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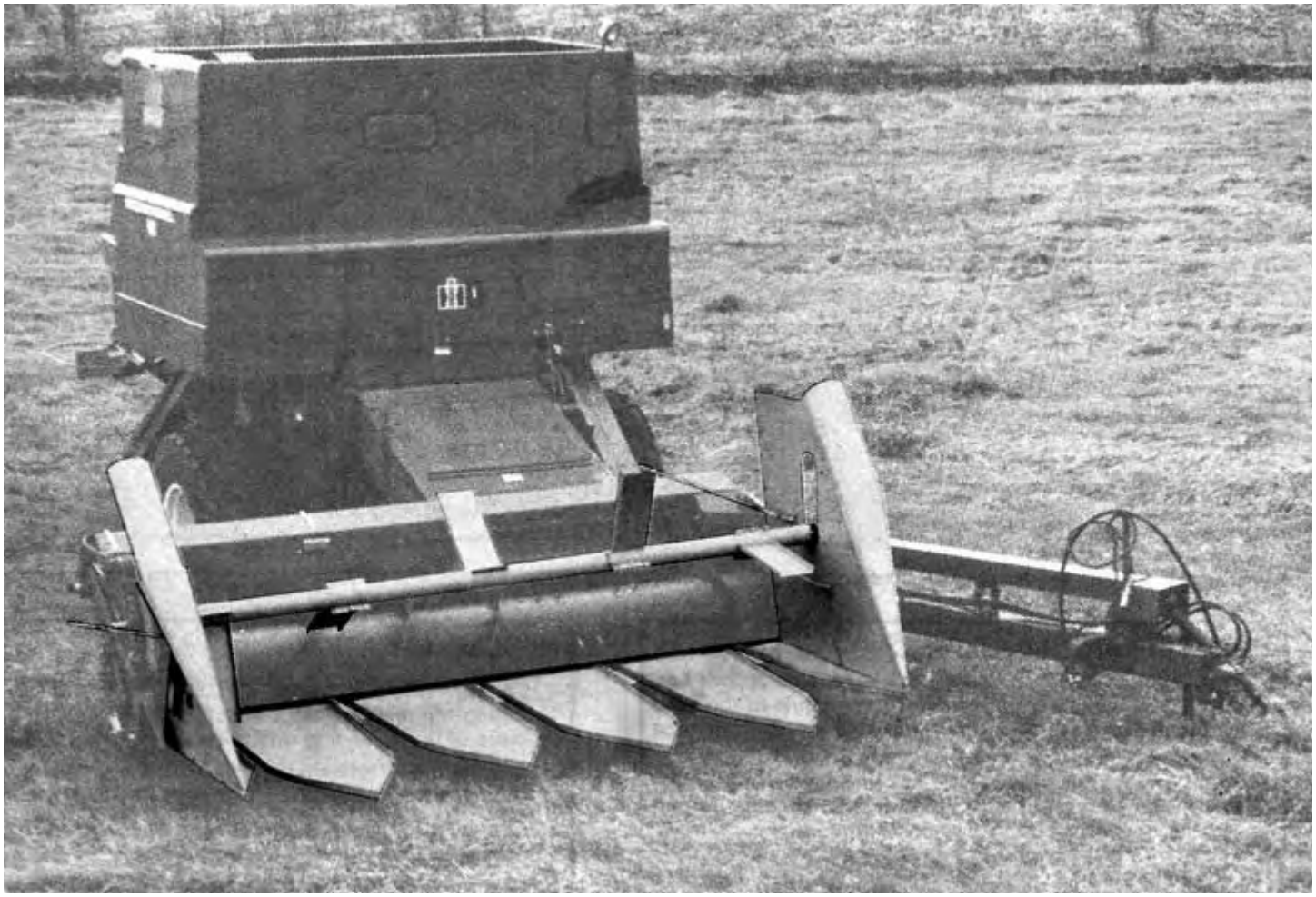
Evaluation Report 204



Zach Sunflower Harvesting Attachment

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

ZACH SUNFLOWER HARVESTING ATTACHMENT

MANUFACTURER:
Zach's Repair and Manufacturing
Fairmont
North Dakota
58030 U.S.A.

