1% when travelling up a 15° slope.

Ease of Operation: The Amazone NT 375 worked well under wet field conditions. However, in extremely sticky conditions, mud build-up would prevent the press wheels from turning even though the press wheels were equipped with scrapers. The large space between adjacent openers allowed very good trash and stone clearance. In very heavy trash, the drill left clumps of straw. The overall height of the machine made filling of the seed and fertilizer boxes difficult if bagged seed and fertilizer were piled at ground level or if a short drill fill was used. A small amount of moisture collected on the lid edge during heavy rains and would fall into the box when opened. The boxes were easy to clean out. The drill was very easy to transport and had ample ground clearance.

Ease of Adjustment: The 22 grease fittings required daily lubrication. Seed and fertilizer rates were easy to change. The depth adjustment was fast and simple and had a calibrated scale for reference when moving from field to field.

Power Requirements: A 110 hp (80 kW) tractor should have sufficient power reserve to operate one section of the 12 ft (3.8 m) drill in all field conditions and speeds.

Operator Safety: The Amazone NT 375 was safe to operate if normal safety precautions were observed.

Operator's Manual: The operator's manual lacked detailed information, especially on safety and warranty. The calibration charts for both seed and fertilizer were incomplete.

Mechanical History: There were a number of failures of feed shaft connections due to poor initial bearing adjustment. Four openers were bent in stony land, the hitch bent and a hole wore into one feed hose due to rubbing on a tire.

[1] *See rating table provided in Appendix II*

RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Modifying the hydraulic system to allow better adjustment of the opener pressure and facilitate better field efficiency.
2. Providing more complete calibration charts in the operator's manual and on the drill.
3. Providing a slow moving vehicle sign.
4. Providing an operator's manual with step-by-step instructions, more complete calibration charts, and sections on safety and warranty.
5. Improving quality control with regard to initial bearing adjustment,
6. Modifications to the hitch to reduce the chance of contact by tractor tires and castor wheel oscillation while towing.
7. Modifying the opener to eliminate bending in stony land.

Station Manager: G.M. Omichinski

Project Engineer: D.J. May

THE MANUFACTURER STATES THAT

With regard to the recommendation:

1. We have changed the hydraulic system so that only one hydraulic hose needs to be attached to the tractor. The adjustment of the opener pressure may now be done quite simply.
2. & 4. For the coming season we have worked out a new detailed operator's manual. This new manual includes extended calibration charts for seeds and fertilizers.
3. Manufacturer did not respond.
5. The failures regarding the feed shaft connections could lead back to a faulty setting of the nylon bearings, in the future this point shall be inspected more often during assembly.
6. On future production runs we are considering fastening the hitch to the castor wheels to prevent them from oscillating as you mentioned.
7. The hoe openers of your test machine were not made correctly. The coulters could bend because the welds were not placed as prescribed in our blueprints. This deficiency was dealt with on the NT375 in the spring of 1985. Additionally a reinforcement has been inserted so that the coulters are now stable.

Manufacturer's Additional Comments:

The hoe points are now made from steel-cast with an improved hardening of the front edge. This way the wear-resistance has been improved considerably, so that the points stand a longer operation time.

The feed hoses are now being installed in such a manner, that they can no longer rub on the wheels of the machine.

GENERAL DESCRIPTION

The Amazone NT 375 (FIGURE 1) is a 12.3 ft (3.8 m) grain drill designed for no-till, minimum till, and conventional seeding. It is equipped with 20 hoe openers spaced 7.4 in (188 mm) apart in four ranks, each followed by its own press wheel. Opener force is controlled by a small hydraulic cylinder on each opener and the depth of all openers is controlled by a single crank at the rear of the machine. The two grain tanks had a combined capacity of 32.1 bu (1.16 m^3) while the fertilizer boxes had a capacity of 2550 lb (1160 kg).

Seed is metered by externally cogged fine and course metering wheels through plastic feed cups equipped with adjustable flaps and shut-off slides. Fertilizer is metered through feedcups by coarse metering wheels only. The metering wheels are chain driven through a variable speed gearbox.

Convoluted flexible plastic hoses deliver the seed and fertilizer separately to the openers. The openers are adjustable to put the fertilizer above, below or with the seed. The test unit was equipped with optional harrows.

Drawbars for pulling two or three units and markers are also available but were not evaluated.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Amazone NT 375 was operated under field conditions as shown in TABLE 1 for 112 hours, while seeding 660 ac (267 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
Soil Type:			
-sand	4	25	10
-sandy loam	9	50	20
-loam	28	167	68
-clay loam	71	416	169
TOTAL	112	660	267
Crop:			
-winter wheat	54	320	130
-spring wheat	9	50	20
-barley	5	30	12
-rye	4	25	10
-rapeseed	3	20	8
-flax	10	55	22
-peas	27	160	65
TOTAL	112	660	267
Land:			
-stubble	80	470	190
-stubble mulch	32	190	77
TOTAL:	112	660	267

During the test small to large stones were encountered in 80 ac (32 ha). The drill was transported over 200 mi (320 km) on paved roads and 120 mi (190 km) on gravelled roads.

