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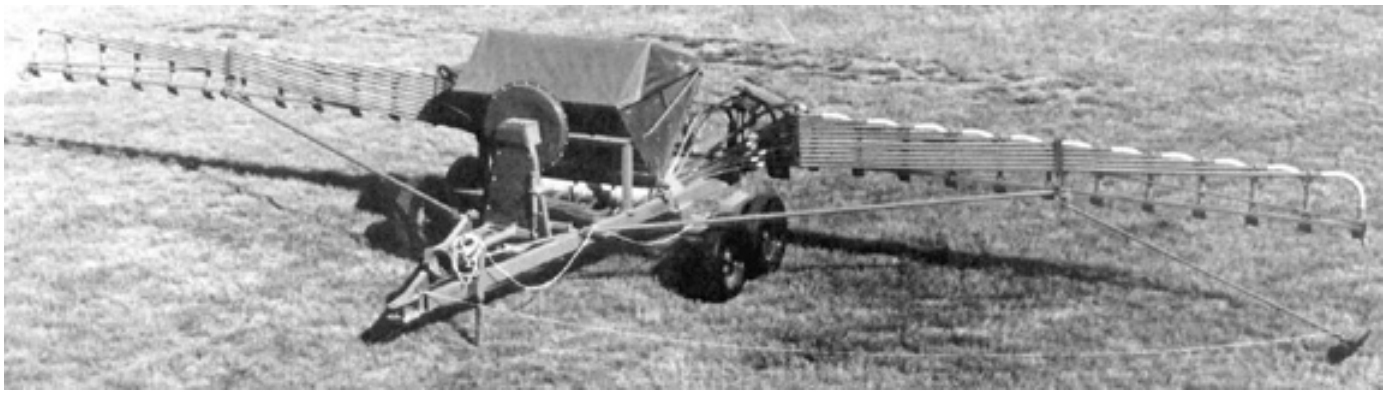

Nodet Gougis Model MT12 Granular Applicator

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

NODET GOUGIS MODEL MT 12 GRANULAR APPLICATOR

MANUFACTURER

Nodet Gougis
5 Avenue du General LEC LERC
77130 Montereau
France

DISTRIBUTOR

Cargill Grain Company Limited
300 - 240 Graham Avenue
Winnipeg, Manitoba
R3C 0J7

RETAIL PRICE:

$7295.00 (April, 1984, f.o.b. Lethbridge, Alberta).