DISTRIBUTOR:
Nobleton Farm Service
Box 340
Nobleton, Ontario L0G 1N0

RETAIL PRICE:
$845.00 (April, 1981, f.o.b. Fairmont, North Dakota, 3.8 m width with 760 mm row spacing).

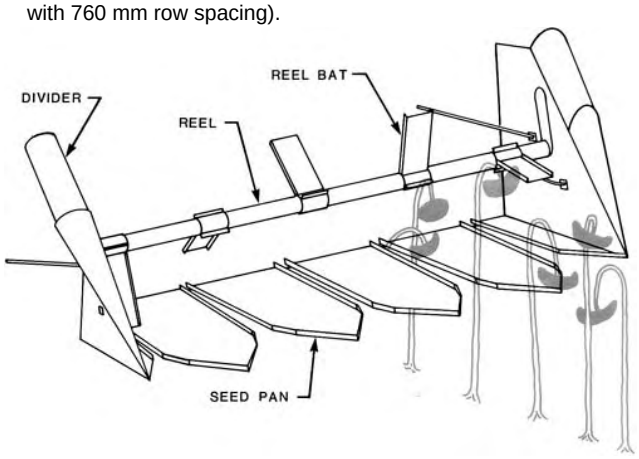


FIGURE 1. Zach Sunflower Harvesting Attachment.

SUMMARY AND CONCLUSIONS

Overall functional performance of the Zach sunflower harvesting attachment was very good. Performance of the seed pans and dividers was very good, while the reel performance was good.

Crop flow was smooth, as long as reel speed was properly synchronized with ground speed. The most suitable ground speed was dependent upon crop conditions, especially moisture content. Speeds up to 7 km/h (4.5 mph) were possible in ideal conditions.

Crop losses were low in both dry and tough crops. The seed pans, which covered 84% of the ground area in front of the cutterbar, collected most of the shattered seed in dry crops; however the aggressive feeding action of the single bat reel caused some unnecessary shattering in dry crops.

The 780 mm (30 in) seed pan spacing permitted on-row cutting for this row spacing, and worked with limited success in rows spaced at 915 mm (36 in). These pans were not suitable for cutting continuously seeded crops or crosscutting of row crops.

Installation was easy. Only 15 man hours were needed to completely install the attachment on the combine header.

Detailed mounting instructions were provided, but there was no detailed parts list, and basic operating instructions were not included. Daily lubrication was not required.

No serious mechanical problems occurred during testing, although some bolts in the pan braces loosened and were lost.

RECOMMENDATIONS

It is recommended that the manufacturer consider:

1. Fitting the reel with double bats on each row, to provide more uniform feeding and to reduce head shattering.
2. Modifications to permit cutting closer to the heads, to reduce the length of stalk processed by the combine.
3. Supplying a shield to protect the reel drive mechanism from the standing sunflower crop.
4. Modifications to the deflector rods to prevent interference with the reel bats during operation.
5. Providing an operator manual complete with installation, operation and safety instructions.

Chief Engineer -- E.O. Nyborg
Senior Engineer -- J. C. Thauberger
Project Engineer -- Gregory R. Pool

THE MANUFACTURER STATES THAT:

With regard to recommendation number:

1. Double reel bats are optional. We carry a full stock of them.
2. With the type of reel we have, the unit cannot be modified, especially if the crop is of uneven height.
3. Optional, custom built shields are available.
4. Deflector rods should be cut to proper lengths, or not used at all.
5. We did not realize the shortage of installation instructions or the need for safety precaution signs. This is being taken into consideration at this time.

Note: This report has been prepared using SI units of measurement. A conversion table is given in APPENDIX II1.

GENERAL DESCRIPTION

The Zach Sunflower Harvesting Attachment (FIGURE 1) is designed to mount on straight-cut combine headers. It consists of an assembly of seed pans, which attach to the combine cutterbar, two crop dividers, and a single bat reel above the cutterbar. The reel is powered by the combine hydraulic reel drive motor.

