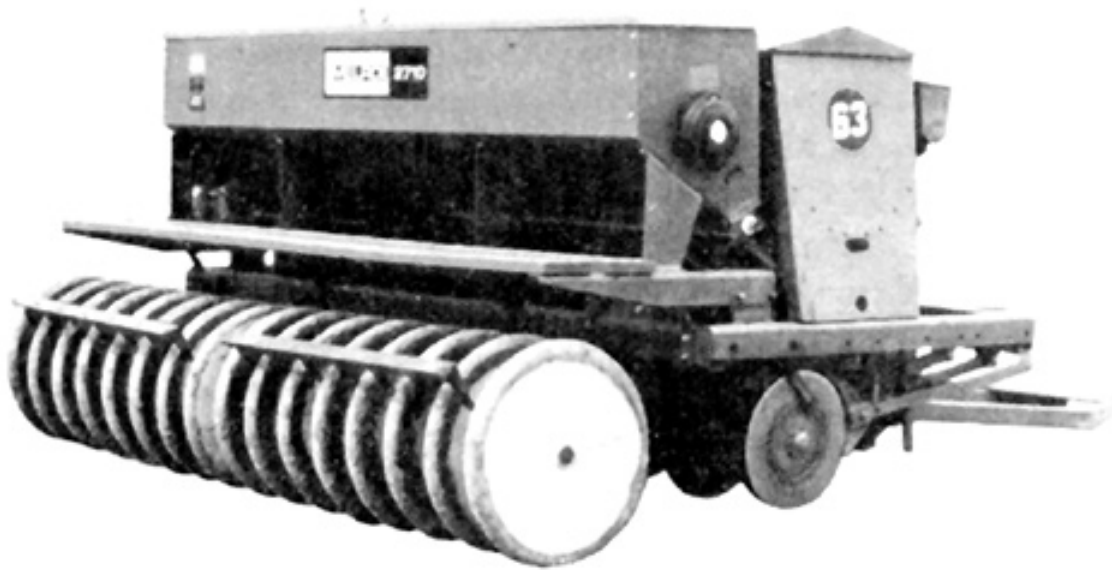


# Evaluation Report 103



## Melroe 2710 Fertilizer Attachment

A Co-operative Program Between



## MELROE 2710 FERTILIZER ATTACHMENT

### MANUFACTURER:

Melroe Division Ag. Products  
Clark Equipment Company  
Bismarck, North Dakota 58501

### DISTRIBUTOR:

Westward Parts Services Ltd.  
P.O. Box 1907  
Regina, Saskatchewan  
S4P 3E1

### SUMMARY AND CONCLUSIONS

Overall functional performance of the Melroe 2710 fertilizer attachment was *fair*. Its performance was reduced by large variations in application rate with changes in field slope and fairly high variation in distribution across the seeding width.

Application uniformity was not affected by field roughness, ground speed or level in the fertilizer box. Application rate was significantly affected by field slope and increased 53% when seeding up a 15° slope. The variation in application across the seeding width was just within acceptable limits.

Actual application rates were about 30 kg/ha (27 lb/ac) higher than those indicated in the manufacturer's calibration tables for all application rates when applying fertilizer types commonly used in the prairies. A large range of fertilizing rates were available with an adequate number of settings in the commonly used range.

Installation of the attachment on a drill was easy with adequate instructions supplied by the manufacturer.

The fertilizer box was very easy to clean. The feed baffles and dropout bottom were easily removed. The box was well sealed with a slight amount of moisture entering only in heavy rains.

The operator's manual was *very good*. It contained comprehensive instructions on installation, adjustment, repair and maintenance.

Only one minor mechanical problem occurred during functional evaluation.

### RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Supplying new calibration charts to eliminate the large discrepancy between actual and indicated application rates for commonly used fertilizers.
2. Indicating, in the operator's manual, the actual density of fertilizer used in preparing calibration charts.
3. Supplying a metric calibration chart, in addition to the regular calibration chart, to aid operators in metric conversion.

Chief Engineer -- E. O. Nyborg

Senior Engineer -- L. G. Smith

Project Engineer -- G. E. Frehlich

### THE MANUFACTURER STATES THAT

With regard to recommendation number:

1. This recommendation is being considered.
- 2 & 3. If new calibration charts are provided they will include metric and English units as well as the density of the fertilizer used for calibrations.

### GENERAL DESCRIPTION

The Melroe 2710 is a 2440 mm (8 ft) wide fertilizer attachment designed for mounting on grain drills. The model tested had 150 mm (6 in) spacing and was supplied with mounts and drive specially designed for a Massey Ferguson 63 grain drill.