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: The drilling of seeds directly into stubble in a no-till planting operation requires an opener that will pass through surface trash, penetrate dry compacted soils and produce a minimum amount of soil disturbance. Excessive soil disturbance promotes weed growth and loss of soil moisture.

The Amazone NT 375 was equipped with narrow hoe openers. Each opener had an individual trailing press wheel (FIGURE 2). Penetration of the openers was excellent when seeding into dry stubble fields (FIGURE 3). There was no provision for the addition of ballast to the drill nor was there a need of it.

The ability of the hoe opener to pass through surface residue was good in all conditions, since no trash cutting was required. However, in heavy trash conditions the opener would leave clumps of straw in the field, which affected seedling development. Generally, straw and chaff should be spread evenly before seeding.

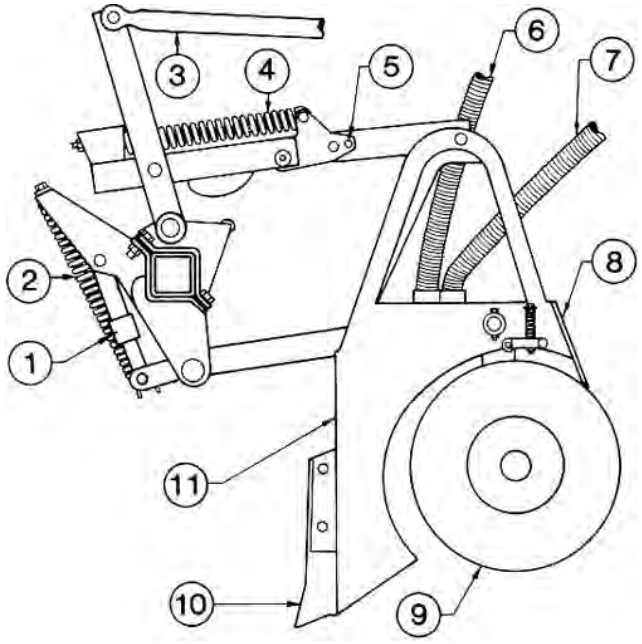

FIGURE 2. Hoe Opener: (1) Hydraulic Cylinder, (2) Cushion Spring, (3) Depth Adjustment. (4} Rock-Trip Spring. (5) Shear Pin. (6} Seed Hose. (7) Fertilizer Hose, (8) Mud Scraper. (9) Press Wheel. (10) Hoe Opener, (11) Shank and Boot.

The depth of all the openers was set with a crank at the rear

of the drill. The crank had a scale along the side, which related approximately to the depth in metric units. Individual depth adjustment of the openers travelling in the tractor wheel tracks was not possible.

FIGURE 3. Penetration of Hoe Openers in Typical Field Conditions.

The drill was equipped with a hydraulic adjustment for opener pressure, which required careful setting by trial and error. If not set properly the openers would rise quickly, but would drop slowly into working position. It is recommended that the manufacturer consider modifying the hydraulic system to allow easier adjustment of the opener pressure and facilitate better field efficiency.

Seed Placement: The basic rules for the conventional seeding of cereal and oilseed crops also apply to the direct drilling of these crops into stubble. The seed is ideally placed when it is in moist soil on a firm seedbed 0.8 to 2 in (20 to 50 mm) from the soil surface with the soil packed tightly about the seed for optimum moisture contact and minimum soil drying.

Seeding depth was very uniform with slight variations resulting from field or seedbed irregularities. Measurements of seeding depth when seeding wheat at 4 mph (6 km/h) in stubble showed that 68% of the seeds were within 0.56 in (7 mm) of the average seeding depth[2]. Higher speeds caused more seed scatter.

Seed coverage was good and only slightly affected by ground speed. Seed coverage was reduced in hard packed ground and in trashy conditions. Fertilizer could be placed above, below or with the seed in a narrow band.

The Amazone NT 375 could be successfully used for seeding conventionally, into a prepared seedbed without requiring machine alterations.

Soil/Stubble Disturbance: Minimizing soil disturbance is important in that it lessens moisture loss and reduces germination of some annual weeds. The width of the openers was 1.0 in (25 mm) at the ground surface. This opener width caused considerable soil disturbance.

Retaining stubble is also important since it helps trap snow to insulate winter wheat and provide moisture in the spring, and guards against soil erosion. The Amazone hoe opener left about 30% of the stubble standing, enough to retain good snow cover.

