Printed: March 1987
Tested at: Portage la Prairie
ISSN 0383-3445
Group 9 (a)

Evaluation Report 519

Tye Series V 114-5360 NoTill Drill

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

TYE SERIES V 114-5360 NOTILL DRILL

MANUFACTURER:

The Tye Company
P.O. Box 218
Lockney, Texas
U.S.A. 79241
(806) 652-3367

DISTRIBUTOR:

Farm King Allied
P.O. Box 1450
Morden, Manitoba
R0G 1J0
(204) 822-4467

RETAIL PRICE:

$29,098 (March 1987; plus $1,480 freight to Portage la Prairie, Manitoba) 15 ft (4.6 m) width, 7 in (180 mm) spacing, with acre counter, optional fertilizer attachment and No-Till attachment.

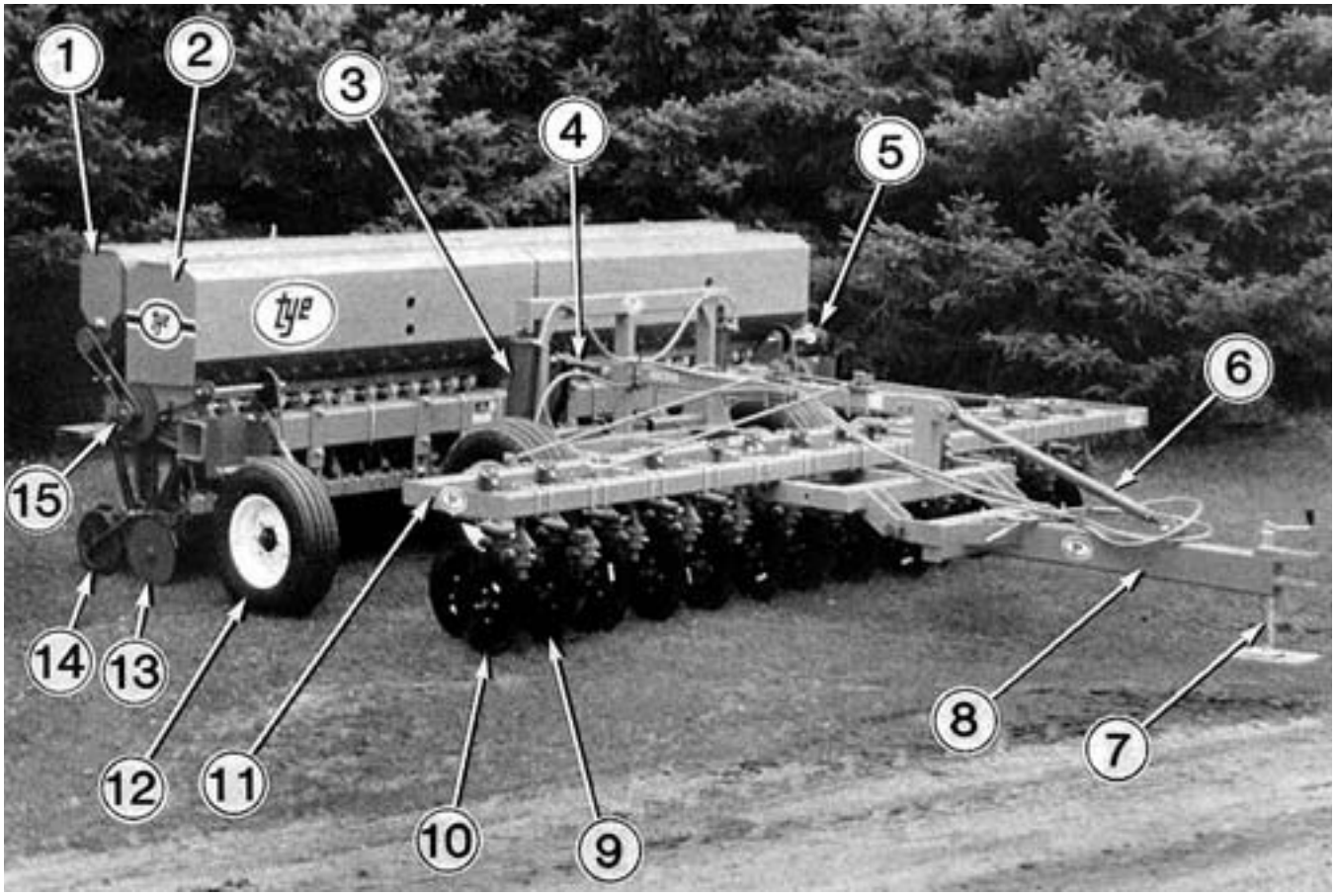

FIGURE 1. Tye Series V 114-5360 NoTill Drill: (1) Fertilizer Box, (2) Seed Box, (3) Hydraulic Cylinder, (4) Drill Levelling Adjustment, (5) Acre Counter, (6) Cutting Coulter Depth Adjustment, (7) Hitch Jack, (8) Hitch, (9) Fluted Coulter, (10) Rippled Coulter, (11) Carrier Frame, (12) Gauge-Drive Wheel, (13) Double Disk Opener, (14) Gauge-Press Wheel, (15) Seed Rate Adjustment.

SUMMARY

Quality of Work: Penetration was very good when seeding directly into moist stubble fields and good when seeding into dry stubble fields. The ability of the double disk opener to cut through surface residue was good in firm soils and fair in soft moist soils when used with the NoTill attachment. In very heavy, poorly spread trash, seed placement was poor. The gauge-press wheels provided adequate compaction in most soils encountered.

The accuracy of the seed metering system was good in wheat with a wide range of rates available. The variation in seeding rates between seed runs was insignificant. The seeding rates of all crops were relatively unaffected by field roughness or level of grain in the grain box. The seeding rate of wheat increased as much as 8% when travelling up a 15° slope. Increasing field speed from 3 to 7 mph (5 to 11 km/h) decreased the seeding rate of wheat as much as 5%.

The accuracy of the fertilizer metering devices was good. Variation in application rates between runs was acceptable. Application rates were not affected by field roughness, or level of fertilizer in the fertilizer box. The application rate increased by as much as 80% when travelling up a 15° slope. Increasing field speed from 3 to 7 mph (5 to 11 km/h) decreased the fertilizer application rate as much as 40%.

Ease of Operation: Wet field conditions occasionally caused the opener to plug with mud. Internal scrapers were provided with the drill and external scrapers were available as optional equipment. Large openings in the seed and fertilizer boxes made filling easy. The seed and fertilizer boxes were easy to clean, but leaked a small amount of moisture in heavy driving rains. The drill was easy to transport, but caution was required due to the large width of the machine.