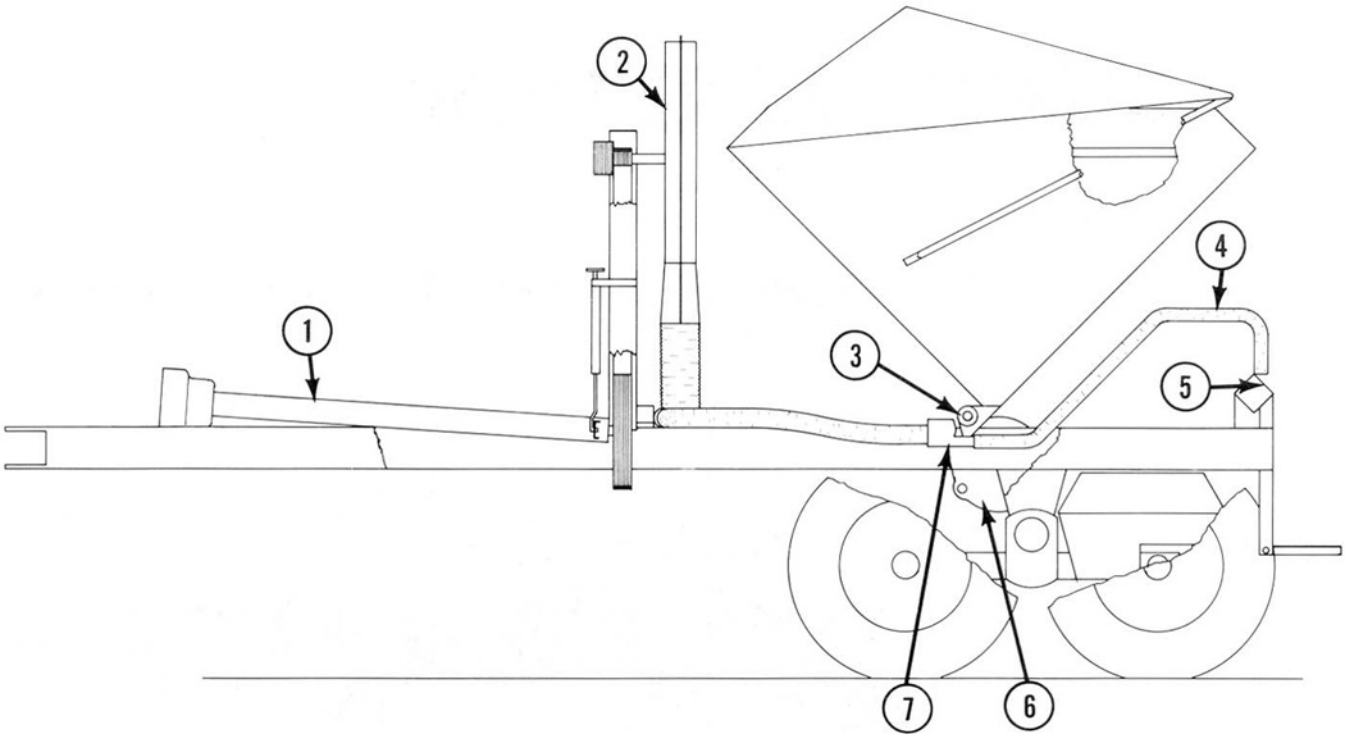

FIGURE 1. Schematic View of Nodet Gougis MT12: (1) Power Shaft, (2) Fan, (3) Meter Shaft, (4) Outlet Hose, (5) Deflector, (6) Gear Drive, (7) Venturi.

SUMMARY AND CONCLUSIONS

Functional Performance: Performance of the Nodet Gougis MT12 was very good.

Meter Calibration: The manufacturer's Avadex BW metering system calibration chart was accurate. The Treflan QR5 calibration chart was 1.3 to 2.7 lb/ac (1.4 to 3.0 kg/ha) low over the normal range of application rates. The Eptam 10G calibration chart was 12.7 to 18.4 lb/ac (14.2 to 20.6 kg/ha) low over the normal range of application rates. A Heritage 5G calibration charge was not supplied.

Metering Accuracy: Delivery rates from individual outlet hoses varied from 11.9 to 13.2 lb/ac (13.3 to 14.8 kg/ha) when applying Avadex BW at 12.5 lb/ac (14 kg/ha) and 5 mph (8 km/h) resulting in a CV of only 2.9%. The variability in delivery rates from individual outlets was similar over the normal range of application rates.

Distribution Uniformity: Distribution uniformity was acceptable for all the chemicals tested. A typical range of application rates across the width of spread was 10.4 to 18.6 lb/ac (4.6 to 20.9 kg/ha) when applying Avadex BW at 13.9 lb/ac (15.6 kg/ha) and 5 mph (8 km/h). Distribution when using Treflan QR5 was similar to Avadex BW. Slowing the power take-off speed to 405 rpm had little effect on distribution uniformity.

Effect of Field Variables: Metering was not significantly affected by field roughness, compaction in the hopper or side slopes. Application rate varied about 7% at fore and aft field slopes of 10%. Changing speed of travel did not affect application rate.

Hitching: Hitching the applicator was convenient. The hitch jack had insufficient adjustment for some tractors. The fan belt was conveniently adjusted to accommodate either 540 or 1000 rpm power take-off tractors. A power take-off adaptor was required for 1000 rpm power take-off shafts.

Hopper: The hopper was easily loaded from the back of a truck. Loading the hopper from the ground was inconvenient. A gate at the bottom of the hopper provided convenient hopper clean out. The hopper cover was not weathertight.

Ease of Adjustments and Operation: Operation of the applicator in the field was convenient. The single disc marker formed a clear noticeable mark in summerfallow fields. In soft fields with a heavy trash, the marker plugged and flipped backward. The application rate was conveniently adjusted by changing gears on the gear drive. A clutch activated from the tractor seat provided a convenient means of starting and stopping the meter shaft. A meter shaft rotation indicator was easily seen from most tractors.

Transporting: Folding the applicator into transport position was convenient. No bracket was provided for transporting the power take-off shaft when towing behind a truck. Removing the power take-off shaft was inconvenient. The MT12 towed well at speeds up to 45 mph (72 km/h).

Operator Safety: The Nodet Gougis was safe to operate if normal safety precautions were followed. All moving parts were adequately shielded.