Soil Compaction: Wide metal press wheels with shallow grooves followed directly behind each opener, effectively pressing the soil about the seeds. The press wheel provided adequate compaction in most soils encountered. Scrapers kept the wheels relatively free of mud in all soil conditions.

In hard packed soil, the seed would sometimes be left with little or no covering soil to be packed around it.

Plant Emergence: In general, the crops seeded directly into stubble or conventionally into a prepared seedbed, germinated well and emerged evenly if adequate moisture was present (FIGURE 4). In dry fields, complete emergence occurred only after rain. Seed emergence in heavy trash was good, but after emergence seedling development was reduced under the clumps of trash left behind the drill.

[2]Seeding depth was determined by measuring the seedling root length to the ground surface. Ungerminated seeds, either on the surface or below the soil surface were not considered.

FIGURE 4. Emergence of Wheat Drilled Directly into Flax Stubble with Average Moisture Conditions.

Metering Accuracy: The grain and fertilizer metering systems were calibrated in the laboratory and compared with the manufacturer's calibration. Since the actual application rates for certain settings depend on factors such as size, density, and moisture content of seed and fertilizer, it is not possible for a manufacturer to prepare charts to include all the variations of seed and fertilizer used. Small variations in seed or fertilizer application rates will not significantly affect grain crop yields.

Calibration of the seed and fertilizer metering devices (FIGURE 5) was convenient since a drive wheel crank and seed catch trays (FIGURE 6) were supplied by the manufacturer. An accurate weigh scale with small increments was required for this calibration.

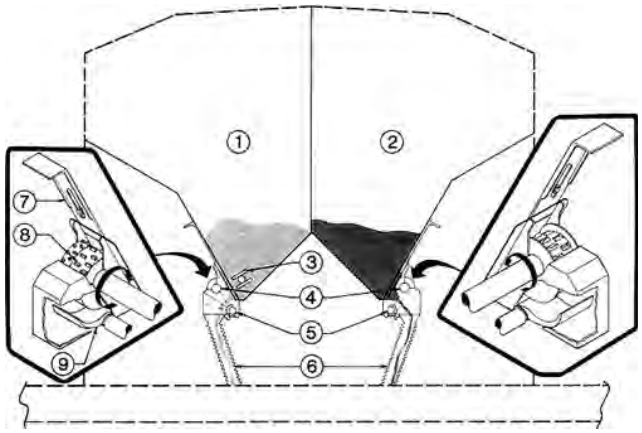

FIGURE 5. Seed and Fertilizer Metering Systems: (1) Seed Box, (2) Fertilizer Box, (3) Agitator, (4) Feedshaft, (5) Flap Adjustment Shafts, (6) Delivery Tubes, (7) Slide Gates, (8) Externally Cogged Feedwheels, (9) Flaps.

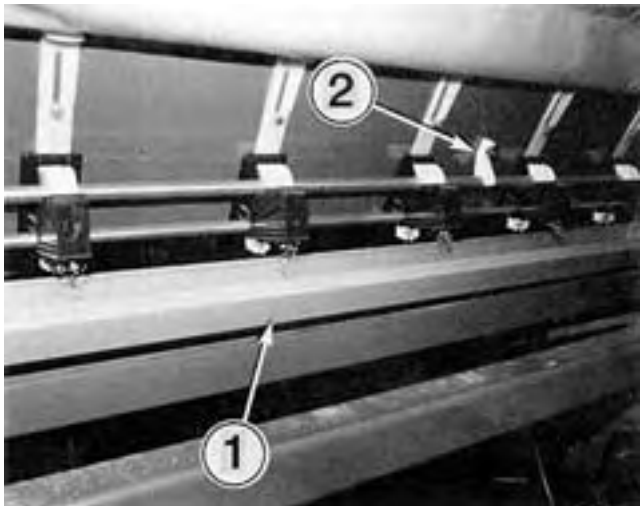

FIGURE 6. (1) Seed Catch Tray, (2) Nylon Bearing.

Seed Metering System: The accuracy of the seed metering system on the Amazone NT 375 in wheat, and rapeseed was

very good. Differences between the actual seeding rate and the manufacturer's calibration charts were probably due to differences in the seed densities. Since seed densities were not stated in the operator's manual and the charts were incomplete, actual rates should be checked by the operator. It is recommended that the manufacturer consider providing more complete calibration charts in the operator's manual and on the drill.

Field roughness, level of seed in the grain box and variation in ground speed did not significantly affect the seeding rate for either large or small seeds. Variation in field slope had a very small effect on the seeding rate as shown in FIGURE 7. When travelling down a 15° hill the seeding rate of wheat increased by about 7%.