Ease of Adjustment: Sixty grease fittings on the NoTill caddy required regular lubrication. Both the seed and fertilizer rates were easy to adjust. The depth adjustment was straight forward, but time consuming.

Power Requirements: A 110 hp (82 kW) tractor should have sufficient power reserve to operate the 15 ft (4.6 m) drill and NoTill attachment in alt field conditions and speeds.

Operator Safety: The Tye Series V 5360 was safe to operate if normal safety precautions were observed.

Operator's Manual: The operator's manual contained useful information, especially on operation, adjustments, safety and optional equipment.

Mechanical History: One drive chain fell off after 435 ac (176 ha).

RECOMMENDATIONS:

It is recommended that the manufacturer consider:

1. Covering the top of the fertilizer spouts and sliding gates to protect against moisture.
2. Providing a slow moving vehicle sign.
3. Relocating the fertilizer adjustment levers to avoid potential injury to the operator.
4. Providing calibration charts with metric conversions.

Station Manager: G.M. Omichinski

Project Engineer: D.J. May

THE MANUFACTURER STATES THAT:

With regard to the recommendations:

1. A rainguard flap now covers the fertilizer spouts to provide weather protection. Ease of inspection is maintained.
2. Tye will provide an SMV emblem or a provision to mount the emblem per ASAE Standard S279.8.
3. Several alternative fertilizer adjustment lever designs are being considered to reduce lever projection above the fertilizer box.
4. Tye maintains seedrate records in lb/ac and kg/ha, and can provide the information to the customer on request. A conversion factor of 1.1208 can also be used for quick reference. Future seedrate charts can be provided in either system.

MANUFACTURER'S ADDITIONAL COMMENTS:

1. Residue Management is extremely important to successful no-till seeding practices. Combine windrows (straw & chaff) should always be spread to full width of the original swath. Penetration and hairpinning in this report (where "extremely heavy surface residue" is mentioned) refers to windrows in fields where they had not been fully spread.
2. 1986 PAMI field evaluations were conducted in an "extremely wet" spring seeding season. It is always important that field residues and windrows be uniformly distributed so that concentrations of wet straw are not present to cause hairpinning around the cutting coulters.
3. Tye's customer experience, concerning metering of fertilizers in rolling terrain have generally not paralleled the lab tests reflected in FIGURE 7. A 15° slope (26% slope) is generally the upper limit to field operation in North America. Typical field slopes are much less.