The seed pans are spaced to correspond with sunflower row spacing. The plants pass between the seed pan and are delivered by the paddle reel to the cutterbar, where the heads are severed from the stalks. The seed pans, which extend ahead of the reel, collect shattered seed that may dislodge during cutting.

The test attachment was 3.8 m (12.5 ft) wide, between divider points, with five row openings, spaced at 760 mm (30 in). Attachments with various header and seed pan widths are available to suit existing combines and row cropping practices. Detailed specifications are given in APPENDIX I.

SCOPE OF TEST

The Zach was mounted on an International 914 pull-type combine, with a 3.8 m (12.5 ft) header. It was operated in the conditions shown in TABLE 1 for 30 hours while harvesting about 44 ha (108 ac) of sunflowers, sown at 760 mm and 915 mm (30 and 36 in) row spacing. It was evaluated for ease of installation, quality of work, ease of operation and adjustment, and operator safety.

TABLE 1. Operating Conditions

Row Spacing (mm)	Hours	Field Area (ha)
760	16	24
915	14	20
Total	30	44

RESULTS AND DISCUSSION

EASE OF INSTALLATION

Installation Time: It took about 15 man hours to attach the Zach to a combine header, using tools found in most farm shops. Clear assembly instructions were provided.

Reel: The reel was mounted on sealed pillow block bearings, which attached to the combine reel arms. The bearings had to be obtained from a hardware supplier while the reel drive sprocket and slip clutch were obtained from the combine dealer.

The stub shafts in the reel ends were easily removed to facilitate installation. The bats were clamped to the reel during assembly, with six bolts each. The reel weighed 56 kg (123 lb) with all bats in place. It could be handled easily by two people.

Seed Pans: The seed pans were each fastened to the cutterbar with two long carriage bolts. Each pan was also supported from underneath by two angle iron braces (FIGURE 2), to provide rigidity

and to permit vertical adjustment. One end of each brace was bolted to the front of each seed pan, while the other end was fastened to a long support bracket. The support bracket was installed underneath the cutterbar with mounting straps, that bolted to the cutterbar and with short braces that fastened to the back of the combine header. The pans were easy to install, however two people were required to handle the large 685 mm (27 in) wide pans. The end pans, which were only half as wide, bolted to the dividers and were easy to install. Shields to cover the knife guards were folded over the points after installation of the seed pans.

Dividers: The dividers were easy to install. The half pans on each end were bolted to the dividers before assembly. Bolts, inserted through the end pans, secured the dividers to the cutterbar. Pan braces underneath and bolts through the reel arms provided rigidity. The dividers could be installed by one person. No shields were provided to protect the reel drive from the standing sunflowers.

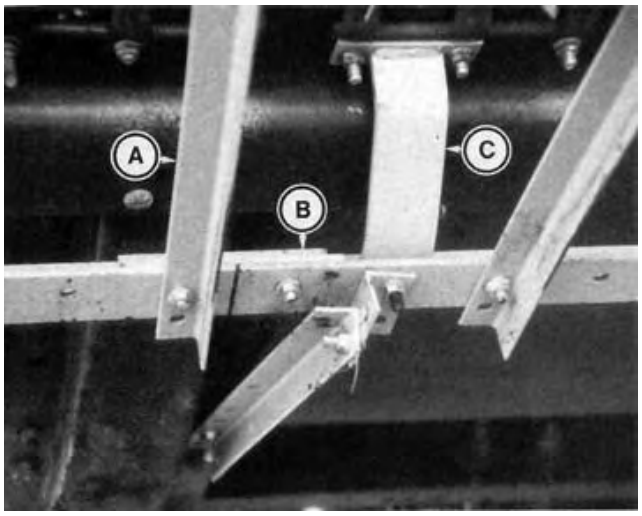


FIGURE 2. Seed Pan Supports: (A) Braces, (B) Support Bracket, (C) Mounting Straps.

General: All mounting hardware with the exception of reel mount bearings and drive chain and sprockets were provided with the attachment. Detailed mounting instructions were included which made installation easy.