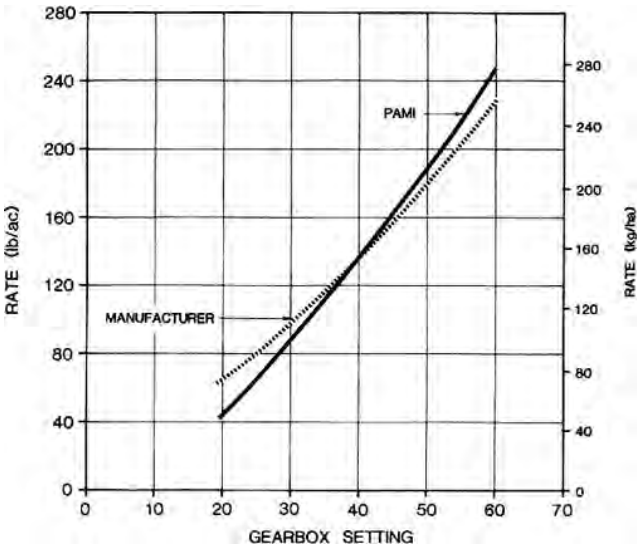

FIGURE 7. Variation in Seed and Fertilizer Application Rate with Change in Slope While Seeding Wheat and 11-51-00 Fertilizer.

The coefficient of variation (CV) can be used to describe the variation of application rates between individual seed cups. If the CV is less than 15%, seeding is acceptable whereas if the CV is much greater than 15%, the variation between individual seed or fertilizer cups is excessive. When seeding rapeseed at 9.7 lb/ac (10.9 kg/ha) the CV was 2.3% indicating that the drill had excel-lent uniformity.

Fertilizer Metering System: The manufacturer's calibration charts did not include details such as the flap setting and slide gate position or the fertilizer density but did give the fertilizer type. FIGURE 8 shows PAMI calibration results in comparison with the manufacturer's calibration chart. The differences are probably due to the differences in size and the density of fertilizer.

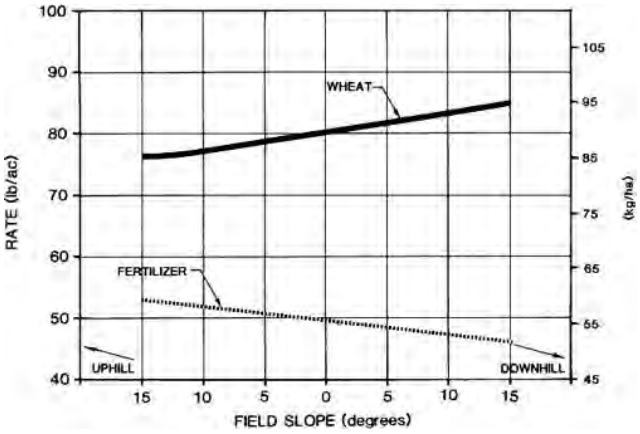

FIGURE 8. PAMI Calibrations Compared to Manufacturer's Calibrations While Applying 11-51-00 Fertilizer.

The CV between individual feed cups was only 1.7% when distributing 11-51-00 fertilizer at a rate of 47.4 lb/ac (53.1 kg/ha). This indicates the drill had excellent uniformity.

The fertilizer application rate was not significantly affected by the level of fertilizer in the box, ground speed or field vibrations. As shown in FIGURE 8, variation in field slope had a small effect on the application rate. When travelling up a 15° hill the fertilizer application rate increased by about 8.1%.

Grass Seeding: A grass seeding attachment was not available as optional equipment for the Amazone NT 375. Large and small seeds such as alfalfa and ryegrass were metered through the grain box with very good accuracy. A grain agitator in the bottom of the box prevented bridging from occurring. The manufacturer did not supply calibration charts for grass seeds. TABLE 2 shows PAMI calibrations for ryegrass and alfalfa.

TABLE 2. Metering Device Calibration for Ryegrass and Alfalfa (PAMI)

Gearbox Setting	Ryegrass slide gate - 1 flap setting - 2		Alfalfa slide gate - 3/4 flap setting - 1	
	lb/ac	kg/ha	lb/ac	kg/ha
10	2.9	3.2	1.4	1.6
15	5.9	6.6	3.0	3.4
20	9.8	11	4.8	5.4
25	14	16	7.0	7.9
30	20	22	9.8	11
35	25	28	12	14
40	27	30	16	18
45	29	33	20	22
50	37	41	24	27

EASE OF OPERATION

Wet Fields: The Amazone NT 375 worked well under wet field conditions. A small amount of mud stuck to the front and sides of the openers. In extremely sticky clay soil, mud would stick to the press wheels preventing them from turning. The press wheel scrapers were not spring loaded and required adjustment as they became worn.

Stony Field: The stone trip mechanism was factory set at about 660 lb (300 kg). The maximum lift height when the openers encountered a stone or other obstructions was 7 in (180 mm), and a shear pin gave added protection to the openers. However, in stony field conditions four openers were bent and required replacement.