GENERAL DESCRIPTION

The Tye Series V 5360 (FIGURE 1) is a 15 ft (4.6 m) grain drill designed for minimum till and conventional seeding. With the optional NoTill attachment the drill can also be used for no-till seeding. The drill is built in two halves and is equipped with 26 double disk openers spaced 7 in (180 mm) apart in two ranks. Drill height is controlled with the tractor three-point hitch or by two hydraulic cylinders when using the NoTill attachment, and adjusted with turnbuckles on the gauge wheels. Seeding depth is adjusted with pressure springs above the disk openers and the gauge-press wheels.

The grain boxes have a capacity of 36.0 bu (1.26 m³) and the optional dry fertilizer boxes have a capacity of 1050 lb (475 kg) of fertilizer. Seed is metered by internally fluted feed wheels. Fertilizer is metered by paddlewheels through infinitely adjustable sliding gates. Flexible rubber hoses separately deliver the seed and fertilizer to the openers. Grass seed may be sown through the main seed box. The 13 in (330 mm) diameter gauge-press wheels pack the soil directly behind the openers. The drill was tested with a standard resettable acremeter.

The optional NoTill attachment consisted of a tool bar, which carried 26 cutting coulters. Each cutting coulter was aligned to cut a seed slot directly ahead of the double disk openers. The tool bar was mounted on a frame, which also carried the drill. Two large wheels under the tool bar frame carried both the NoTill attachment and drill.

Other optional equipment available but not tested included various gauge-press wheels, depth bands, external scrapers, row markers, Till and Drill attachment, Legume box, Native Grass box, and various cutting coulters.

SCOPE OF TEST

The Tye Series V 5360 NoTill Drill was operated under field conditions as shown in TABLE 1 for 44 hours, while seeding 440 ac (178 ha). It was evaluated for quality of work, ease of operation and adjustment, power requirements, operator safety and suitablity of the operator's manual.

During the test small to large stones were encountered in 135 ac (55 ha).

TABLE 1. Operating Conditions

Field Condition	Operating Hours	Equivalent Field Area	
		ac	ha
Soil Type:			
- sand	5	50	20
- sandy loam	18	100	73
- clay loam	15	150	61
- clay	6	60	24
Total	44	440	178
Crop:			
- winter wheat	6	60	24
- spring wheat	9	95	38
- barley	14	140	57
- rapeseed	10	100	41
- flax	3	25	10
- fababeans	2	20	8
Total	44	440	178
Land:			
- stubble	39	390	158
- stubble mulch	5	50	20
Total	44	440	178

RESULTS AND DISCUSSION

QUALITY OF WORK

Penetration: The drilling of seeds directly into stubble or pastureland in a no-till planting operation requires an opener that will cut through heavy 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 Tye Series V 5360 was equipped with double disk furrow openers (FIGURE 2) preceded by single disk cutting coulters and each was trailed by an individual gauge-press wheel. Penetration of the openers was very good when seeding directly into moist stubble fields and good when seeding into dry stubble fields. In hard compacted fields the seed disks could not penetrate into the narrow slot left by the cutting coulter. The manufacturer recommended using a wider bubble coulter in these conditions in place of the narrow ripple coulter supplied with the machine.

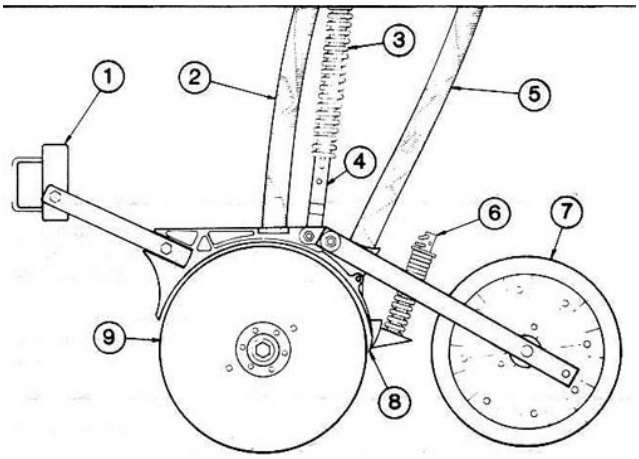

FIGURE 2. Double Disk Opener: (1) Drill Frame, (2) Seed Hose, (3) Pressure Spring, (4) Pressure Rod, (5) Fertilizer Tube, (6) Depth Rod, (7) Gauge-Press Wheel, (8) Mud Scraper, (9) Seed Disks.

