## Results

Results are as yet preliminary and inconclusive due to the limited number of test plots established. It is possible, however, to draw the following conclusions from the results presented in Tables 1 and 2.

The multiple dose anticoagulant produced unacceptable results with 11 and 30 percent control. Multiple dosage anticoagulants must be consumed several times over a period of days. Several feedings are necessary over a period of 10 days with no more than a 48 hour interval between bait consumption. It appears that well established alfalfa fields offer too much competition to this bait.

Strychnine, the quickest acting of the commonly used rodenticides, produced acceptable results with 66 and 55 percent control. Strychnine sometimes produces variable results depending upon the condition of the gophers stomach. This toxicant is apparently more effective if the animal has not been recently fed and has an empty stomach. The success of this bait is enhanced if its characteristic bitter taste and slight odor can be masked.

Zinc Phosphide produced good results with 85 and 70 percent control. The characteristic garlic-like odor of this toxicant appears to attract gophers and account for its greater acceptability. This material is currently restricted to non-crop areas.

# COMBINE HARVESTING SORGHUM

Walter W. Hinz, Extension Agricultural Engineer and Robert E. Dennis, Extension Agronomist

## Summary

Arizona growers have a reputation for producing sorghum grain of high quality. Kernels are plump, full and foreign material is usually at a minimum. Sorghum containing excessive stalks and leaves has a marketing problem, does not store well, and is unsatisfactory for use in cooked rations. Trash accumulates in the storage pile or bin, forming barriers to the free movement of air. Moisture collects in the trash causing grain to mold. Cooked grain with excessive amounts of trash sours after processing.

Sorghum is harvested in Arizona with self-propelled combine harvesters. Modern self-propelled combines are operated by one man and can do an excellent job of harvesting under a wide variety of conditions. Yield losses in combining and trashy grain will result in reduced profits. Both of these problems are caused by improper combine adjustments or improper combine operation. Equipment adjustments must be made by the combine operator as he monitors the threshing operation. He must decide if the losses that are occurring are acceptable.

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## Proper Combine Operation

The experienced combine operator uses a number of checks to tell him if his combine is performing properly.

(1) How much grain is being lost during the operation and what are the causes? If the operator knows the causes, he can decide if losses can be reduced and the adjustments to make.

(2) How much cracked grain is evident?

(3) How much trash is being found in the tank?

(4) Is straw being broken up excessively?

## Harvest Losses

Seed losses may occur at the header, at the cylinder, at the straw walker or at the shoe.

Losses at the header may be due to grain heads too low for the cutterbar, heads knocked to the ground by the reel, heads missed because of improper reel adjustment and heads shattered because of improper setting and speed of reel.

Cylinder losses during threshing may be due to imcomplete threshing of heads, overloading of cylinder resulting in too much grain being carried out the end of the combine with the straw, and excessive seed cracking from grain being returned in the tailings for rethreshing. Performance of the straw walker will affect performance of the shoe. Overthreshing that results in broken straw will overload the shoe.

## How To Determine Where Losses Occur

Pre-harvest loss must be determined before other losses can be measured. This is usually found by counting the seeds on the ground in a one-square foot area at several locations in the standing grain and taking an average. One kernel per square foot indicates an approximate loss of 3-1/3 pounds of sorghum per acre. Thirty seeds per square foot would mean a loss of 100 lbs. per acre.

Header loss is found by counting the seeds in a one-square foot area behind the header under the combine. Several counts should be made for an average. The number of kernels found in the pre-harvest loss must be subtracted to find the true loss from the header. This loss can then be translated into a loss in pounds per acre by multiplying the number of seeds by 3-1/3.

Cylinder losses can be found by looking for partially threshed heads. These will be located on the ground directly behind the separator. Count the kernels in a one foot long strip for the full width of the separator. These losses wil represent losses for the full cutting width of the combine. The loss per acre is determined by the following formula:

$$\text{Losses in lbs. per acre} = \frac{\text{seeds found in 1 ft. long strip behind separator}}{\text{cutting width of combine in ft.}} \times 3\text{-}1/3$$

As an example, if 140 unthreshed kernels were counted and the combine cutting width was 14 feet, the cylinder loss in pounds per acre = $\frac{140 \times 3\text{-}1/3}{14} = 33\text{-}1/3$

Straw Walker and shoe losses can be determined by counting the loose kernels on the ground directly behind the separator. Check two or three one-foot square areas to obtain an average value. Do not count the kernels on partially threshed heads since this represents cylinder loss. The pre-harvest loss and the header loss must be subtracted from the seed count obtained. The remaining seeds represent the straw walker loss.

