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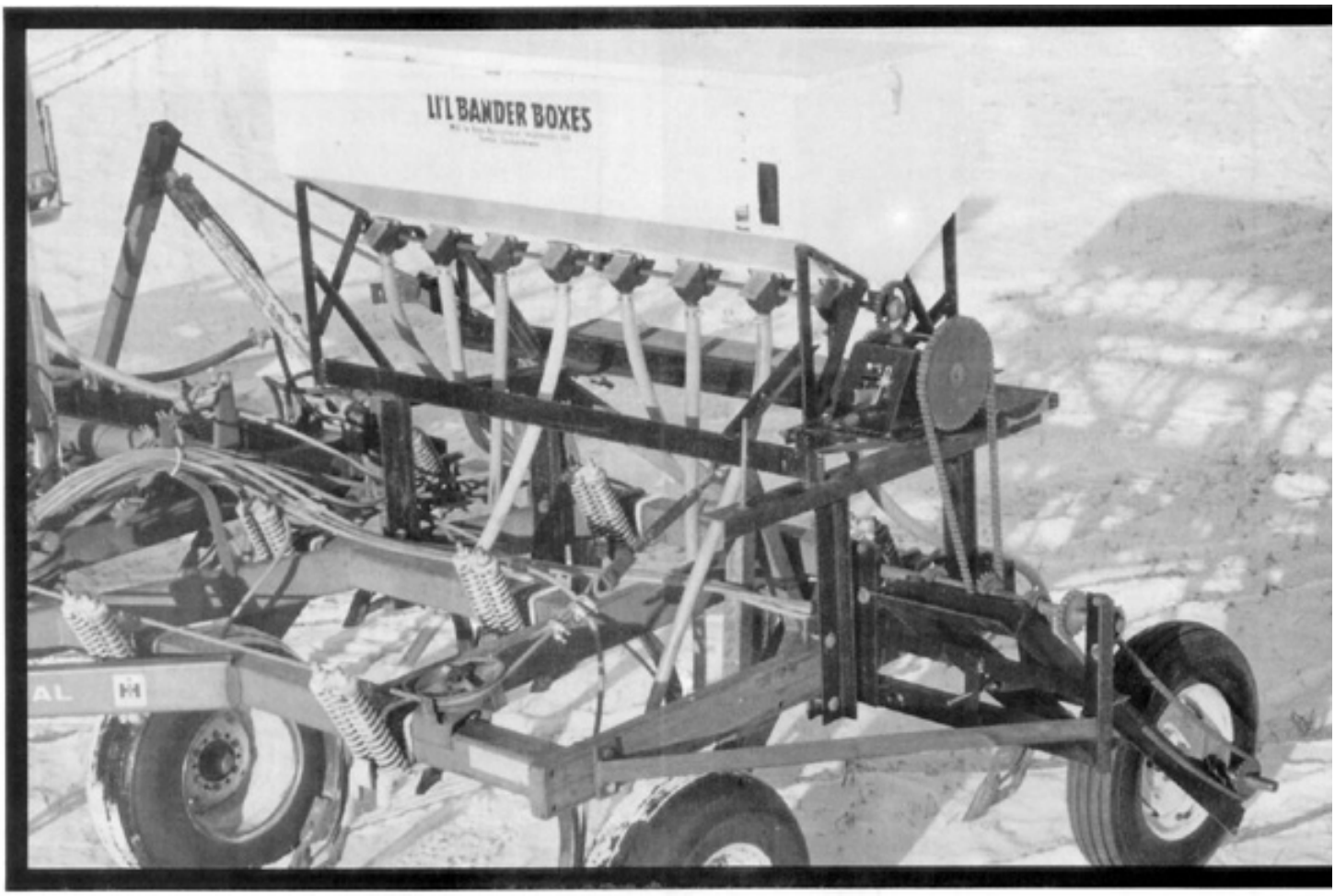
Evaluation Report 496



ACCU Lil Bander Fertilizer Attachment

A Co-operative Program Between

ALBERTA FARM MACHINERY RESEARCH CENTRE

PAMI
PRAIRIE AGRICULTURAL MACHINERY INSTITUTE

ACCU LIL BANDER FERTILIZER ATTACHMENT

MANUFACTURER AND DISTRIBUTOR:

Accu Agricultural Implements Ltd
PO Box 53
Senlac, Saskatchewan
S0L 2Y0
(306) 228-3140

RETAIL PRICE:

$1,298.00 (March. 1986. f.o.b. Humboldt. one box with eight outlets, and mounting hardware).