QUALITY OF WORK

Feeding: The flow of crop into the combine was smooth as long as reel speed was properly synchronized with ground speed. It was important to maintain a reel index* between 1.0 and 1.2. With the reel index less than 1.0, the reel could not effectively clear the crop from the cutterbar, resulting in occasional plugging. With the reel index greater than 1.2, the bats were too aggressive, causing excessive shattering of the heads and throwing of whole heads over the back of the combine header.

The reel was fitted with a single bat for each row. The high field speed needed to properly feed material to the cutterbar caused unnecessary head shattering and throwback. It is recommended that the reel be fitted with two bats for each row, to provide more uniform feeding and reduce shattering.

Operation in weedy crops did not affect feeding performance or cause plugging. The deflector rods attached to the inside of each end divider did not perform effectively. Their function was to direct the tall cut sunflower plants at each end of the header into the combine feed auger. The deflector rods often bent out of adjustment and interfered with the reel bats. It is recommended that the manufacturer consider modifications to the deflector rods to prevent interference with the reel bats.

Stubble Length: For uniform feeding, the reel was operated with about 50 mm (2 in) clearance between the reel bat ends and the top edge of the pans. The 510 mm (20 in) reel bat length thus resulted in an excessive length of stalk, often as long as 750 mm (30 in) being cut off with each sunflower head, reducing combine capacity and increasing stalk material in the grain tank.

*Reel Index is defined as the ratio of reel tip speed to forward travel speed.

It is recommended that the manufacturer consider modifications to reduce the length of stalk processed with each head.

Shatter Loss: The seed pans were very effective in reducing seed loss, especially in dry crops. Individual pans were 635 mm (25 in) wide, with a 125 mm (5 in) row space between pans. The seed pans covered 84% of the ground area in front of the reel and cutterbar, and collected most of the shattered seed.

In dry crops, shattering was very significant, and maintaining a proper ground speed and reel index was important in reducing shatter loss. The losses were dependent on the moisture content of the crop. Head shattering and seed losses were negligible in crops with high moisture content.

Dividers: Performance of the crop dividers was very good. Their size and shape ensured that very few sunflower plants were knocked down while the crop was being harvested. Some cut sunflower heads became lodged in the slots where the reel passes through the dividers (FIGURE 3) and occasionally caused the reel drive chain to jump off its sprocket. Hairpinning also occurred between the right divider and the combine header divider. This problem could be avoided with a suitable shield on the

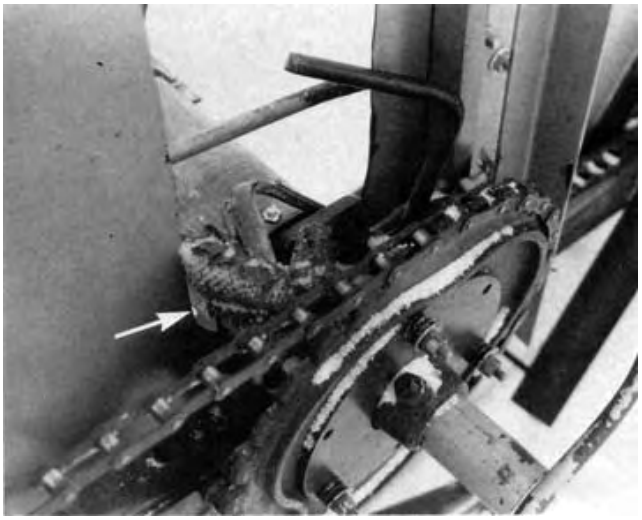


FIGURE 3. Sunflower Heads Lodged in Reel Slot.

EASE OF OPERATION AND ADJUSTMENT

Row Spacing: Tests were conducted in sunflowers seeded at 760 mm and 915 mm (30 and 36 in) row spacings. Although the 760 mm (30 in) seed pan spacing on the Zach permitted on-row cutting for this row spacing, performance in the larger row spacing also was very good. Most of the sunflowers sown at this wider spacing were successfully harvested, but this was due to the long lengths of stalk, which allowed the plants to be easily deflected to accommodate the wide seed pans. It was very important to follow the rows with the combine, as the large pans were not suitable for crosscutting headlands or for continuously seeded crops. When not following rows, the seed pans knocked down a significant number of plants.

