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# Header Attachments Help Save Grain Sorghum at Harvest

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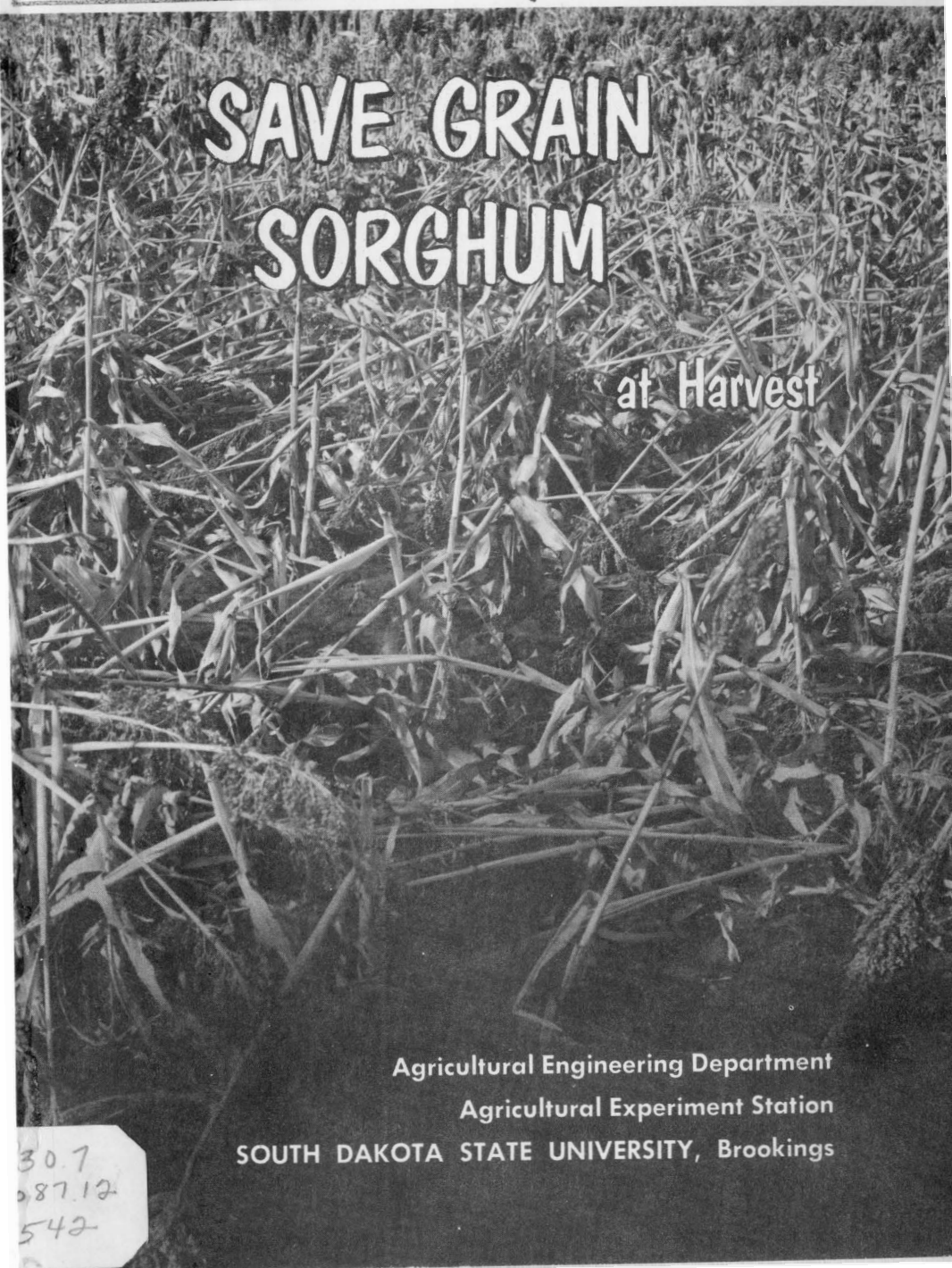

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Use of a trade name does not imply endorsement of one product over another.

# Header Attachments Help . . .

# SAVE GRAIN SORGHUM at Harvest

If you have at least 90 acres of grain sorghum a year, a commercial row harvester would pay for itself in 8 years by reducing grain losses. The implement would "pay its way" even sooner if lodging occurred at least once during its service life.