Operator's Manual: The operator's manual clearly outlined applicator operation, servicing, calibration procedures and contained a well illustrated parts list. The operator's manual was prepared in both Imperial and SI (Metric) units of measure.

Mechanical Problems: Several mechanical problems occurred during testing. A set screw on the drive wheel sprocket was lost and the booms bent on several occasions.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying an accurate Eptam 10G meter calibration chart.
2. Supplying a Heritage 5G meter calibration chart.
3. Modifications to weatherproof the hopper.
4. Modifications to prevent the disc marker from flipping backwards.
5. Modifications to eliminate disc marker cable and tractor tire interference.

Senior Engineer: E. H. Wiens

Project Engineer: L. J. deBoer

THE DISTRIBUTOR STATES THAT

With regard to recommendation number:

1. There will be no calibration chart for Eptam 10G until the manufacturer of Eptam has uniform granular for this product.
2. A meter chart for Heritage 5G will be issued shortly.
3. Recommendations have been supplied to the manufacturer and modifications will be underway for the 1985 models.
4. Tests are underway to reduce drag and disc markers will be modified.
5. A decal will be printed with instructions that, on machines prior to 1985, the marker should not be used with dual wheel tractors or tractors with tires exceeding 20 inches in width. The present marking system will be discontinued as of April 1984 and foam markers will be available for 1985 models.

GENERAL DESCRIPTION

The Nodet Gougis model MT12 is a trailed, pneumatic granular applicator. Granules are metered from a 35 ft³ (1 m³) capacity hopper into 32 venturi assemblies by a ground driven, serrated, nylon meter shaft located at the bottom of the hopper. A power take-off driven fan located at the front of the hopper provides air which pneumatically conveys granules from the venturis to 32 outlet hoses on the booms. Granules from each hose are spread by deflectors located below each outlet. The outlet hoses are spaced at 14.8 in (376 mm), resulting in a spreading width of 39.4 ft (12 m). Application rate is changed by changing gear combinations on a gear drive to the meter shaft. The booms fold ahead for transporting.

FIGURE 1 shows the main components of the Nodet Gougis while detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Nodet Gougis MT12 granular applicator was operated for 45 hours while applying Avadex BW on 505 ac (205 ha), Treflan QR5 on 47 ac (13 ha) and a combination of Avadex BW and Treflan QR5 on 230 ac (93 ha). Field speeds ranged from 4 mph (6 km/h) on rough fields to 6 mph (10 km/h) on smooth fields.

The applicator was evaluated for quality of work, ease of operation, power requirements, operator safety and suitability of the operator's manual. Metering and distribution accuracy were evaluated in the laboratory. Standard test procedures[1] were used to determine the effect of field and machine variables on metering and distribution.

[1]PAMI T772-R78. Detailed Test Procedures for Granular Applicators.

RESULTS AND DISCUSSION

QUALITY OF WORK

Calibration Chart Accuracy: The metering system was calibrated in the laboratory with Avadex BW, Treflan QR5, Heritage 5G and Eptam 10G. The manufacturer's calibration chart for Avadex BW was accurate. The manufacturer's calibration chart for Treflan QR5 was from 1.3 to 2.7 lb/ac (1.4 to 3.0 kg/ha) low over the normal range of application rates. The calibration chart for Eptam 10G was from 12.7 to 18.4 lb/ac (14.2 to 20.6 kg/ha) low over the normal range of application rates. It is recommended that the manufacturer supply an accurate meter calibration chart for Eptam 10G.

The manufacturer did not supply a meter calibration chart for Heritage 5G. FIGURE 2 shows the meter calibration curve obtained in the laboratory for Heritage 5G. It is recommended that the manufacturer supply a meter calibration chart for Heritage 5G.

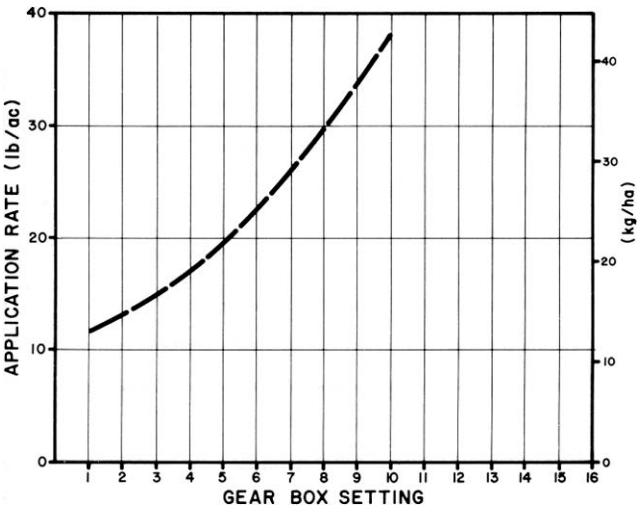

FIGURE 2. Heritage 5G Meter Calibration.