### RETAIL PRICE:

\$650.00 (February, 1978, f.o.b. Humboldt, to fit a 2440 mm (8 ft) Massey Ferguson model 63 grain drill with 150 mm (6 in) spacing).

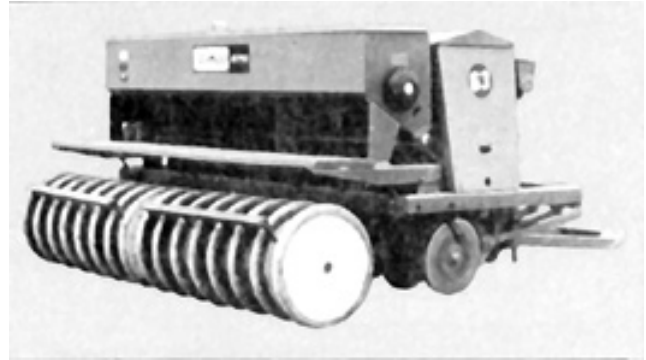


FIGURE 1. Melroe Fertilizer Attachment Mounted on a Massey Ferguson 63 Drill.

The fertilizer box has a volume of 0.31 m<sup>3</sup> (10.8 ft<sup>3</sup>), suitable for holding about 320 kg (705 lb) of fertilizer. Flexible wire augers on a circular feed shaft meter fertilizer through plastic discharge cups and feed tubes to drill seed drop tubes. Application rate is set by adjusting the speed of the feed shaft through a gearbox drive.

Detailed specifications are given in APPENDIX I.

### SCOPE OF TEST

The Melroe 2710 was mounted on a Massey Ferguson 63 grain drill and was operated for 120 hours while applying a variety of fertilizers to about 222 ha (550 ac). It was evaluated for quality of work, ease of operation, ease of installation and adjustment, operator safety and suitability of the operators manual. In addition, the fertilizer application system was calibrated in the laboratory.

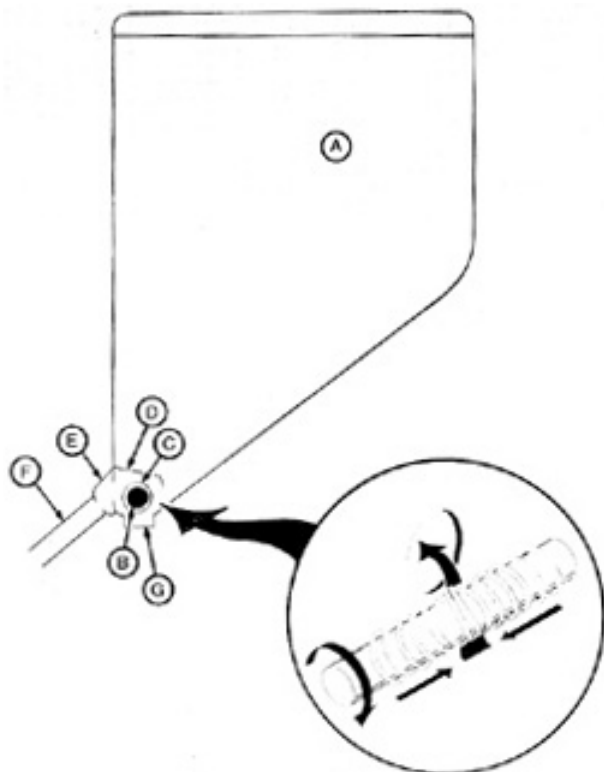
### RESULTS AND DISCUSSION

#### QUALITY OF WORK

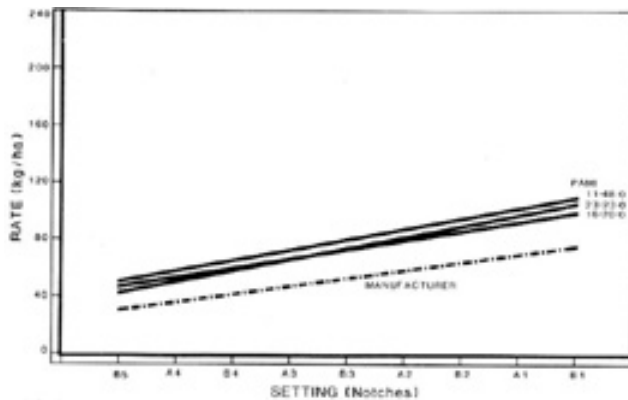
*Metering Accuracy:* The fertilizer metering system (FIGURE 2) was calibrated in the laboratory using a standard procedure. Results were compared with the manufacturer's calibration tables. FIGURE 3 shows calibration results for the Melroe 2710 with 11-48-0, 23-23-0 and 16-20-0 fertilizers when using the lowest gear and sprocket drive ratio. Three other drive ratios permit application rates up to 265 kg/ha (240 lb/ac). The densities of the fertilizers used for calibration were 927 kg/m<sup>3</sup> (57 lb/ft<sup>3</sup>), 990 kg/m<sup>3</sup> (61 lb/ft<sup>3</sup>) and 860 kg/m<sup>3</sup> (53 lb/ft<sup>3</sup>), respectively. The density of the fertilizer used by the manufacturer in preparing his calibration table was not stated in the operator's manual.