Damaging winds before and during grain sorghum harvest in South Dakota frequently result in high crop loss due to lodging. One way to avoid lodging is to harvest soon after maturity when grain is at high moisture content. This is acceptable in many areas. But in some areas, such as central South Dakota, many farmers believe they cannot justify the expense of drying equipment and so they wait for the sorghum to mature naturally which increases possibilities of lodging.

An investigation by the Agricultural Engineeering Department at South Dakota State University compared different header attachments on a conventional combine to determine if any could materially reduce crop losses due to lodging.

Field losses of various header attachments were evaluated from tests in the fall of 1965 and 1966 at the Agricultural Engineering Experiment Station Research Farm near Brookings. The attachment which resulted in the lowest grain loss was then evaluated economically to determine if ownership could be justified under South Dakota conditions.

By Paul K. Turnquist, associate professor, and Vern E. Matter, former graduate research assistant, Agricultural Engineering Department

## 1965 TESTS

### Cultural Practices and Machinery

Grain sorghum stalks were chopped and plowed in late fall of 1964. A commercial grain sorghum was planted May 28, 1965, with a till planter on 30-inch row spacing. Pre-emergence weed control was applied in a band. The crop was harrowed once with a flextine harrow and cultivated once. The sorghum was sprinkler irrigated three times. Recommended amounts of fertilizer were applied.

A self-propelled combine equipped with a conventional grain

head harvested the sorghum on October 6, 11, 15, and 29. The reel had been modified from original equipment on the basis of previous studies. The original reel consisted of four 4-inch batts while the modified reel consisted of six 16-inch batts. The diameter of the modified reel was 53½ inches. Straw walker covers were installed to minimize stalk lodging in the machine. Cylinder speed was set at 780 r.p.m. and concave clearances were three-eighths of an inch for front and one-eighth of an inch for rear. Sieve and wind setting were adjusted to do the most efficient job of saving and cleaning the grain.

### Attachments Studied

Two attachments were compared with the conventional header on the four harvesting dates. Attachment 1 was Flexo-Guards[1] which are guard extensions with rods that extend ahead and above the guards. Attachment 2 consisted of row crop snouts designed by the researchers to lift lodged stalks and to prevent cut heads from being thrown on the ground or into the cutting knife.

### Results of Tests

Table 1 shows the losses measured for each attachment and the conventional header on the four harvesting dates. On the October 6 harvest, the grain sorghum was standing and in good condition. The Flexo-Guards and the row crop snouts performed better than the conventional header. With the conventional header, cut heads fell into the cutting knife and were re-

[1]Flexo-Guard is the trade name of the attachment manufactured by the Richardson Manufacturing Company of Cawker City, Kansas.