The ability of the double disk opener to cut through surface residue was good in firm soils and fair in soft, moist soils. Straw was pushed into the furrow bottom without being cut when operating in soft, moist soils (FIGURE 3). Extremely heavy, poorly spread surface residue prevented proper opener penetration regardless of soil conditions or whether or not the NoTill attachment was used. Straw and chaff should be spread evenly before seeding.

When used with the NoTill attachment, two hydraulic cylinders

raised and lowered the entire machine. Individual depth adjustment of the openers travelling in the tractor wheel tracks was possible by moving the clip pin up on the depth strap above the gauge-press wheels. Pressure adjustment on the individual openers was also possible by moving the clips up on the pressure rod thus putting more compression on the pressure springs.

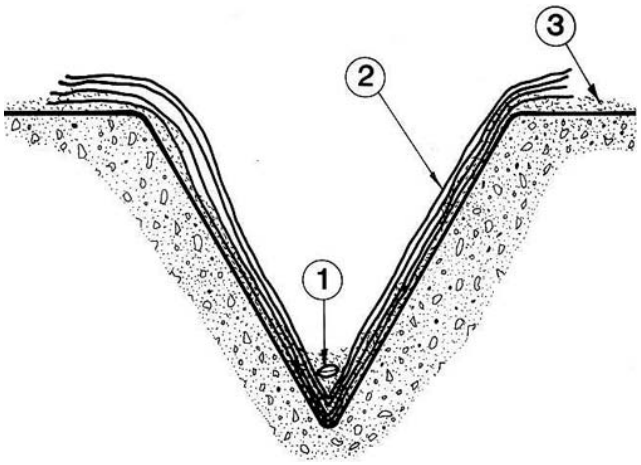

FIGURE 3. Schematic Representation of Hairpinning in Soft Moist Conditions: (1) Seed, (2) Uncut Straw, (3) Chaff.

The downward force on each opener could increase from 0 to over 500 lb (2220 N) as the springs compressed. The maximum average force with grain and fertilizer boxes empty was 130 lb (580 N) per opener.

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 with the soil packed tightly about the seed for optimum moisture contact and minimum soil drying. Generally, small oil seeds and winter wheat should be seeded 0.8 to 1.5 in (20 to 40 mm) from the soil surface. Cereals should be seeded 1.5 to 2.5 in (40 to 65 mm) from the soil surface.

In very heavy, poorly spread trash, seed placement was poor. Failure of openers to cut through the surface residue resulted in seed being placed either in the residue or on the soil surface (FIGURE 3). In lighter trash conditions and in softer soil the trash was pushed to the bottom of the furrow without being cut. The seed was then placed on the trash and covered with a small amount of trash and soil. This reduced the contact between the seed and the soil that is necessary for good germination. Seed placement was good in fields with evenly spread surface residue.

Seeding depth was fairly uniform with slight variations resulting from field or seedbed irregularities. Measurements of seeding depth when seeding wheat at 5 mph (8 km/h) in stubble showed that at least 68% of the seeds were within 0.67 in (17 mm) of the average seeding depth[1]. 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. Seed and fertilizer were placed together in a narrow band. Fertilizer could also be deep banded with an optional attachment, which mounts on the NoTill attachment.

The Tye Series V 5360 could be used for seeding conventionally into a prepared seedbed by simply removing the NoTill attachment and hooking the drill up directly to the tractor three-point hitch. The test unit performed very well in the stubble mulch fields encountered.

Soil/Stubble Disturbance: Minimizing soil disturbance is important under dry conditions in that it lessens moisture loss and reduces germination of some annual weeds. The angle between the two seed disks of the Tye Series V 5360 is about 11 degrees. This angle was small enough to keep soil disturbance minimal in most field conditions (FIGURE 4).

Retaining stubble is also important since it helps trap snow to insulate winter wheat, to provide moisture in the spring, and to reduce soil erosion. The small angle between the seed disks minimized the amount of stubble knockdown in most field conditions, and resulted in very good snow catch. The Tye Series V 5360 disk opener left about 50% of the stubble standing.

FIGURE 4. Soil Disturbance and Stubble Knockdown with Tye Series V 5360.

Soil Compaction: The narrow rubber gauge-press wheels followed directly behind each opener, effectively pressing the soil about the seeds. The press wheels provided fair compaction in most soils encountered. The pressure on the press wheels was adjustable to increase pressure in light soils or decrease pressure in heavy soils.