Although delivery rates for a certain setting depend upon the fertilizer type, granule size, density and moisture content, it can be seen from FIGURE 3 that delivery rates for these three commonly used fertilizers were fairly similar and were about 30 kg/ha (27 lb/ac) higher than indicated by the manufacturer for all settings. It is recommended that the manufacturer supply new calibration charts to suit fertilizers commonly used on the prairies.

1. PAMI T773, Detailed Test Procedure for Grain Drills.



**FIGURE 2.** Fertilizer Metering System: (A) box, (B) feed shaft, (C) wire auger, (D) baffle, (E) feed cup, (F) feed tube, (G) dropout panel.



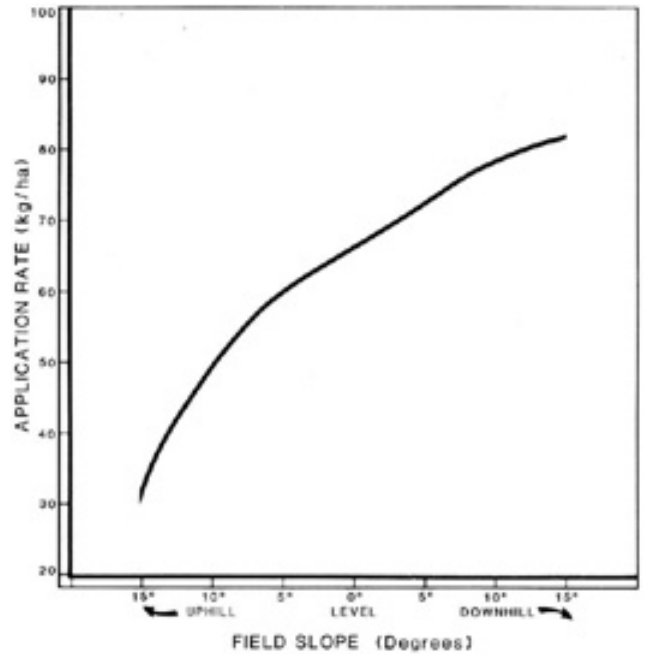
**FIGURE 3.** Calibration of Fertilizer Metering System.

The coefficient of variation (CV)<sup>2</sup> is commonly used to describe the variation in application rates across the drill width. It is accepted for fertilizer application, that the CV should not be greater than 15%. If the CV is less than 15%, fertilizer application is acceptable whereas if the CV is much greater than 15%, the variation among individual fertilizer spouts is excessive.

Fertilizer distribution across the width of the drill was just within acceptable limits. When applying 23-23-0 fertilizer at 60 kg/ha (54 lb/ac), the CV was 11%. When applying 43 kg/ha (39 lb/ac) the CV was 15%.

The fertilizer application rate was not affected by the level of fertilizer in the box, ground speed or field vibrations. It was, however, significantly affected by field slope. FIGURE 4 shows the variation in fertilizer application rates when seeding uphill, downhill and on level ground with the fertilizer drive set at gear A3 while applying 23-23-0 fertilizer. The application rate varied from 30 kg/ha (27 lb/ac) while seeding up a 15° slope to 82 kg/ha (74 lb/ac) while seeding down a 15° slope. The application rate on level ground was 66 kg/ha (59 lb/ac). The variation between seeding on level ground and seeding 15° uphill was 53%.

2. The coefficient of variation is the standard deviation of application rates from individual fertilizer spouts expressed as a percent of the mean application rates.