Trashy Fields: Heavy surface residue had no effect on opener penetration. Straw tended to bunch in front of the openers and be left in small piles in the fields. Adjustment of the harrows did not help to spread the straw bunches. The four ranks of openers gave very good trash clearance, however, in extremely heavy surface residue plugging still occurred. Generally, surface residue should be spread evenly before seeding.

Filling: The Amazone NT 375 had two pairs of grain and fertilizer boxes with a wooden walkway between the pairs of boxes. Since the platform was 4.4 ft (1.3 m) from the ground, handling bagged seed and fertilizer was difficult. Some drill fills were too short to adequately reach the top of the drill, which was 7.0 ft (2.1 m) above the ground.

The grain boxes had a combined capacity of 32.1 bu (1.16 m^3) of grain and the fertilizer boxes had a capacity of 2550 lb (1160 kg) of fertilizer.

Grain and fertilizer box level indicators were provided and could be seen easily from the tractor. Feed indicators were also provided for the operator to check that the feedshafts were in motion.

Moisture: The grain and fertilizer boxes were adequately sealed to prevent leakage into the box in light rains, but small amounts of water collected on the underside of the lid edge during heavy rains. If the drill is left out in heavy rains the fertilizer shafts should be checked before operating to ensure that they are free to rotate and that the fertilizer has not caked.

Cleaning: The grain and fertilizer boxes could be easily cleaned with a vacuum cleaner or by completely opening the flap adjustment and dumping the leftover grain or fertilizer into the calibration trays. With the latter method some brushing of grain into the seed cups was required to completely clean the box.

Acremeter: The Amazone NT 375 was equipped with one continuous reading, resettable acremeter. It read to the nearest hundredth of an acre to a maximum of 10,000 ac and was accurate to within 4%

Transportability: The Amazone NT 375 trailed well and rode smoothly behind a tractor or light truck at speeds of 30 mph (50 km/h) provided grain and fertilizer boxes were empty. Occasionally a large bump would cause the castor wheels to oscillate rapidly. This generally occurred on paved roads at speeds of about 30 mph (50 km/h). The overall width of the machine was 12.7 ft (4.0 m), which permitted travel on most roadways. There was ample ground

clearance to prevent openers from dragging on roads. Mechanical locks were provided for the drive and the openers.

Marker: The test machine was not equipped with a marker system but they are available as optional equipment. When operating in dusty conditions, it was sometimes difficult to see the edge of the previous pass.

EASE OF ADJUSTMENT

Lubrication: The Amazone NT 375 had 22 grease fittings, which required regular lubrication. The drive gears, chains and gearboxes also required oil regularly.

Seeding and Fertilizer Rates: The seeding and fertilizing rates were adjusted in an identical manner. Using the calibration charts as a starting point the slide gate positions, flap positions and gearbox settings were selected and the machine calibrated. Calibrations and fine tuning of the gearbox setting were continued until the desired rates were achieved (FIGURE 9).

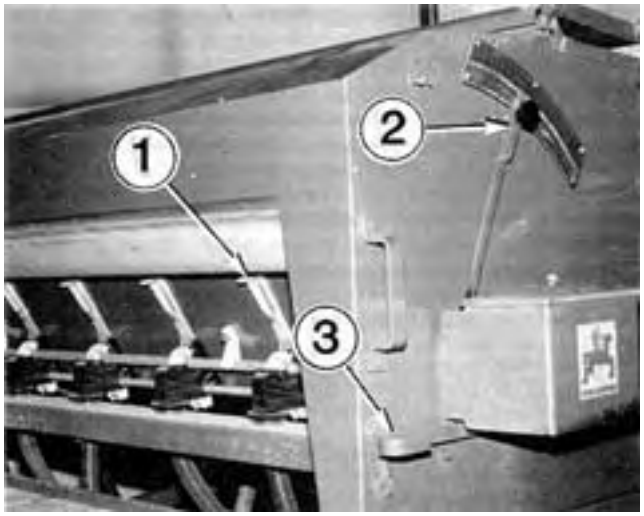

FIGURE 9. Adjustment of Seed and Fertilizer Metering (1) Slide Gate, (2) Gearbox Setting, (3) Flap Position Adjustment.

Patience was required when first setting the drill for various grains, but the operator soon got a feel for initial setting of the gearbox, especially if accurate records were kept during calibration of the metering devices.

Depth: The 20 hoe openers were raised and lowered almost simultaneously even though each opener had its own hydraulic cylinder. One crank at the rear of the machine adjusted the depth of the opener. A scale along the edge of the crank made depth setting convenient (FIGURE 10).