Application rates were not seriously affected by field roughness, level of material in the hopper, forward speed or by side slopes. Application rates varied about 7% on fore and aft field slopes of 10%.

The ground driven metering shaft conveniently provided for uniform application rates regardless of forward speed.

Metering accuracy: Delivery rates across the width of the machine were uniform for all granular materials used throughout the test. FIGURE 3 shows typical rates from the 32 metering outlet hoses while applying 12.5 lb/ac (14.0 kg/ha) of Avadex BW at 5 mph (8 km/h). Application rates from individual outlets only varied from 11.9 to 13.2 lb/ac (13.3 to 14.8 kg/ha), resulting in a coefficient of variation[2] of 2.9%. The variability in delivery rates from individual tubes was similar over the normal range of application rates.

Spreading Accuracy: Granules delivered by the metering mechanism were pneumatically conveyed across the width of the machine and were discharged onto deflector plates (FIGURE 4) spaced at 14.8 in (376 mm). The deflector spacing and deflector height were kept constant throughout the test. FIGURE 5 shows a typical distribution of Avadex BW when applying 13.9 lb/ac (15.6 kg/ha) at 5 mph (8 km/h). Application rates varied from 10.4 to 18.6 lb/ac (11.6 to 20.9 kg/ha) across the spreading width, resulting in a CV of 10%. Spreading uniformity for Avadex BW was not influenced by the application rates over the normal range of application rates.

[2]The coefficient of variation (CV) is the standard deviation of the application rates expressed as a percent of the mean application rate. The low CV represents uniform application whereas a high CV indicates non-uniform application. One granular herbicide manufacturer has suggested that the CV should be no greater than 10%.

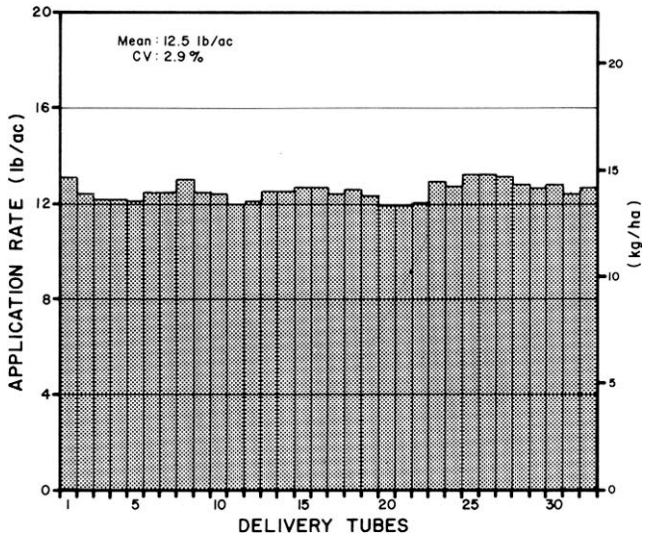

FIGURE 3. Typical Variation in Delivery Rates from Individual Outlet Hoses when Applying Avadex BW at 12.5 lb/ac (14 kg/ha) and 5 mph (8 km/h).

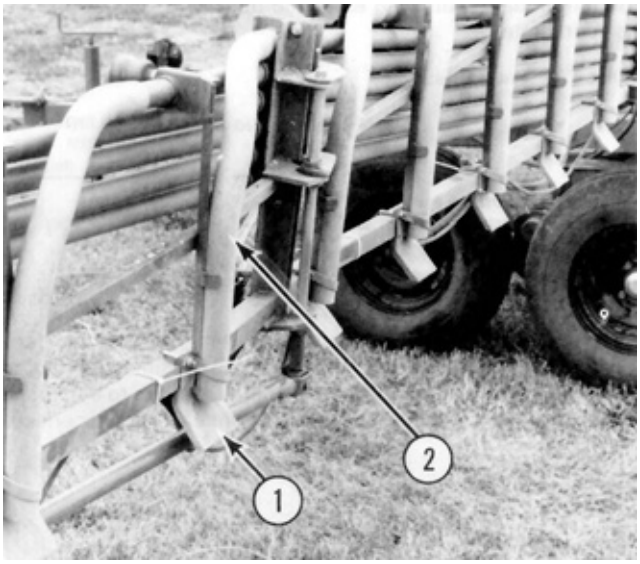

FIGURE 4. Distribution System: (1) Deflector Plate, (2) Outlet Hose.