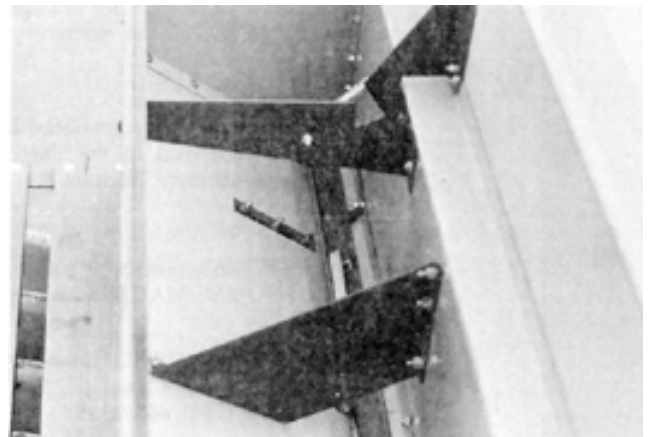


**FIGURE 4.** Variation in Fertilizer Application Rate with Change in Field Slope while Applying 23-23-0 Fertilizer at A3 Gearbox Setting.

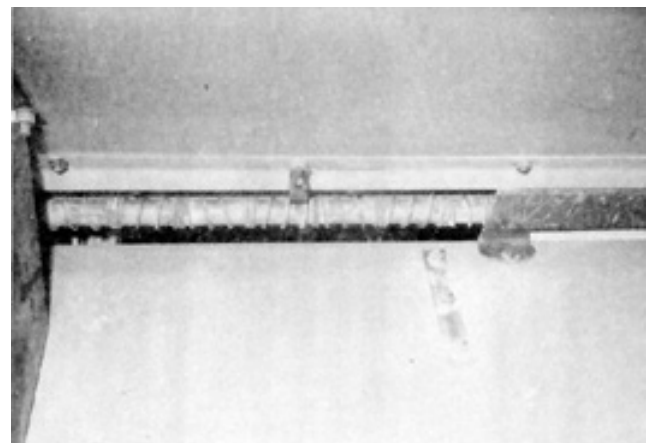
#### EASE OF OPERATION

**Filling:** Filling the Melroe 2710, when mounted on a Massey Ferguson 63 drill, was safe and convenient. The walkway on the drill was of ample width while the fertilizer box opened widely (FIGURE 5).

**Cleaning:** The Melroe 2710 was very easy to clean. Both the baffles above the feed shaft and the dropout panel below the feed shaft could easily be removed (FIGURE 6).



**FIGURE 5.** Interior of Fertilizer Attachment Showing Wide Opening Lid.



**FIGURE 6.** Interior of Fertilizer Attachment Showing the Cleanout Panels Removed.

**Baffles:** The baffles above the seed shaft (FIGURE 2) had to be carefully installed to minimize the clearance at the section joints. A clearance between the joints permitted a small amount of fertilizer to fall through the nearest discharge tubes if the drill was transported with fertilizer in the hopper.

**Moisture:** The fertilizer box was well sealed. A small amount of moisture entered the fertilizer box only in heavy rains. If the attachment is forced to stand out in the rain, it must be checked before operation to ensure that the feed shaft is free to turn and that the fertilizer has not caked.

#### EASE OF INSTALLATION AND ADJUSTMENT

**Installation:** The Melroe 2710 could be installed on a Massey Ferguson 63 drill in about three hours. Installation instructions were well described in the operator's manual. Two men were needed to initially place the attachment on the drill due to the weight of the attachment and necessary alignment needed to install the first bolts.

**Fertilizing Rate:** The fertilizer application rate was set by adjusting the idler gear on the multiple speed gearbox (FIGURE 7). The gear selection lever had to be carefully positioned when changing speeds, to ensure that the idler was fully engaged in both the drive gear and driven gear. If the gears were not properly engaged, the selection lever would jump out of position as soon as seeding began.

**Lubrication:** No lubrication was necessary. All drives contained sealed bearings while the feed shaft ran in nylon bushings. The manufacturer recommended periodic cleaning of the feed shaft bushings with solvent to remove fertilizer accumulation.

#### OPERATOR SAFETY

The Melroe 2710 was safe to operate providing normal safety procedures were followed.

#### OPERATOR'S MANUAL

The operator's manual was simple, concise and well illustrated presenting comprehensive instructions on installation, calibration, operation and maintenance. The calibration chart indicated rates about 30 kg/ha (27 lb/ac) too low for fertilizers commonly used in the prairies. The density of the fertilizer used in preparation of the chart was also not stated and the manual did not include a metric calibration chart.

#### DURABILITY RESULTS

TABLE 3 outlines the mechanical history of the Melroe 2710 fertilizer attachment during 120 hours of operation while fertilizing about 222 ha (550 ac). The intent of the test was the evaluation of functional performance. The following problems occurred during functional testing. An extended durability evaluation was not conducted.