$712.00 (One ground drive assembly)

SUMMARY AND CONCLUSIONS

Quality of Work: The accuracy of the fertilizer metering system was very good. Fertilizer was applied at rates from 24 to 345 lb/ac (27 to 385 kg/ha) depending on type. The calibration chart was accurate but could not be used for custom blended fertilizers. A method for field checking rates was not provided. Distribution across the width of the Accu Lil Bander was uniform with CV's less than 10%

Performance of the fertilizer delivery system was very good, The smooth-tined plastic hoses did not plug, and the box had adequate height for gravity flow.

Fertilizer placement depended upon the cultivator and banding openers used.

Ease of Installation: Ease of installing the Accu Lil Bander was very good. tt took one man about 8 hours to install each box. It was easily adapted to the test cultivator. A loader or crane was required. Written instructions and several sketches were adequate.

Ease of Operation and Adjustment: Ease of filling the tank was good. The 7.8 ft (2.4 m) filling height was too high for some drill fills, but worked well for auger filling. The large filler opening was weathertight, Ease of cleaning was fair. Fertilizer had to be swept or vacuumed out of the flat bottom. The metering wheels were easily removed.

Monitoring was good, Material flow could be viewed from the tractor. A sight glass helped to judge the amount of fertilizer in the box. The boxes obstructed visibility behind the cultivator.

Ease of transporting was very good. The boxes were offset to allow the cultivator wings to fold up normally. The wing lifts had to be slightly adjusted. The boxes should be emptied before transporting to avoid excessive cultivator frame stress or tire overloading,

Application rate adjustment was good, The multiple speeds were easy to set, Ease of maintenance was good. Daily servicing took about 3 minutes. No servicing information was supplied,

Power Requirements: The Accu Lil Bander had no measurable effect on the cultivator power requirements.

Operator Safety: No serious safety hazards were apparent with the machine. Climbing onto the cultivator for filling was hazardous,

Operator's Manual: The operator's manual was good, It contained information on installation, operation, adjustment, and troubleshooting. Safety information was not provided.

Mechanical History: A few minor problems occurred.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Modifications to improve the ease of cleaning.
2. Providing safety information with the machine.

Senior Engineer: G.E. Frehlich

Project Engineer: M.E. Jorgenson

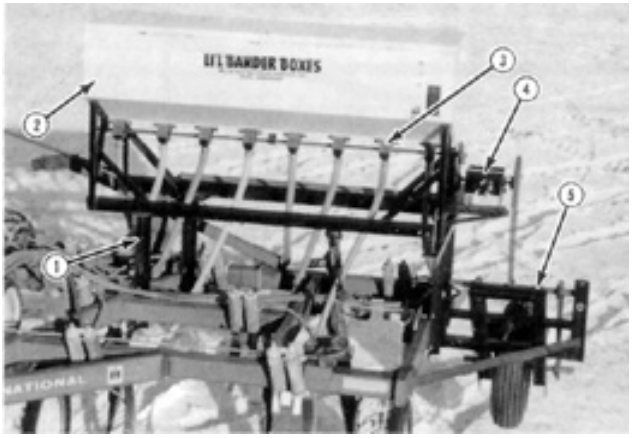


FIGURE 1. Accu Lil Bander: (1) Frame, (2) Box, (3) Metering Cups, (4) Metering Gearbox, (5) Ground Drive.

THE MANUFACTURER STATES THAT

Wit h regard to recommendation number:

1. Changes are under consideration. In defense of our present design, the added cost to our boxes, and hence to the customer does not justify the five minutes saved in cleaning time.
2. We will provide the safety information which PAMI feels is necessary.

MANUFACTURER'S ADDITIONAL COMMENTS

1. A densty and calibration scale is now available upon request.
2. A new universal mounting frame which adjusts for any size of cultivator members is now standard equipment. Various drive wheel mounting locations are available. For specific requests, please contact the manufacturer.
3. In the USA contact our distributor at Concord Inc. 2800 7th Avenue North, Fargo, North Dakota, 58102, phone (701) 280-1260.