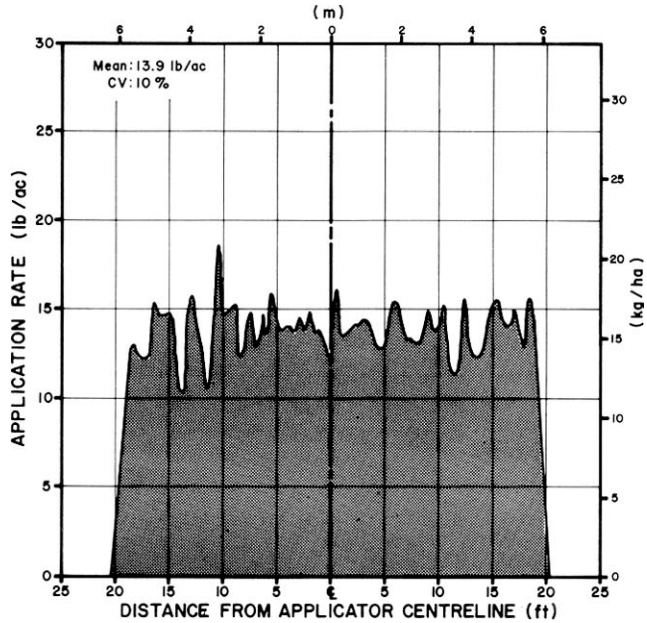

FIGURE 5. Typical Distribution Pattern when Applying Avadex BW at 13.9 lb/ac (15.6 kg/ha) and 5 mph (8 km/h).

Distribution uniformity for granular Treflan QR5 was similar to that obtained with Avadex BW. FIGURE 6 shows a typical distribution of Treflan QR5 on the ground when applying 22.6 lb/ac (25.4 kg/ha) at 5 mph (8 km/h). Application rates varied from 18.8 to 27.6 lb/ac (21.1 to 31.0 kg/ha) across the spreading width, resulting in a CV of 8.8%. Spreading uniformity for Treflan QR5 was not influenced by the application rates over the normal range of application rates.

Reducing power take-off speed from 540 to 405 rpm did not appreciably alter the distribution pattern for Avadex BW or Treflan QR5.

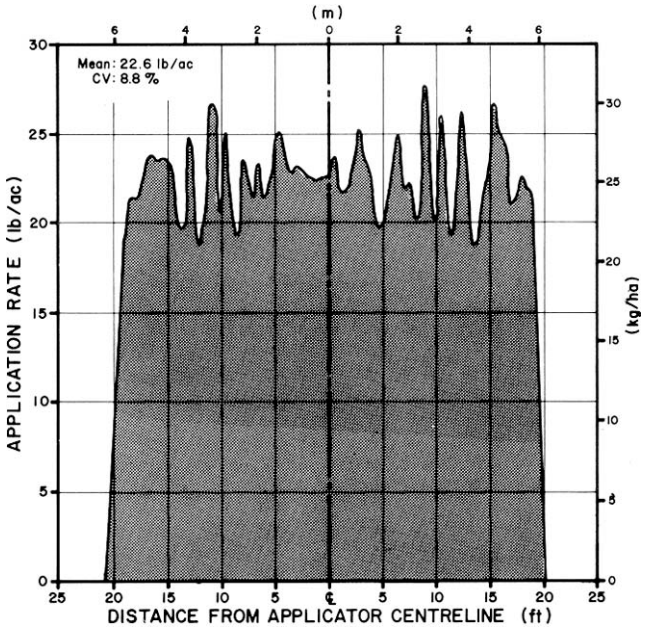

FIGURE 6. Typical Distribution Pattern when Applying Treflan QR5 at 22.6 lb/ac (25.4 kg/ha) and 5 mph (8 km/h).

The distribution patterns shown in FIGURES 5 and 6 represent operation on smooth level fields on calm days. High wind and boom bounce on rough fields could result in patterns different than those shown. Large boom height variation occurred on rolling land. Thorough soil incorporation was necessary to obtain uniform distribution in the soil.