Turning: The left divider and the half pan attached to it were 300 mm (12 in) shorter than the other pans. This effectively eliminated interference with the right tractor tire on sharp right turns.

Seed Pans: The seed pan angle was easy to adjust with the slotted braces that attached to the front of each pan. The pans did not require any adjustments during the test except to replace or tighten several bolts that loosened. The total time required to adjust all the pans was about 10 minutes. It was important to have the seed pans sloping toward the combine header to permit the collected seeds to be conveyed into the combine. It was also important to have all the pans at the same height to prevent sunflower heads from falling between the pans.

Seed pan vibration effectively conveyed collected seeds into the combine. Operation on rough fields did not cause excessive bouncing of the seed pans. Cutting ability and feeding characteristics were not affected by field roughness.

Reel Drive: The reel drive chain, on the right side of the header, was exposed to the standing sunflower crop (FIGURE 4). As a result, plants often caught in the drive, causing the chain to jump

off the drive sprockets. It is recommended that the manufacturer supply a suitable shield as part of the divider assembly to protect the reel drive mechanism.

Unhooking: The complete combine header, with the Zach in place, could be easily unhooked from the combine and placed on the ground without damage to the machine.

Lubrication: No lubrication was required as the reel was mounted on sealed bearings.

FIGURE 4. Exposed Reel Drive.

OPERATOR SAFETY

The Zach was safe to operate provided normal safety procedures were followed. Neither safety instructions nor decals were provided with the attachment.

OPERATOR MANUAL

No operator manual was provided with the Zach, although detailed mounting instructions were supplied. These instructions were clearly written and provided much useful information. It is recommended that a suitable operator manual be provided, complete with operating, adjustment and safety instructions.

DURABILITY RESULTS

The Zach sunflower harvesting attachment was operated in the field for 30 hours while harvesting about 44 ha (108 ac) of sunflowers. The intent of the test was functional evaluation. An extended durability evaluation was not conducted. No mechanical problems occurred during testing, however some pan brace bolts were lost when they loosened.

APPENDIX I
SPECIFICATIONS

Make:	Zach
Model:	5 row, 760 mm spacing
Serial No.:	16
Overall Dimensions:	
-- length	1830 mm
-- width	4100 mm
-- height	1680 mm
Total Weight:	276 kg
Feeding System:	
-- type	seed pans and reel with bats
-- attachment	to straight-cut combine header
Seed Pans:	
-- length	1830 mm
-- width	635 mm
-- depth	40 mm
Reel:	
-- length	3630 mm
-- diameter	
-- drum only	110 mm
-- with bats	1130 mm
-- number of fingers per row	1
-- drive	chain and sprocket from hydraulic motor
Options:	
-- 3050 mm to 7925 mm widths reel	
-- tip rods various seed pan widths	

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
CONVERSION TABLE

1 hectare (ha)	= 2.5 acres (ac)
1 metre (m)	= 3.3 feet (ft)
1 millimetre (mm)	= 0.04 inches (in)
1 kilogram (kg)	= 2.2 pounds mass (lb)
1 kilometre/hour (km/h)	= 0.6 mile/hour (mph)

ALBERTA FARM MACHINERY RESEARCH CENTRE

3000 College Drive South
Lethbridge, Alberta, Canada T1K 1L6
Telephone: (403) 329-1212
FAX: (403) 329-5562
http://www.agric.gov.ab.ca/navigation/engineering/afmrc/index.html

Prairie Agricultural Machinery Institute
Head Office: P.O. Box 1900, Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-2555

Test Stations:

P.O. Box 1060
Portage la Prairie, Manitoba, Canada R1N 3C5
Telephone: (204) 239-5445
Fax: (204) 239-7124

P.O. Box 1150
Humboldt, Saskatchewan, Canada S0K 2A0
Telephone: (306) 682-5033
Fax: (306) 682-5080

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