Using the narrow press wheel in very 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 stubble mulch seedbed, germinated well and emerged evenly if adequate moisture was present (FIGURE 5). In dry fields, complete emergence occurred only after rain. Seed emergence in heavy, poorly spread trash ranged from fair to poor as the trash prevented proper opener penetration.

FIGURE 5. Emergence of Wheat Drilled Directly into Stubble 55 Days After Seeding.

Metering Accuracy: The grain and fertilizer metering systems (FIGURE 6) were calibrated in the laboratory and compared with the manufacturer's calibrations. Differences between the manufacturer's calibration charts and actual seeding rates may be due to a number of factors such as seed size, density and moisture content. Seed densities were stated in the operator's manual. When planting seed of similar density to that shown in the manufacturer's seeding charts, the rates should be nearly identical. However, actual rates should be checked by the operator, for best metering accuracy. Small variations in seed or fertilizer application rates will not significantly affect grain crop yields.

In general, the accuracy of the Tye 5360 was good for the wheat used in PAMI calibrations. Sample wheat density was 62.5 lb/bu (779 kg/m^3). A calibration chart for rapeseed was not provided by the manufacturer. A calibration chart for any seed not covered in the operator's manual may be obtained by sending a small sample of the seed to the manufacturer.

Field roughness and level of seed in the grain box did not significantly affect the seeding rate for either large or small seeds. Variation in field speed and variation in field slope had a significant effect on the seeding rate. As shown in FIGURE 7, travelling up a 15° slope increased the seeding rate of wheat by as much as 8%. When increasing field speed from 3 to 7 mph (5 to 11 km/h) the seeding rate of wheat decreased as much as 5%.

[1]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.

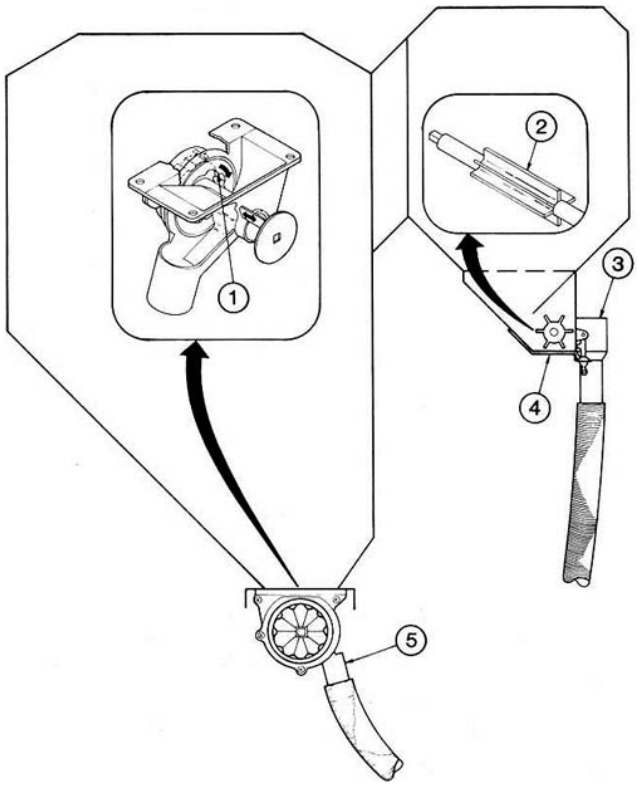

FIGURE 6. Grain and Fertilizer Metering System: (1) Internally Fluted Feed Wheel, (2) Fertilizer Paddlewheel, (3) Fertilizer Spout, (4) Cleanout Door, (5) Seed Spout.

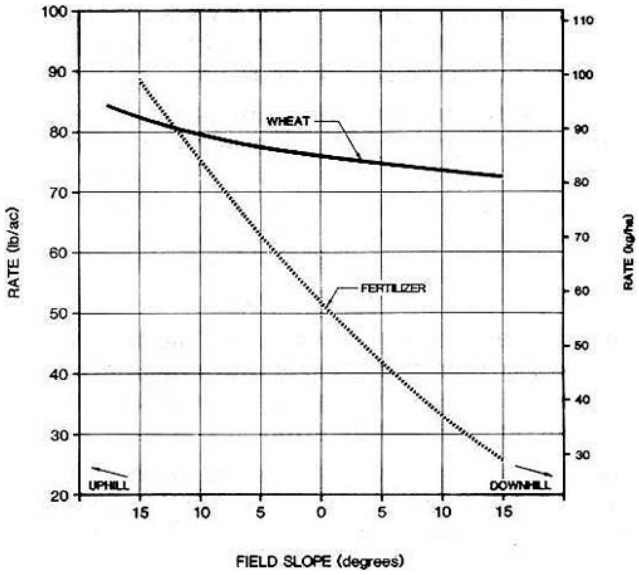

FIGURE 7. Variation in Seed and Fertilizer Application Rate with Change in Field Slope while Seeding Wheat and 11-51-00 Fertilizer.