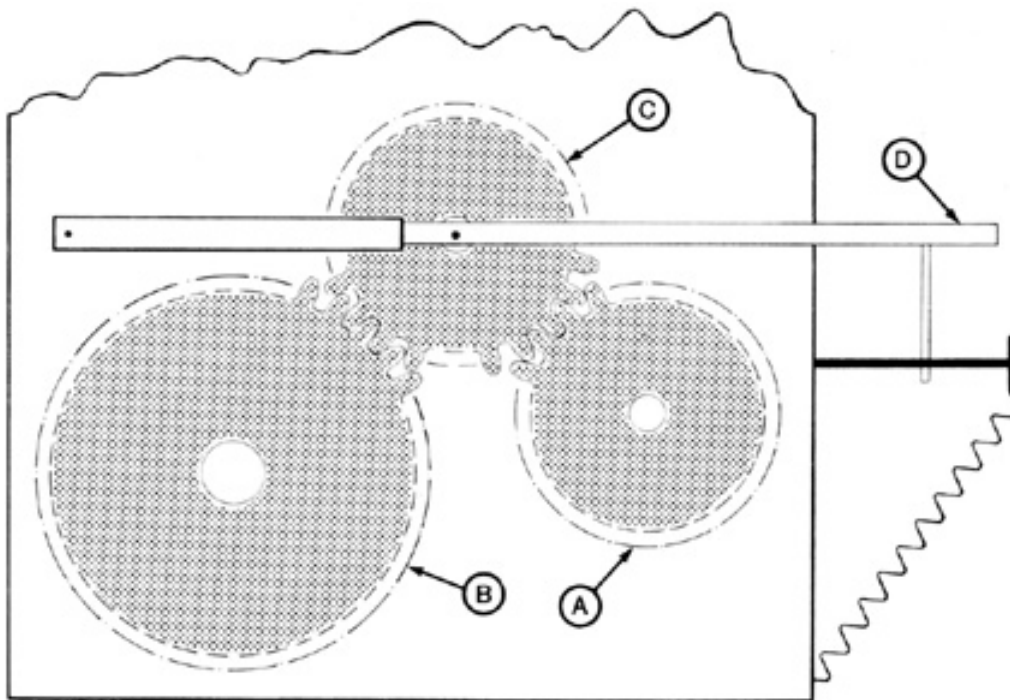


FIGURE 7. Multiple Speed Gearbox for Adjusting the Application Rate: (A) drive gear, (B) driven gear, (C) idler gear, (D) selection lever.

TABLE 3. Mechanical History

ITEM	HOURS	FIELD	AREA
		ha	(ac)
-one nylon feed cup broke as the feed tube was being inserted into the drill drop tube during installation			
-the drive gear cluster on the gearbox drive shaft began to slip when the gearbox was operated in the "A" setting. A spacer was installed to allow full engagement of the gear cluster with the driving pin at	26	46	(114)

APPENDIX I

SPECIFICATIONS

MAKE: Melroe Fertilizer Attachment

MODEL: 2710-166

SERIAL NO.: MB1496

DIMENSIONS:

- effective application width 2438 mm (96 in)
- spacing of discharge tubes 150 mm (6 in)
- number of discharge tubes 16

METERING SYSTEM:

- type wire augers on round horizontal shaft
- drive chain and gear from grain drill power shaft
- adjustment multiple speed gearbox controlling feed shaft speed
- number of feed speeds 19 in each of four ranges
- transfer to openers plastic discharge tubes feeding into grain box drop tubes

FERTILIZER BOX CAPACITY: 320 kg (705 lb)

NUMBER OF CHAIN DRIVES: 1

NUMBER OF LUBRICATION POINTS: none

NUMBER OF SEALED BEARINGS: 5

APPENDIX II

MACHINE RATINGS

The following rating scale is used in PAMI Evaluation Reports.

- |               |                    |
|---------------|--------------------|
| (a) excellent | (d) fair           |
| (b) very good | (e) poor           |
| (c) good      | (f) unsatisfactory |

APPENDIX III

METRIC UNITS

In keeping with the Canadian metric conversion program, this report has been prepared in SI units. For comparative purposes, the following conversions may be used.

- |                                     |                           |
|-------------------------------------|---------------------------|
| 1 hectare (ha)                      | = 2.47 acres (ac)         |
| 1 kilometre/hour (km/h)             | = 0.62 miles/hr (mph)     |
| 1 metre (m) = 1000 millimetres (mm) | = 39.37 inches (in)       |
| 1 kilowatt (kW)                     | = 1.34 horsepower (hp)    |
| 1 kilogram (kg)                     | = 2.2 pounds (lb)         |
| 1 newton (N)                        | = 0.22 pounds force (lb)  |
| 1 litre (L)                         | = 0.028 bushels (bu)      |
| 1 kilogram/hectare (kg/ha)          | = 0.9 pounds/acre (lb/ac) |



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