Distribution in the direction of travel was uniform With no detectable surging.

EASE OF OPERATION

Hitching: The MT12 was conveniently hitched to a tractor. A jack was provided for raising or lowering the hitch. The maximum hitch height using the jack provided was 16.5 in (420 mm) which was insufficient for some tractors. Hitch height was not adjustable but the hitch tongue had sufficient length so that the applicator remained reasonably level when towed with most tractors.

The fan drive belt could be switched from one set of sheaves to another for use with either 540 or 1000 rpm power take-off tractors. This was convenient, but an adaptor was required to connect the power shaft to 1000 rpm power take-off shafts.

Hopper Loading: The hopper was conveniently loaded from the back of the truck. However, the edge of the hopper was 5.3 ft (1625 mm) from the ground and was too high to load with bagged granules while standing on the ground. The screen located at the top of the hopper screened out foreign material that might affect meter performance.

The hopper held about 1440 lb (655 kg) of Avadex BW which was sufficient to apply granules to about 120 ac (49 ha), at a 12 lb/ac (13.5 kg/ha) application rate, before refilling. The hopper was completely emptied when running the applicator in the field. A gate at the bottom of the hopper could be raised to clean the hopper.

The hopper cover was not weathertight. Rain entered the hopper through the cover and moisture entered through the metering system. Modifications to weatherproof the hopper are recommended.

Field Operation: The MT12 functioned very well at speeds up to 6 mph (10 km/h). On rough fields, boom movement was excessive, making slower field speeds necessary. The booms were spring cushioned to protect the boom ends from excessive boom bounce.

The MT12 was equipped with a single disc marker attached to the boom with a cable support to the applicator hitch. The marker made a clear, noticeable mark in summerfallow fields. The mark could not be seen in unworked stubble fields. In fields with heavy trash, the mark was often difficult to see. In soft fields with heavy trash, the marker tended to dig in and collect dirt and trash above the centre of the shaft. Excessive trash build up caused the boom to lift and the marker disc to flip backwards (FIGURE 7). It is recommended that modifications be made to restrain the disc marker from flipping backwards when disc marker plugging occurs.

FIGURE 7. Disc Marker Flipped Backwards out of Position.

Setting the Application Rate: The application rate was conveniently adjusted by changing gears on the gear drive to the meter shaft. Tools were not required. Changing ground speed did not affect application rate since the meter shaft was ground driven.

A clutch was provided for stopping and starting the meter shaft when finishing fields or to avoid double application on headlands. This was controlled from the tractor seat by pulling a rope.

Care had to be exercised to ensure that the clutch was disengaged when moving with the fan shut off. Failure to do this resulted in granules plugging the venturis and spilling on the ground. The venturis could be easily unplugged by running the fan, but granules were wasted.

The meter shaft rotation indicator could be seen from the seat of most tractors. This was the only method to ensure that granules were being applied on the field.

The dual walking beam wheels performed well over rough field conditions, cushioning the applicator.

Transporting: The MT12 could be folded into transport or unfolded into field position by one person without the use of tools in about 2 minutes. The boom support braces were conveniently stored in the frame sections during transporting. There was no bracket for transporting the power shaft, unless the shaft was connected to the tractor power take-off shaft, making it necessary to remove it for transporting. Removing the power take-off shaft was inconvenient.

The MT12 towed very well at speeds up to 45 mph (72 km/h). Backing the applicator was convenient.

Lubrication: The MT12 had 9 grease fittings that required daily lubrication. All grease fittings were easily accessible.

Power Requirements: The power required to drive the distribution fan at 540 rpm was 3.7 hp (2.8 kW). This was negligible compared to the power required to pull the applicator in the field.

OPERATOR SAFETY

The Nodet Gougis was safe to operate if normal safety procedures were followed. All moving parts were adequately shielded.

OPERATOR'S MANUAL

The operator's manual clearly outlined application operation, servicing and calibration procedures. It also contained a well-illustrated parts list.

A calibration chart was provided in the operator's manual. In addition, a chart was conveniently located on the applicator for setting application rates in the field.

The operator's manual was prepared in both Imperial and SI (Metric) units.

DURABILITY RESULTS

Table 1 outlines the mechanical history of the Nodet Gougis MT12 granular applicator during 45 hours of field operation. The intent of the test was evaluation of functional performance. The following failures represent only those which occurred during the functional testing. An extended durability evaluation was not conducted.