The coefficient of variation (CV) can also be used to describe the variation of application rates among individual seed cups. If the CV is less than 15%, seeding is acceptable whereas if the CV is much greater than 15%, the variation among individual seed or fertilizer cups is excessive. When seeding rapeseed at 9.3 lb/ac (10.4 kg/ha) the CV was 8.5% indicating very uniform seeding.

Fertilizer Metering System: FIGURE 8 shows PAMI calibration results in comparison with the manufacturer's calibrations. The small differences between the two calibrations is probably due to the difference in density of fertilizer.

The variation in fertilizing rates from one run to another was very small. When distributing 11-51-00 fertilizer at a rate of 47.5 lb/ac (53.4 kg/ha), the CV among individual fertilizer cups was 10.9% indicating acceptable uniformity in metering.

The fertilizer application rate was not significantly affected by the level of fertilizer in the box, or field vibrations. Variations in field speed and variation in field slope did have an effect on the fertilizing rate. As shown in FIGURE 7, travelling up a 15° slope increased the fertilizing rate by as much as 80%. When increasing field speed from 3 to 7 mph (5 to 11 km/h) the fertilizer application rate decreased as much as 40%.

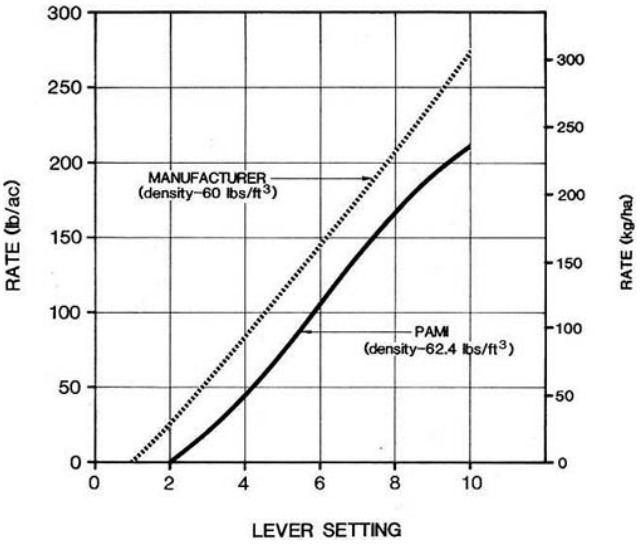

FIGURE 8. PAMI Calibrations Compared to Manufacturer's Calibrations While Applying Fertilizer.

Grass Seeding: A grass seeding attachment was available as optional equipment for the Tye Series V 5360 but was not tested. It was possible to meter large and small seeds such as ryegrass and alfalfa through the grain box with good accuracy. Occasionally large light seeds would bridge above the feed wheel opening. The manufacturer supplied calibration charts for some grass seeds.

EASE OF OPERATION

Wet Fields: Excessive mud build-up on the single disk cutting coulters and the double disk openers occasionally caused plugging when operating in wet clay or clay loam soils. A small amount of mud would also stick to the press wheels. Internal disk scrapers kept the inside of the disks clean in wet conditions. External scrapers were available as optional equipment but were not tested.

Stony Fields: Compression of the pressure springs as the openers went over stones permitted the openers to lift a maximum of 6.5 in (170 mm). The opener force increased to 500 lb (2200 N) as the springs compressed to the maximum. Average opener force during normal operation varied from 100 to 150 lb (450 to 670 N).

Trashy Fields: Where heavy surface residue was not properly spread over the entire width of the swath, opener penetration and seed placement were poor. The addition of ballast improved performance marginally. Surface residue should be spread evenly before attempting to seed through it.

Filling: The Tye Series V was easy to fill as it had large openings on both the seed and fertilizer boxes. The top of the boxes was 5.3 ft (1.63 m) above the ground for easy filling with most drill fills. The rear operator platform was 8.0 in (200 mm) wide.

The grain box had a capacity of 36.0 bu (1.26 m^3) and the fertilizer box had a capacity of 1050 lb (470 kg) with a fertilizer density of 62.4 lb/ft^3 (1000 kg/m^3). The drill was equipped with grain and fertilizer level sight glasses.