GENERAL DESCRIPTION

The Accu Lil Bander (FIGURE 1) is a granular fertilizer applicator box that mounts on the frame of a cultivator for deep banding fertilizer.

Fertilizer is metered from the box by plastic fluted feed wheels in separate metering cups for each opener. The ground wheel drives the metering system using sprockets, gears, and a 9 speed gearbox. Plastic hoses deliver fertilizer by gravity from each metering cup to the banding boots.

Metering rate is adjusted by changing gears or by shifting the gearbox.

The Accu Lil Bander is available in sizes to suit most widths of cultivators including folding wing cultivators. The test machine consisted of two boxes with 8 outlets each, and one ground drive with a drive shaft between the boxes.

Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Accu Lil Bander was installed on the wing sections of a 25 ft (7.6 m) International 55 heavy duty cultivator with 25 shanks arranged in 3 rows. Fertilizer was placed on a 12 in (305 mm) spacing using Dutch #80 fertilizer banding knives.

The machine was operated in the field and laboratory for about 15 hours. It was evaluated for quality of work, ease of installation, operation and adjustment, power requirements, safety, and suitability of the operator's manual.

RESULTS AND DISCUSSION

QUALITY OF WORK

Fertilizer Metering: The accuracy of the Accu Lil Bander metering system (FIGURE 2) was very good when applying fertilizer.

Fertilizer could be applied at 27 different rates ranging from 24 to 245 lb/ac (27 to 387 kg/ha) depending on the fertilizer type. The manufacturer's calibration chart listed rates for 5 commonly used fertilizers. Rates given in the chart agreed closely with rates obtained by PAMI.

The actual application rate at a given setting will vary with factors such as size, density and moisture content of the fertilizer, making it difficult for the manufacturer to provide charts which include all types and blends of fertilizers. Small variations in amount of fertilizer applied may not significantly affect yield, but can reduce economic returns. For best results, the application rate should be adjusted according to the chart, and then checked in the field. For fertilizer blends not listed in the calibration chart, the application rate was set according to a similar material, and then checked in the field. The manufacturer did not provide a method for field checking application rates.

Fertilizer application rates were not affected by changes in ground speed, level of fertilizer in the box, nor field roughness. Rates were slightly affected on slopes. For example, when applying 34-0-0 at 160 lb/ac (180 kg/ha) the rate increaed by 6%on a 15 degree downhill slope, and decreased by 6% on a 15 degree uphill slope. Side slopes did not affect metering rates.

In moist sticky soils, the ground drive tire picked up some mud, but mud buildup was not severe enough to affect metering rates.

The fertilizer application rate across the width of the Accu Lil Bander was uniform with all fertilizers tested, at all rates. For example, FIGURE 3 shows the distribution of 46-0-0 fertilizer at a rate of 112 lb/ac (125 kg/ha) across one 8 outlet box. Coefficients of Variation[1] (CV's) at all application rates for all fertilizers tested were less than 10%.

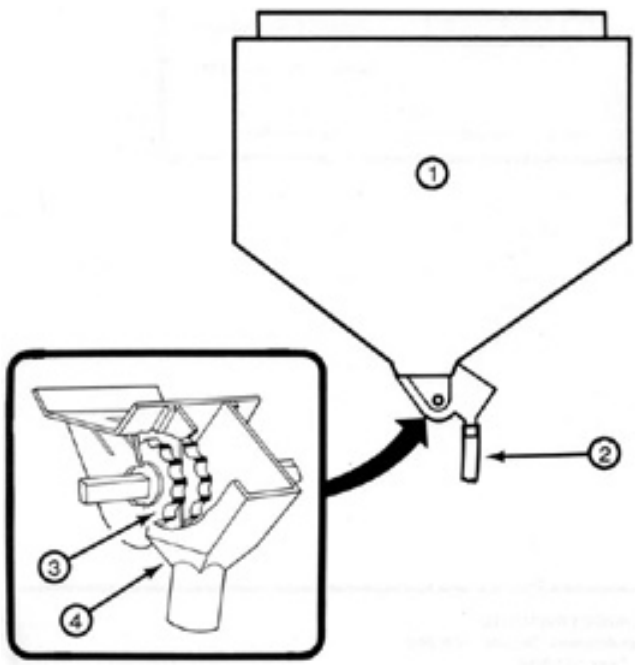


FIGURE 2. Fertilizer Metering System: (1) Box, (2) Delivery Hose, (3) Metering Wheel, **(4)** Metering Cup.