TABLE 1. Mechanical History.

ITEM	OPERATING HOURS	EQUIVALENT FIELD AREA ac	(ha)
- A set screw on the drive wheel sprocket was lost and replaced at	7	140	(56)
- The left boom, support brace and marker boom bent and were straightened at	14, 30	240, 520	(96, 208)

Booms: The left boom support brace and marker boom bent due to the marker cable interfering with an outside dual tractor tire while making a turn (FIGURE 8). Modifications to eliminate disc marker cable and tractor tire interference are recommended.

FIGURE 8. Disc Marker Cable and Tractor Tire Interference.

APPENDIX I

SPECIFICATIONS

MAKE:	Nodet Gougis MT12 Granular Applicator	
MODEL:	MT12	
SERIAL NUMBER:	998395	
MANUFACTURER:	Nodet Gougis 77130 Montereau France	
OVERALL DIMENSIONS:	FIELD POSITION	TRANSPORT POSITION
- length	152 in (3850 mm)	152 in (3850 mm)
- width	463 in (11760 mm)	113 in (2860 mm)
- height	76 in (1930 mm)	75 in (1900 mm)
- wheel tread	105 in (2655 mm)	105 in (2655 mm)
WEIGHTS:	FIELD POSITION	TRANSPORT POSITION
- left wheels	946 lb (430 kg)	858 lb (390 kg)
- right wheels	890 lb (405 kg)	868 lb (395 kg)
- hitch	154 lb (20 kg)	264 lb (120 kg)
Total	1190 lb (905 kg)	1190 lb (905 kg)
TIRES:	4, 7.50 - 14, 4 ply	
METERING SYSTEM:		
- type	meter shaft (serrated nylon)	
- drive	ground driven through gear box	
- adjustment	interchangeable gears	
- transfer to ground	pneumatic nozzles with deflector plates	
- number of discharge openings	32	
- spacing	14.7 in (375 mm)	
- discharge height	37.5 in (950 mm)	
- spreading width	472 in (12000 mm)	
HOPPER CAPACITY:	35 ft³ (1.0 m³)	
NUMBER OF LUBRICATION POINTS:	9 grease fittings	

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports:

Excellent
Very Good
Good
Fair
Poor
Unsatisfactory

APPENDIX III

CONVERSION TABLE

acres (ac) x 0.40	= hectares (ha)
bushels (bu) x 36.4	= litres (L)
feet (ft) x 0.305	= metres (m)
horsepower (hp) x 0.75	= kilowatts (kW)
inches (in) x 25.4	= millimetres (mm)
miles/hour (mph) x 1.61	= kilometres/hour (km/h)
pounds (lb) x 0.45	= kilograms (kg)
pounds/bushel (lb/bu) x 1.25	= kilogramslhectolitre (kg/hL)
pounds force (lb) x 4.45	= newtons (N)
pounds force/foot (lb/ft) x 0.015	= kilonewtons/metre (kN/m)

SUMMARY CHART
NODET GOUGIS MODEL MT12
GRANULAR APPLICATOR

RETAIL PRICE:	$7295.00 (April, 1984, f.o.b. Lethbridge)
METER CALIBRATION:	
- Avadex BW	- accurate
- Treflan QR5	- 1.3 to 2.7 lb/ac (1.4 to 3.0 kg/ha) low over normal range
- Heritage 5G	- not supplied
- Eptam 10G	- 12.7 to 18.4 lb/ac (14.2 to 20.6 kg/ha) low over normal range
METER ACCURACY:	- CV = 2.9% when applying Avadex BW at 12.5 lb/ac (14.0 kg/ha) and 5 mph (8 km/h)
DISTRIBUTION UNIFORMITY:	- acceptable for all granular products tested
EFFECT OF FIELD VARIABLES:	
- bounce	- no effect
- level of material in hopper	- no effect
- side slopes	- no effect
- fore and aft slopes	- 7% variation
- ground speed	- no effect
HITCHING:	- convenient
HOPPER:	- conveniently loaded from the back of a truck - not weathertight
EASE OF OPERATION AND ADJUSTMENT:	- application rate was easily adjusted
TRANSPORTING:	- convenient
OPERATOR SAFETY:	- all parts were adequately shielded
OPERATOR'S MANUAL:	- complete and informative

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