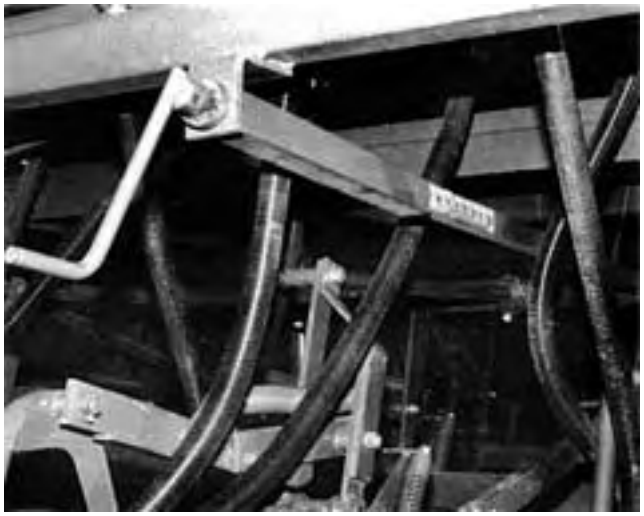

FIGURE 10. Depth Adjustment.

The fertilizer could be placed above, below or with the seed by simply moving the fertilizer placement levers on the side of the openers to the desired location. Some of the openers under the middle of the drill were hard to reach and most of the levers required pliers to move. Changing the fertilizer/seed placement took one person about 10 minutes.

Power Requirements: Maximum draft, at 1.6 in (4 cm) depth, with full grain boxes on level fields with average moisture was about 4800 lb (21.5 kN), while average draft was about 2700 lb (12.0 kN). A 110 hp (80 kW) tractor should be adequate in all fields and field speeds.

OPERATOR SAFETY

The Amazone NT 375 was safe to operate if normal safety precautions were observed. Pinch points and moving parts were adequately shielded but the drill lacked warning decals. The tractor's "slow moving vehicle sign" was not visible from behind the drill. It is recommended the manufacturer consider providing a slow moving vehicle sign.

OPERATOR'S MANUAL

The operator's manual contained information on assembly, adjustment, operation and optional equipment. It lacked information on safety and warranty, some Imperial conversions, and generally lacked continuity. The calibration charts for both seed and fertilizer were incomplete. It is recommended that the manufacturer consider providing an operator's manual with step-by-step instructions, more complete calibration charts, and sections on safety and warranty.

MECHANICAL HISTORY

The Amazone NT 375 was operated for 90 hrs while seeding 530 ac (214 ha). The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted. TABLE 3 outlines the mechanical problems that occurred during the functional testing.

TABLE 3. Mechanical History

Item	Operating Hours	Field Area ac	Field Area (ha)
-number of failures of connections (cotter pins, roll pins, rubber bushings) along seed and fertilizer feedshafts	3 – 48	20 - 300	(8 - 120)
-hitch bent and was replaced at	22	130	(53)
-four hoe openers bent and were replaced at	40	250	(100)
-fertilizer feed tube wore through and was repaired at	81	500	(200)
-complete set of hoe points wore out and were replaced at	85	530	(215)

DISCUSSION OF MECHANICAL PROBLEMS

Feedshaft Connections: The large initial bearing pressure on the plastic bearings (FIGURE 6) resulted in excessive torque along the whole seed and fertilizer metering system. This caused premature wear and failure of shaft connections. It is recommended that the manufacturer consider improving quality control with regards to initial bearing adjustment on the feedshafts.

Hitch: The hitch bent due to coming in contact with the outer dual wheel of a tractor when turning a corner. It was replaced with a new hitch. It is recommended that the manufacturer consider modifications to the hitch to reduce the chance of tire contact by tractors with dual wheels.

Hoe Openers: Four hoe openers were bent due to stony conditions (FIGURE 11). They were initially repaired and then replaced with new openers. It is recommended that the manufacturer consider modifying the opener to eliminate bending in stony land.

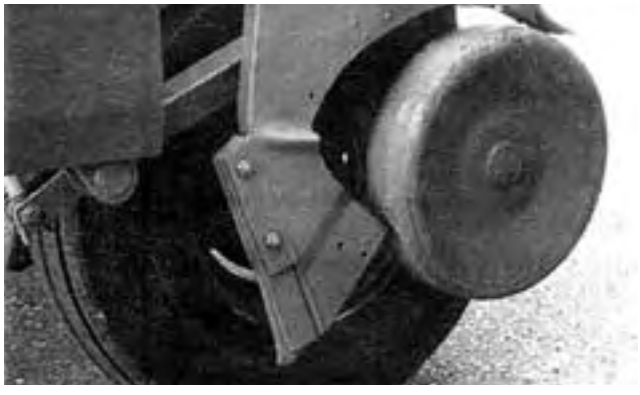

FIGURE 11. Bent Hoe Opener.