**Flexo-guards, mounted on the conventional header, help in saving heads under standing conditions.**

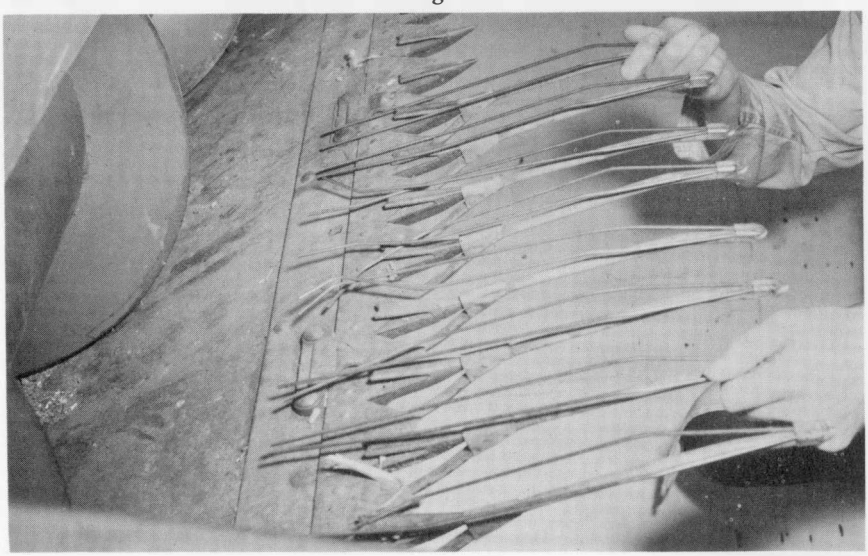


Table 1. Losses as a Percent of Total Yield, 1965

| Harvest date and moisture | Treatments | Reel loss* | Cutter-bar loss† | Header loss (Reel + cutter-bar) | All other components‡ | Total loss | Yield bu./A. |
|---|---|---|---|---|---|---|---|
| Oct. 6 | Conventional Header | 8.9 | 3.8 | 12.7 | 2.1 | 14.8 | 50.2 |
| 25% Moisture content | Flexo-guards | 3.8 | 1.8 | 5.6 | 0.9 | 6.5 | 64.0 |
| Standing | Row crop snouts | 2.9 | 1.3 | 4.2 | 1.9 | 6.1 | 57.3 |
| Oct. 11 | Conventional header | 19.4 | 4.5 | 23.9 | 2.9 | 26.8 | 83.0 |
| 18% Moisture content | Flexo-guards | 32.5 | 5.1 | 37.6 | 2.2 | 39.8 | 57.2 |
| Lodged | Row crop snouts | 18.4 | 5.4 | 23.8 | 3.6 | 27.4 | 62.2 |
| Oct. 15 | Conventional header | 24.6 | 2.6 | 27.2 | 3.3 | 30.5 | 79.5 |
| 15% Moisture content | Flexo-guards | 22.8 | 5.0 | 27.8 | 4.5 | 32.3 | 74.7 |
| Lodged | Row crop snouts | 32.9 | 3.7 | 36.6 | 3.6 | 40.2 | 72.4 |
| Oct. 29 | Conventional header | 41.4 | 6.1 | 47.5 | 6.0 | 53.5 | 78.8 |
| 15% Moisture content | Flexo-guards | 45.5 | 6.7 | 52.2 | 4.8 | 57.0 | 79.4 |
| Lodged | Row crop snouts | 38.2 | 4.9 | 43.1 | 7.1 | 50.2 | 77.9 |

*Whole heads which were not harvested. †Cutter-bar shatter and partial heads. ‡Cylinder, shoe, and rack losses.

**(See Graph, Next Page)**

cut and partially lost. The attachments prevented much of this type of loss. Both attachments also minimized loss of whole heads which were kicked forward by the feeder auger. The last three harvests were conducted under heavily lodged conditions caused by a severe windstorm on October 7, 1965. Under these conditions, one method was not consistently better than any other. All were considered unsatisfactory. Total losses ranged from 27% to 57% of the yield.