Moisture: The grain and fertilizer box lids were adequately sealed to prevent leakage into the box in light rains, but small amounts of moisture entered during heavy driving rains.

The top of the fertilizer spouts were completely open and water entered the spouts and the bottom of the fertilizer box through the sliding gates, even in light rains. It is recommended that the manufacturer consider covering the top of the fertilizer spouts and sliding gates to protect against moisture. The fertilizer shaft should be checked before operation to ensure that it is free to rotate and that the fertilizer has not caked.

Cleaning: The grain and fertilizer boxes could be easily cleaned by removing excess grain and fertilizer with a vacuum cleaner. The grain box also had clean out plugs and the fertilizer box had a bottom cleanout door for fast removal.

Acremeter: The Tye Series V 5360 was equipped with a

standard resettable acremeter. It read to the nearest thousandth of an acre to a maximum of 100 acres and was accurate to within 1%.

Transportability: The Tye Series V 5360 trailed well and rode smoothly behind a tractor or heavy truck at speeds up to 30 mph (50 km/h) provided grain and fertilizer boxes were empty. If the NoTill attachment was not used, the drill could be transported directly on the tractor three-point hitch. The overall width of the machine was 15.8 ft (4.8 m). Caution was required when transporting on public roads, through gates and over bridges.

There was ample ground clearance of 20 in (500 mm) to prevent openers from dragging on roads (FIGURE 9). Mechanical locks were provided on the NoTill attachment to hold the entire NoTill Drill in the raised position.

FIGURE 9. Ground Clearance During Transport.

Marker: A row marker was available as optional equipment but was not tested. When operating in tall stubble or in dusty conditions it was sometimes difficult to see the edge of the previous pass.

EASE OF ADJUSTMENT

Lubrication: The drill had no grease fittings but the 8 chain drives required regular oiling. The NoTill attachment had 60 grease fittings, which required regular lubrication.

Seeding and Fertilizing Rates: To adjust the seeding rate a jam nut had to be loosened and a hand adjustment wheel turned. The handwheel was turned until the seeder opening matched the opening determined from the seed rate chart. Then the handwheel was secured by tightening the jam nut. The rate was verified and the handwheel adjusted to obtain the correct seed rate.

To adjust the fertilizing rate a wing nut was loosened on the fertilizer adjustment lever and the lever moved to correspond with the setting obtained from the fertilizer rate charts. The fertilizing rate was verified and the lever adjusted again if necessary.

There were also four different drive sprocket ratios that could be used for fast or slow seeding rates. To change the shaft speed a drive chain had to be removed, the sprockets exchanged and secured, and the chain replaced. This procedure took one person about 40 minutes for both sides of the drill.

When adjusting the seeding and fertilizing rates or changing the drive sprockets, it was very important to ensure that both halves of the drill were adjusted identically. If the two drill halves were not set the same, the drill would not seed uniformly across its entire width.

Depth: The entire drill was raised and lowered on the NoTill attachment. To change the planting depth a clip was moved on each opener pressure rod. Raising the clip increased the spring pressure and increased the planting depth. Lowering the clip decreased the spring pressure and decreased the depth. Each hole on the pressure rod represented approximately 20 lb (90 N) and there were two pressure rods per opener. To move each of the 52 clips took one person about 25 minutes.

The planting depth could also be adjusted by moving the clip pin in the depth strap above the gauge-press wheel. Raising the clip pin increased the planting depth. Lowering the pin decreased the depth. It took about 20 minutes for one person to move the 26 clip pins.

To increase the depth of the cutting coulters, the turnbuckle on the hitch was shortened. This increased the pressure on the carrier frame. In order to maintain levelness on the drill the turnbuckle between the carrier and the drill had to be lengthened. To raise the cutting coulters the reverse procedure was used. Adjusting the cutting coulter depth took one person about 5 minutes.

POWER REQUIREMENTS

Maximum draft at 1.6 in (4 cm) depth on level fields with average soil moisture was about 3400 lb (15.1 kN) while average draft was about 2500 lb (11.1 kN). A 110 hp (82 kW) tractor should be adequate in all fields and field speeds.

OPERATOR SAFETY

The Tye Series V 5360 was safe to operate if normal safety precautions were observed. Warning decals were properly displayed on the NoTill carrier but not on the drill. 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.

The fertilizer adjustment levers stuck up from the centre rear of the two fertilizer boxes. The tops of the levers posed a potential source of injury if the operator leaned over them to inspect the inside of the seedbox. It is recommended that the manufacturer consider relocating the fertilizer adjustment levers to avoid potential injury to the operator.