Fertilizer Feed Hose: The hose rubbed on the rear tire of the drill while the openers were in field position. The hose gradually wore through and was repaired with insulating tape.

APPENDIX I
SPECIFICATIONS

MAKE:	Amazone
MODEL:	NT 375 No-Till Grain Drill
DIMENSIONS:	
-- height	7.1 ft (2.2 m)
-- length	22.0 ft (6.7 m)
-- width	12.7 ft (3.9 m)
-- effective seeding width	12.3 ft (3.7 m)
-- transport ground clearance	9.8 in (248 mm)
SEEDING METERING SYSTEM:	
-- type	externally cogged fine and coarse metering wheels
-- drive	chain driven through variable speed gearbox from drive wheel
-- adjustment	fine or coarse wheels, flaps and shutoff slides on feed cups, lever on variable speed drive
-- transfer to openers	convoluted flexible plastic hose
FERTILIZER METERING SYSTEM:	
-- type	externally cogged coarse metering wheels
-- drive	chain driven through variable speed gearbox from drive wheel
-- adjustment	flaps and shutoff slides on feed-cups, lever on variable speed drive
-- transfer to openers	convoluted flexible plastic hose
OPENERS:	
-- type	hoe
-- width	1.0 in (25 mm)
-- number of openers	20 per unit
-- opener spacing	7.4 in (188 mm)
-- number of rows	4
-- distance between rows	35 in (890 mm)
PRESS WHEELS:	
-- type	flat metal, shallow centre groove
-- diameter	15.5 in (390 mm)
-- width	3.8 in (95 mm)
-- number of openers	20 per unit
-- opener spacing	7.4 in (188 mm)
TIRES:	
-- number	4
-- size	11L-15
-- number of castor wheels	2
GRAIN AND FERTILIZER BOX CAPACITIES:	
-- grain box capacity (total)	32.1 bu (1.16 m³)
-- number of grain boxes	2 per unit
-- fertilizer box capacity (total)	2550 lb (1160 kg)
-- number of fertilizer boxes	2 per unit

WEIGHT: (Without ballast)	**Boxes Empty**	**Boxes Full**
-- on rear wheels	3730 lb (1692 kg)	5800 lb (2631 kg)
-- on castor wheels	2565 lb (1164 kg)	4640 lb (2105 kg)
-- weight on hitch	10 lb (4 kg)	10 lb (4 kg)
total weight	6305 lb (2860 kg)	10450 lb (4740 kg)

NUMBER OF CHAIN DRIVES:	3
NUMBER OF LUBRICATION POINTS:	22
NUMBER OF HYDRAULIC CYLINDERS:	20
NUMBER OF SEALED BEARINGS:	37

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

SUMMARY CHART

AMAZONE NT 375 NO-TILL GRAIN DRILL

RETAIL PRICE:	$21,120 (August, 1985, f.o.b. Portage la Prairie, Manitoba)
QUALITY OF WORK:	
Penetration	**Excellent;** moist stubble fields **Very good;** dry stubble fields
Trash Clearance	**Very good**
Accuracy of:	
Seed Metering Device	**Very good;** wheat and rapeseed
Fertilizer Metering Device	**Very good;** 11-51-00
EASE OF OPERATION:	
Wet Field Conditions	**Good**
Filling	**Fair;** boxes quite high
Transportability	**Very good;** high ground clearance
EASE OF ADJUSTMENT:	
Seed and Fertilizer Rates	Easy to change
Depth	Quick and simple; calibrated scale
POWER REQUIREMENTS:	110 hp (80 kW) tractor has sufficient reserve for all field conditions and speeds.
OPERATOR SAFETY:	Safe, if normal precautions observed
OPERATOR'S MANUAL:	Lacked detailed information and instructions.
MECHANICAL HISTORY:	Feedshaft connections failed, hitch bent, and four openers bent.

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Evaluation Report 421

(Supplement)
Amazone NT 375 No-Till Grain Drill

INTRODUCTION:

The Amazone NT 375 No-till Grain Drill was tested for an additional 95 hours over a two year period, for a total of 207 hours of use. The intent of this test was to carry out an extended durability assessment of the drill. During the total 207 hours of operation, the drill underwent the following modifications initiated by the manufacturer: the original hoe points wore out and were replaced with better wearing hoe points at 85 hours; a set of reinforced coulters, modified top coulter links, and a third set of hardened hoe points were all installed on the drill at 125 hours; modified lower coulter links were installed on the drill at 206 hours.

SCOPE OF TEST

The Amazone NT 375 was operated under field conditions as shown in TABLE 1 for an additional 570 ac (231 ha) for a total of 1230 ac (498 ha) of use. It was monitored for mechanical breakdown and component wear.

TABLE 1. Operating Conditions During Extended Durability Evaluations.