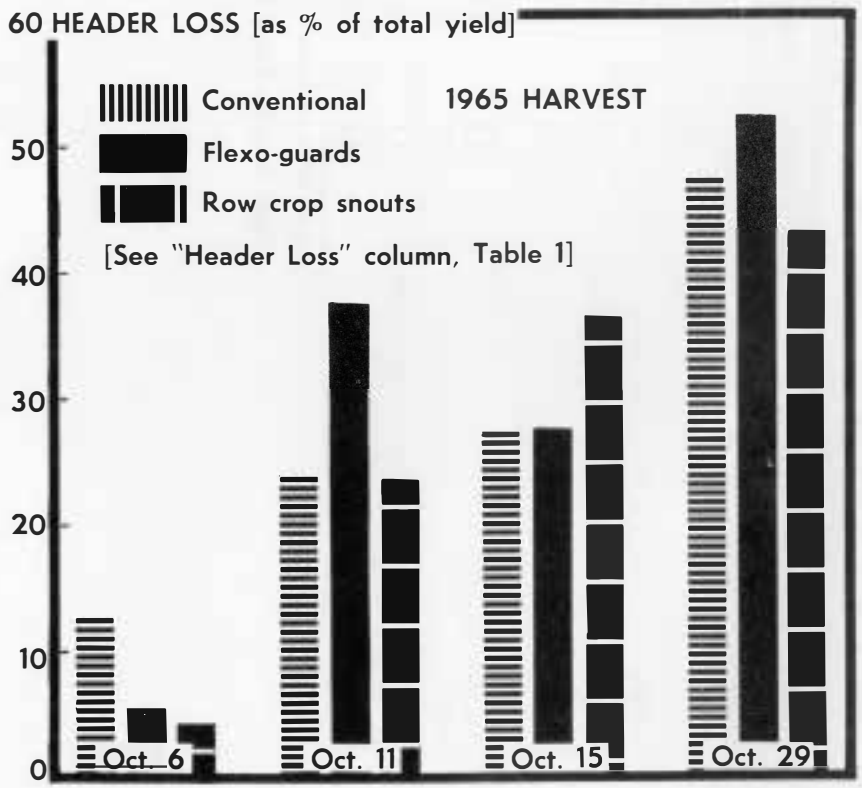
## 1966 TESTS

### Cultural Practices and Machinery

Grain sorghum stalks were chopped and fall plowed in 1965. Commercial seed was till planted May 24 and 25, 1966. Oil and atrazine, 1 pound/acre, was applied as a post-emergence treatment and two cultivations were used to obtain effective weed control. Three sprinkler irrigations were applied during the summer. Recommended amounts of fertilizer were applied. The same self-propelled combine was used as in the 1965 tests.

### Attachment Studied

Flexo-Guards and row crop snouts were not used during the 1966 tests. On the basis of the 1965 tests it was concluded that an attachment with gathering devices should be considered. After pre-



liminary studies were made, it was decided to test a Hesston Row Harvester.[2] The row harvester was compared to a conventional header on three harvesting dates of October 4, 7, and 17, 1966.

**Results of Tests**

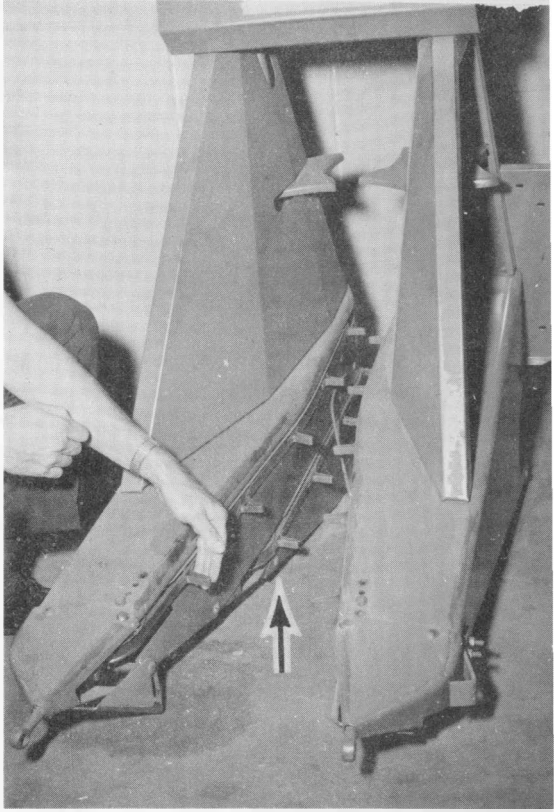
The grain sorghum was standing for the first two harvest dates. The third date was delayed until a degree of lodging occurred which was about the same as the 1965 lodging. A paired experiment was used to compare the two treatments. Table 2 shows the 1966 results. Field shatter and header shatter losses were collected, but not included in the header loss analysis because of the minute quantities. Table 3 shows the yield data for each test in table 2.

A comparison of table 1 with table 2 shows conventional header loss did not differ greatly between the two years. For the 1965 season under standing conditions, the overall average header loss was 12.7% while under lodged conditions it was 32.9%. The 1966 averages were 10.8% for standing conditions, and 34.8% for lodged conditions.

Table 2 shows that on the average the row harvester under heavily lodged conditions had less loss than the conventional header under any of the conditions tested. Statistically the row harvester performed significantly better than the conventional header for all harvesting dates. For the severe lodging, October 17, the conventional header loss was 3.5 times greater than the row unit. It should also be noted that for standing conditions, October 4, the conventional header loss was 2.6 times greater than the row unit.

It was concluded that a row harvester which has gathering devices does reduce harvest losses appreciablv.

[2]Made by Hesston Manufacturing Company, Hesston, Kansas.