1 The coefficient of variation is the standard deviation of application rates from individual openers expressed as a percent of the mean. A CV of less than 15% is considered acceptable. A C V less than 10% is considered very uniform. Application is not uniform if the CV is greater than 15%.

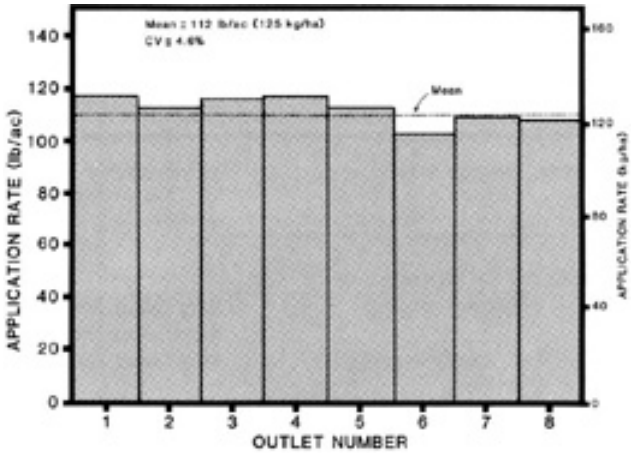


FIGURE 3. Distribution Uniformity Pattern in 46-0-0 at 112 lb/ac (125 kg/ha).

Fertilizer Delivery to Openers: Performance of the fertilizer delivery system was very good. The smooth plastic hoses did not restrict material flow or plug with fertilizer when properly installed. The metering cups were 28 in (710 mm) above the frame which was adequate with a 3-row cultivator to ensure good gravity-flow of fertilizer from the box to the boots. The hoses had to be free of sags or flat areas to avoid plugging, yet some slack was needed to al low for shank tripping. Some knives which use a restricted fertilizer outlet may cause the hoses to plug. The Dutch #80 knives did not cause any delivery problems.

Fertilizer Placement: The Accu Lil Bander did not come with its own banding boots or knives. Fertilizer placement depends on the knife or chisel and boot used. Fertilizer placement was very good with the Dutch #80 banding knives and the International 55 heavy duty cultivator on 12 in (305 mm) spacing. Fields were fall-banded to a depth of 4 to 4-1/2 in (102 to 114 mm). Fertilizer was placed in a band about 1 in (25 mm) wide and varying in depth about 1/2 in (12 mm).

EASE OF INSTALLATION

Ease of installation was very good. Each Accu Lil Bander box was assembled and installed by one man in about 8 hours. The boxes were mounted on the cultivator frame, the ground drive was assembled and installed, and the hoses were routed through the frame to the openers.

A front-end loader, hoist or crane was required to lift the boxes onto the cultivator. A welder and common hand tools were also required. The angle-iron frame was easily adjusted to suit the cultivator frame and various box positions. Installation instructions in the operator's manual were clearly written and well illustrated. Numerous sketches were helpful.

On multiple section cultivators, the center box is normally positioned behind the wing-mounted boxes to allow the wings to fold for transport and to improve weight distribution. On the test machine, the center box had to be positioned ahead of the wing boxes, to clear cultivator components. The ground drive was mounted on the left end of the cultivator. The drive shaft between the boxes had to be removed before folding the wings for transporting.

EASE OF OPERATION AND ADJUSTMENT

Filling: Ease of filling was good. The box openings were about 7.8 ft (2.4 m) above ground which was too high for some drill fills. During the tests, a 30 ft (9.1 m) grain auger with a flexible spout worked well. The cultivator could be backed under the auger to fill all boxes without moving. The large 21 in (535 mm) opening (FIGURE 4) gave ample room for auger filling. The screens in the boxes helped to trap large clumps of foreign material above the metering cups. The screens were easily removed for access to the cups or for cleaning.

The 6 ft (1.8 m) boxes held 17.0 ft^3 (480 L) each. This amounted to about 100 to 135 lb/ft (150 to 200 kg/m) of cultivator width, depending on the density of fertilizer used.