Field Condition	Additional Operating Hours	Additional Field Area	
		ac	ha
Soil Type:			
-sand	2	10	4
-sandy loam	8	50	20
-loam	12	70	29
-clay loam	73	440	178
TOTAL	95	570	231
Crop:			
-winter wheat	10	60	24
-spring wheat	53	320	130
-barley	25	150	61
-rye	7	40	16
TOTAL	95	570	231
Land:			
-stubble	53	320	130
-stubble mulch	38	230	93
-conventional	4	20	8
TOTAL:	95	570	231

TABLE 2. Mechanical History During Extended Durability Evaluation.

Item	Operating Hours	Field Area ac	(ha)
-a total of nine openers were stuck in the raised position and were repaired at	106, 133	660, 830	(266,336)
-seed & fertilizer metering drive connection broke and was repaired at	108	675	(272)
-weld broke between castor wheel upright and spindle reinforcements and was repaired at	133	830	(336)
-seven hoe openers bent and were replaced at	202	1210	(490)
-two top coulter links bent (one original, one updated) and were replaced at	202	1210	(490)
-two frame brackets which pin the front of the lower links bent and were replaced at	202	1210	(490)
-six shear pins broke and were replaced	throughout the test		
-transport catches on several coulter linkages bent and were repaired	throughout the test		

DISCUSSION OF MECHANICAL PROBLEMS

Stuck Coulters: Five coulters were stuck in the raised position after the first winter, due to storing the drill outside and four more coulters were stuck after the second winter. The coulter pivot points were corroded and dry, and would not allow the coulter to swing down into working position. The pivot points were taken apart, polished, lubricated and reassembled.

Feedshaft Connections: One roll pin broke due to prior misadjustment of bearings along feedshafts. It was replaced with a new roll pin.

Castor Wheels: The weld between the castor wheel upright and spindle reinforcements broke and was repaired after 350 m (560 km) of highway travel with occasional castor wheel shimmey. It was repaired by welding larger reinforcements into place (FIGURE 1). Castor wheel shimmey did not reoccur after this modification.

FIGURE 1. Castor Wheels With Reinforcements.

Acremeter: The acremeter became hard to turn and resulted in the acremeter drive gear wearing out after 133 hours. It is likely that the acremeter leaked water and internal parts became corroded. The acremeter and drive gear were replaced with new ones.

Hoe Openers: Seven additional coulters (four original and three reinforced) bent after the first year of seeding, due to stony conditions. They were replaced with new openers.

Coulter Links and Frame Brackets: At the time of failure of the three reinforced openers, the drill was operating in a field with medium to large stones. These stones caused structural damage to other members including bending of two top coulter links and bending of two frame brackets which pin the front of the lower links. The manufacturer supplied new top links and frame brackets as well as new lower links made of spring steel. The manufacturer claimed these lower links would allow the coulter to twist out of the way of large rocks when operating in stony conditions. A lengthy evaluation of these lower links was not conducted as they were only supplied at the conclusion of the three year drill study. However, a short test in very rocky soil showed that the links would allow the coulters to twist out of the way of rocks as the manufacturer claimed.

Shear Pins: Only six coulter shear pins were broken at various times throughout the test. These shear pins were not located on coulters that had been damaged by stones. The broken shear pins were replaced with new ones.

Transport Catches: Transport catches on several linkages bent throughout the test (FIGURE 2). Once bent the catches would

no longer hold the coulter in the raised transport position. They were repaired by heating and bending back to proper shape.

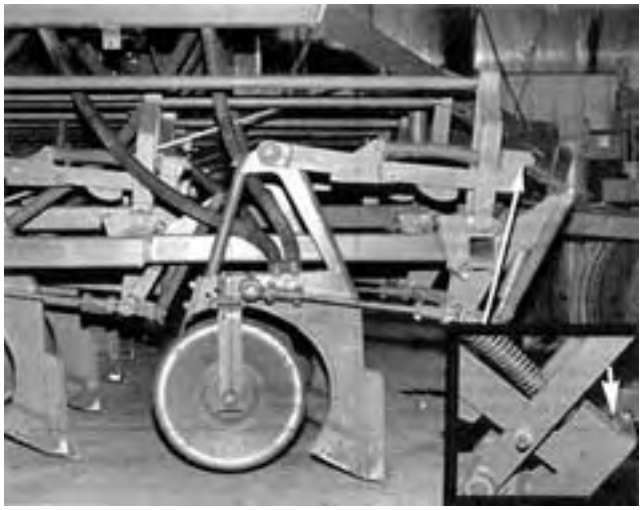

FIGURE 2. Transport Catches (Transport Position in Inset).

Hoe Points: The second and third set of hoe points which were fabricated from a more wear resistant material than the original set of points, showed little sign of wear after 122 and 82 hours of use respectively.

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