**Row harvester units are mounted on the conventional header. Gathering lugs (arrow) on belts help bring stalks into the header of the machine.**

## ECONOMIC ANALYSIS OF ROW HARVESTER

In order to justify a row harvester, the savings in grain should pay for owning and operating the attachment. The break-even acres re-

quired to justify ownership was based on the following data:

(1) A grain saving by row harvester as compared to conventional header under standing conditions of 4.28% of yield.

(2) A yield of 35.4 bu./A. based on South Dakota average for 1959-63.

(3) $1.00 per bushel for market price of grain sorghum.

(4) Cost of a 4-row unit, drive, and freight $900 (1966).

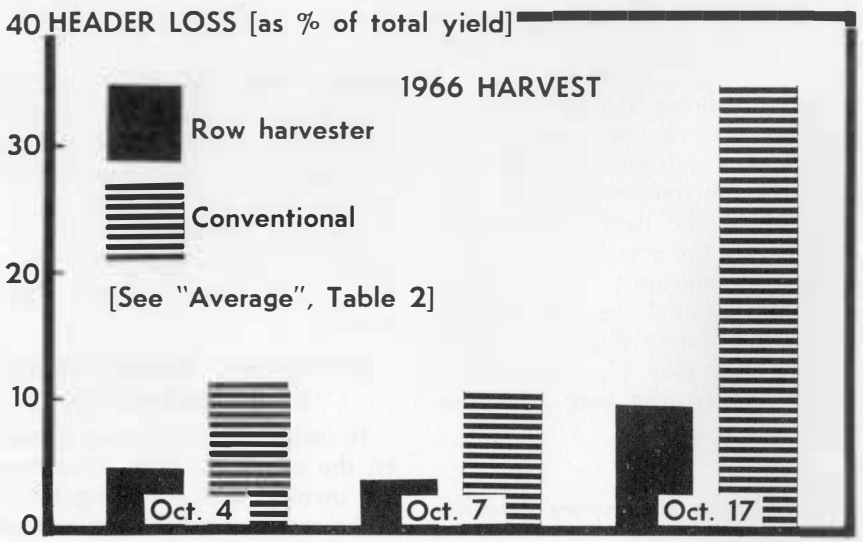
(5) Service life of 8 years.

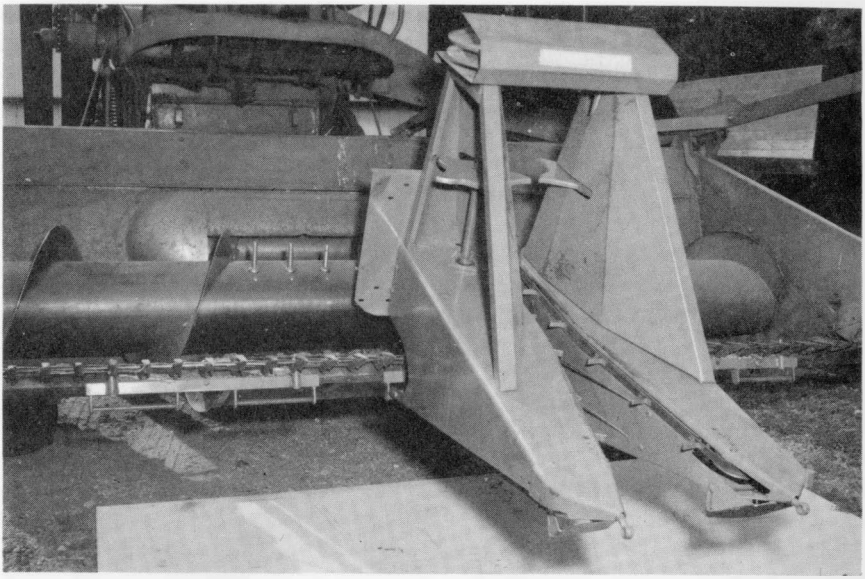
(6) Annual cost of owning and operating of 15% of purchase price.