The box lids were weathertight. No rain entered the box during the test. The tight fitting lids were sometimes difficult to open due to sticking and binding. Spring catches held them tightly shut in windy weather.

There was no step or walkway provided for climbing up onto the cultivator. However, the manufacturer provided adequate framing so that planks could be added for a walkway to easily and safely fill the boxes.

Cleaning: Ease of cleaning was fair. The metering cups could not be dropped open for thorough cleaning, but the metering wheels were removable. The flat box bottom had to be cleaned by palling material out the top, and sweeping or vacuuming it out the metering cups. The manufacturer suggested washing the box clean with water for long storage periods. Because fertilizer should be cleaned out for storage during damp weather, the method of cleanout was inconvenient. It is recommended that the manufacturer consider modifications to improve the ease of cleaning.

Monitoring: Monitoring of the Accu Lil Bander was good. Material flow in the cups and hoses could be seen from the tractor. A sight glass in the boxes helped in judging the level of fertilizer. The metering drive conveniently shut off when the cultivator was lifted out of the ground.

The frame-mounted boxes obstructed visibility behind the cultivator, but the cultivator shanks were easily viewed.

Transporting: Ease of transporting was very good. The Accu Lil Bander did not interfere with normal transporting of the cultivator. The boxes were offset so that the wings could fold. On the test cultivator, the weight of the boxes caused the wings to ride over-center when fully raised. This made the wings difficult to lower. The wing lift stops on the cultivator were readjusted to prevent them from raising over-center. The ground drive wheel on the left end increased overall cultivator height by 2.5 ft (0.8 m). Extreme caution is advised when transporting implements which exceed 15 ft (4.6 m) in total height. The Accu Lil Bander should not be transported with fertilizer in the boxes to prevent stress on the tires, axles, and the frames.

Application Rate Adjustment: Ease of setting and adjusting application rates was good. Gears were changed, and the gearbox was shifted to give 27 different settings. There was no place on the machine to store the extra gears, so they had to be carried in the tractor.

A calibration chart was supplied with the operator's manual but there was no chart attached to the box. The chart could not be used when applying special custom blends of fertilizers. The rates for these materials had to be checked in the field, but no field calibration method or scale was supplied.

Maintenance: Ease of maintenance and servicing was very good. Daily maintenance took about 3 minutes. The telescoping drive shafts required light oiling. No other lubrication was suggested in the operator's manual.

Parts were easily removed for repairs, and a complete parts list was supplied.

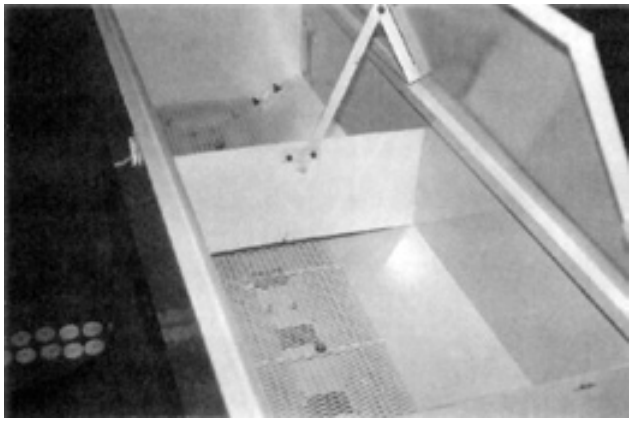


FIGURE 4. Box Opening.

POWER REQUIREMENTS

No increase in cultivator draft due to the added weight of the full fertilizer boxes could be measured in the field. Power requirements for cultivators listed in PAMI reports include a sufficient margin to allow for the effects of such attachments in most conditions.

OPERATOR SAFETY

No serious safety hazards were apparent. The ground drive chains were not shielded, but were not hazardous since they rotated only when the machine was moving.

Climbing on and off the cultivator was hazardous because there were no steps or handrails.

No safety information was was provided. The operator's manual did not discuss safety. It is recommended that the manufacturer consider providing safety information with the machine.

OPERATOR'S MANUAL

The operator's manual was good. It contained complete installation instructions, a parts list and a calibration chart. Tips were provided on operation, adjustment, and troubleshooting, but safety tips were not given. A recommendation to include safety information has been made.