To convert the straw walker loss found in the area behind the separator, to a loss in pounds per acre, use the following formula:

$$\text{Loss in pounds per acre} = \frac{.28 \times \text{seeds per sq. ft.} \times \text{separator width in inches}}{\text{Cutting width of combine in feet}}$$

As an example assume 20 seeds per sq. ft. represent the straw walker and shoe loss found. The combine being used has a 44 inch separator width and a 14 foot cutting width. Inserting this information in the formula gives the following result:

$$\text{Loss in pounds per acre} = \frac{.28 \times 20 \times 44}{14} = 17.6$$

The shoe loss can be checked separately by catching the material from the rear of the shoe in a container. If many seeds are found, some adjustments need to be made.

## Adjustments

Ground speed must be adjusted so the combine will thresh and separate the crop without excessive loss. The operator will have to vary his speed with field conditions and according to his judgement of the results being obtained. Too much speed will overload the combine causing high grain losses.

Cutterbar height should be low enough to get most heads without cutting more stalk than is really required. It is usually necessary to adjust the header height while the combine is operating in the field. The grain height will show considerable variation in most fields.

Reel position can be adjusted vertically and horizontally. Reel slats should strike the grain heads slightly below the lowest heads and a little ahead of the cutterbar. Reel speed should be 10 to 25 per cent faster than the forward speed of the combine.

Cylinder peripheral speed should be 4000 to 5000 feet per minute for sorghum. The manual should be consulted for the manufacturers recommendations since the RPM required for a given peripheral speed will vary with the diameter of the cylinder. If a large number of unthreshed heads are being found, the cylinder speed needs to be increased. Most seeds are removed from the heads by the threshing action taking place when the heads strike the fast rotating cylinder. Remaining seeds are removed as

the material being threshed passes between the cylinder and concave. The clearance between the cylinder and concave should be approximately 1/2" in front and 1/4" in back. These settings will perhaps have to be modified somewhat according to field conditions encountered. Decreasing the clearance will more thoroughly remove seeds from heads but will also break up straw more, using more power and possibly resulting in more seed damage. The best machine setting for seed removal may not be a good setting for minimizing seed damage, so a compromise is required.

Chaffer sieve and fan adjustments are closely related. Sufficient air must be supplied by the fan to remove chaff and straw without blowing kernels over the shoe. Set the chaffer 1/2 to 2/3 open and the lower sieve 1/3 to 1/2 open for observation. If excessive straw and chaff are reaching the grain tank, closer settings should be tried. If the chaffer is not opened wide enough however, too much grain may appear in the tailings or be lost out the back of the shoe.

Continuous evaluation of losses and observation of the condition of the grain in the tank is necessary to determine adjustments that may be necessary. An experienced combine operator will keep losses to a minimum and harvest a maximum crop.

# Use of Forage Crops for Livestock Production in Arizona

Robert E. Dennis and Albert M. Lane, Extension Agronomist and Livestock Specialist, respectively

## Summary

The principal factors limiting yield of forage crops in Arizona are usually water and nitrogen for grasses and for legumes, water and phosphorus. Management skill is also essential, especially for production and grazing of irrigated pastures. Maximum profit can only be realized by carefully blending all production and utilization factors.

Carrying capacities for planning purposes can be determined by using projected yields of dry matter forage per acre and estimates concerning feed requirements. The discussion that follows assumes that feed consumption for an animal unit (1000 pound animal or its equivalent) would be the equivalent of 22 pounds of air dry feed (10% moisture) per day.

## Computation of Feed Requirement

The approximate feed requirement for other size animals would be as follows:

450 lb. calves - 12 lbs.
600 lb. cattle - 15 lbs.
850 lb. cattle - 20 lbs.
165 lb. ewes - 4.5 lbs.

The amount of forage used by immature animals is slightly higher proportionally, as reflected in the 600 lb. figure for cattle. These estimates do not equate with feedlot consumption figures. The estimates should be considered as guides for determining carrying capacities somewhat above maintenance. To achieve maximum gains, animals will need supplementary feed, usually extra energy such as grain.

Perhaps the most important variable for projecting carrying capacities is forage yield. In the tables that follow three different yield levels have been assumed. Select the yield level most nearly correct for the situation under consideration.

## Permanent Pasture

Warm season grasses such as bermudagrass and Blue panicgrass are used for much of the irrigated land at the lower elevations. Alfalfa is an excellent legume for pasture, but there is always the danger of bloat, and it requires special management (see Bull. A16). At the higher elevations, cool season grasses such as Tall fescuegrass and Tall Wheatgrass are better adapted (See Q 420, "Establishment of perennial irrigated pastures" and Q 421, "Management of perennial irrigated pastures").

Tables to Facilitate Estimates at Elevations of 2000 to 3000 feet.