OPERATOR'S MANUAL

The operator's manual contained information on lubrication, adjustments, warranty, safety, final assembly, operation, and optional equipment. The operator's manual did not include metric calibration charts for grain and fertilizer rates. It is recommended that the manufacturer consider providing calibration charts with metric conversions.

MECHANICAL HISTORY

The Tye Series V 5360 was operated for 44 hours while seeding 440 ac (178 ha). The intent of the test was an evaluation of functional performance and an extended durability evaluation was not conducted.

Drive Chain: A drive chain fell off the drill after 435 ac (175 ha). The exact cause of loss is unknown, however, failure of the chain due to over tensioning by the operator was suspected.

APPENDIX I
SPECIFICATIONS

MAKE:	Tye
MODEL:	Series V 114-5360 NoTill Drill
SERIAL NUMBER:	W-5-1010-7-5
DIMENSIONS:	
-- height	
-transport	7.3 ft (2.2 m)
-field	5.3 ft (1.6 m)
-- length	20.7 ft (6.3 m)
-- width	16.1 ft (4.9 m)
-- effective seeding width	15.2 ft (4.6 m)
-- transport ground clearance	20 in (500 mm)
SEED METERING SYSTEMS:	
-- type	internally fluted feed wheels
-- drive	sprocket and chain driven off drive gauge wheels
-- adjustment	turn handwheel to open or close feed wheel
-- transfer to openers	convoluted rubber hose
FERTILIZER METERING SYSTEMS:	
-- type	paddlewheel
-- drive	sprocket and chain driven off seed drive
-- adjustment	move adjustment lever to open or close sliding gates
-- transfer to openers	convoluted rubber hose
OPENERS:	
-- type	double disk (plus cutting coulters on NoTill caddy attachment)
-- size	
-opener disks	13.5 in (340 mm)
-coulters (narrow rippled)	17 in (430 mm)
-- number of openers	26
-- number of ranks	2
-- distance between ranks	6 in (150 mm)
GAUGE-PRESS WHEELS:	
-- type	semi-pneumatic
-- diameter	13 in (330 mm)
-- width	2 in (50 mm)
-- number	26
-- spacing	7 in (180 mm)

WHEELS:	
-- number	4
-- tire size	
-gauge-drive	2, 9.5 L x 15 8-ply
-carrier transport	2, 12.5 L x 16 12-ply
GRAIN AND FERTILIZER BOX CAPACITIES:	
-- grain box	36.0 bu (1.26 m³)
-- fertilizer box	1050 lb (475 kg)
WEIGHT:	
-- drill	
-boxes empty	3430 lb (1560 kg)
-boxes full	6640 lb (3010 kg)
-- drill, fertilizer, NoTill attachment (Boxes empty)	
-on wheels	6590 lb (2990 kg)
-on hitch	440 lb (200 kg)
total weight	7030 lb (3190 kg)
NUMBER OF CHAIN DRIVES:	8
NUMBER OF LUBRICATION POINTS:	
-- carrier and NoTill attachment	60
NUMBER OF HYDRAULIC CYLINDERS:	
-- carrier	2
NUMBER OF SEALED BEARINGS:	
-- drill and NoTill attachment	128

APPENDIX II
MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent	Fair
Very Good	Poor
Good	Unsatisfactory

SUMMARY CHART

TYE SERIES V 114-5360 NOTILL DRILL

RETAIL PRICE:	$29,098 (March 1987, plus $1,480 freight to Portage la Prairie, Manitoba)
QUALITY OF WORK:	
Penetration	**Very good;** moist stubble fields **Good;** dry stubble fields and pastureland
Trash Cutting	**Good;** firm soils **Fair;** soft moist soils
Accuracy of:	
Seed Metering Device	**Good;** wheat
Fertilizer Metering Device	**Good;** 11-51-00
EASE OF OPERATION:	
Wet Field Conditions	Occasional plugging
Filling	Easy; large box openings
Transportability	**Good;** quite wide
EASE OF ADJUSTMENT:	
Seed and Fertilizer Rates	Easy to adjust
Depth	Simple but time consuming
POWER REQUIREMENTS:	110 hp (82 kW) tractor has sufficient reserve for all field conditions and speeds.
OPERATOR SAFETY:	Safe, if normal precautions observed
OPERATOR'S MANUAL:	**Very good;** useful information
MECHANICAL HISTORY:	Drive chain fell off once

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