MECHANICAL HISTORY

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

Five hoses pulled loose from the banding knives shortly after field work started. The hoses were pushed on further, and two hoses that were too short had to be replaced. The manufacturer had suggested clamping or taping the hoses to the shanks to reduce this problem.

Cultivator Frame Loading: The Accu Lil Bander, when full of fertilizer, weighed about 188 lb/ft (280 kg/m) across the width of the cultivator. On the test machine, the boxes had very little effect on hitch loading. Nearly all of the additional weight was carried by the cultivator wheels. The main frame wheels on the Interational 55 cultivator exceeded Tire and Rim Association load ratings by 22% in field position when the boxes were full. The boxes could not be transported when full. No mechanical problems occurred with the cultivator as a result of the added weight. The hydraulic lift on the test machine was not affected, though on some machines the cultivator may not lift when the boxes are fill.

APPENDIX I

SPECIFICATIONS

MAKE:	ACCU
MODEL:	Lil Bander
SERIAL NO.:	N/A
OVERALL DIMENSIONS:	
- box - height	4.5 ft (1.4 m)
- width	6.0 ft (1.8 m)
- length (frame)	4.0 ft (1.2 m)
(box)	2.1 ft (0.6 m)
- filling height (mounted on cultivator)	7.8 ft (2.4 m)
METERING AND DELIVERY SYSTEM:	
- type	fluted feed wheels
- drive	sprockets and chains from ground drive wheel
- tire size	6.70x15, 4ply
- adjustment	change gears or gearbox setting
- number of outlets	8 per 6 ft (1.8 m) box
- transfer to openers	1-1/4 in (32 mm) inside diameter, corrugated plastic hose with smooth lining
BOX CAPACITY:	
- one 6 ft (1.8 m) box with 8 outlets	17.0 ft³ (480 L)
WEIGHT:	
- metering gearbox and ground drive	260 lb (118 kg)
- one 6 ft (1.8 m) box with frame	385 lb (175 kg)
- fertilizer (11-51-0)	1116 lb (507 kg)
- gross weight	1761 lb (800 kg)
NUMBER OF LUBRICATION POINTS	6
NUMBER OF V BELTS:	0
NUMBER OF CHAINS:	2

OPTIONAL EQUIPMENT:

- available in various widths
- left or right end ground drive
- small seed and herbicide metering wheel covers

APPENDIX II

MACHINE RATINGS

The following rating scale is used in Machinery Institute Evaluation Reports:

excellent	fair
very good	poor
good	unsatisfactory

SUMMARY CHART

ACCU LIL BANDER FERTILIZER ATTACHMENT

RETAIL PRICE	$1,298.00 (March, 1986, f.o.b. Humboldt, Sask., one box with eight outlets, and mounting hardware). $712.00 (One ground drive assembly).
QUALITY OF WORK	
-- Fertilizer Metering	**Very Good;** rates from 24 to 345 lb/ac (27 to 385 kg/ha), accurate chart, uniform distribution with CV's less than 10%
-- Fertilizer Delivery to the Openers	**Very Good;** no plugging, adequate height for gravity flow
-- Fertilizer Placement	Banding boots not supplied, placement depends on cultivator and openers used
EASE OF INSTALLATION	**Very Good;** took one man 8 hours for one box, loader or crane required, instructions and sketches were adequate
EASE OF OPERATION AND ADJUSTMENT	
-- Filling	**Good;** filling height was 7.8 ft (2.4 m), large filler opening and weathertight lid
-- Cleaning	**Fair;** had to sweep out flat bottom, and vacuum for thorough cleaning
-- Monitoring	**Good;** material flow was seen from tractor, sight glass on box showed level of fertilizer
-- Transporting	**Very Good;** did not interfere with cultivator, should be transported with empty boxes
Application Rate Adjustment	**Good;** speeds easy to adjust, no calibration for custom blended fertilizers
-- Maintenance	**Very Good;** daily servicing took 3 minutes
POWER REQUIREMENTS	No measurable effect on cultivator draft
OPERATOR SAFETY	No serious hazards, caution is advised when climbing on cultivator
OPERATOR'S MANUAL	**Good;**
MECHANICAL HISTORY	A few minor problems occurred

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