Using the above figures gives a savings of $1.51 per acre in grain

**Table 2. Header Loss as a Percent of Total Yield, 1966**

| Pair | October 4 24% moisture content standing | | October 7 19% moisture content standing | | October 17 19% moisture content lodged | |
|---|---|---|---|---|---|---|
| | Conventional header | Row harvester | Conventional header | Row harvester | Conventional header | Row harvester |
| 1 | 5.5 | 1.4 | 10.9 | 1.8 | 38.4 | 7.3 |
| 2 | 10.7 | 3.7 | 8.1 | 3.3 | 35.4 | 9.6 |
| 3 | 9.2 | 4.2 | 11.4 | 4.0 | 33.4 | 9.6 |
| 4 | 14.6 | 8.4 | 11.9 | 4.7 | 40.5 | 11.4 |
| 5 | 13.3 | 4.8 | 8.3 | 4.8 | 48.1 | 16.6 |
| 6 | 7.8 | 4.9 | 11.9 | 4.1 | 26.3 | 7.5 |
| 7 | 15.3 | 4.3 | 15.8 | 6.5 | 32.8 | 13.3 |
| 8 | 12.8 | 6.5 | 7.1 | 3.2 | 30.3 | 7.8 |
| 9 | 12.7 | 3.2 | 11.5 | 1.2 | 28.6 | 7.7 |
| 10 | 10.3 | 1.6 | 7.8 | 3.2 | 34.1 | 6.7 |
| **Average** | **11.2** | **4.3** | **10.5** | **3.7** | **34.8** | **9.7** |





**One unit is mounted on the conventional header for each sorghum row.**

saved. This requires 90 acres per year of use to pay for the attachment. Any acreage above this would be additional profit. All field losses were assumed as total losses not recovered by grazing livestock.

When considering these figures it must be realized that conservative values were used in the calculations. The probability of lodging at least once during the assumed life of the attachment is relatively high. Any lodging that would occur during the actual service life would reduce the break-even acres.

**Table 3. Yield Data in Bushels/Acre at 12% Moisture Content (M. C.) 1966**

| Pair | October 4 24% moisture content standing | | October 7 19% moisture content standing | | October 17 19% moisture content lodged | |
|---|---|---|---|---|---|---|
| | Conventional header | Row harvester | Conventional header | Row harvester | Conventional header | Row harvester |
| 1 | 95.4 | 100.9 | 102.8 | 100.3 | 71.0 | 93.4 |
| 2 | 86.9 | 89.7 | 71.9 | 83.1 | 52.2 | 81.6 |
| 3 | 94.0 | 93.0 | 83.1 | 87.4 | 53.1 | 72.7 |
| 4 | 96.8 | 70.0 | 73.7 | 87.7 | 76.2 | 68.7 |
| 5 | 79.1 | 66.2 | 70.8 | 83.8 | 35.4 | 68.5 |
| 6 | 84.6 | 75.5 | 103.0 | 109.3 | 79.3 | 90.8 |
| 7 | 72.8 | 76.4 | 70.6 | 86.7 | 60.0 | 65.9 |
| 8 | 82.9 | 76.0 | 69.8 | 89.9 | 65.5 | 76.7 |
| 9 | 64.6 | 61.1 | 75.1 | 93.6 | 89.8 | 89.0 |
| 10 | 81.6 | 71.7 | 95.0 | 91.5 | 88.3 | 87.9 |
| **Average** | **83.9** | **78.0** | **81.6** | **91.3** | **67.1** | **79.5** |

If lodging is assumed, and a grain savings by the row harvester as compared to a conventional header is 25% of yield, the savings in grain is $8.85 per acre. This results in a break-even acreage of 15.25 to own and operate the attachment.

## SUMMARY

In a 2-year study, three attachments for a conventional header on a self-propelled combine were tested in harvesting of grain sorghum. Purpose of the study was to determine whether or not grain losses could be reduced and whether or not the resulting savings would pay for the additional cost of the attachment.

Tests in 1965 indicated that Flexo-Guards and row crop snouts offered no significant improvement over a conventional header. The 1966 tests indicated that a row harvester which has gathering devices significantly reduced grain losses under standing and lodged conditions. Conservative calculations indicated that the average South Dakota farmer could justify the ownership of commercial units if his annual acreage is 90 acres or more. This is assuming that lodging does not occur. If lodging occurs at least once during the service life of the attachment, the break-even acres to justify ownership would be lowered.

Additional information on grain sorghum harvest losses may be obtained in Agricultural Experiment Station Circular 172 "Reducing Grain Sorghum Shatter Losses."

**The unit is attached to a bracket (arrow) which is bolted to the header.**