Table 4. Effect of overseeding newly established alfalfa with Mesa oats on November 10, 1974 at the rate of 60 lb/A.

Treatments	Forage yield (T/A green weight)			
	Not overseeded with oats		Overseeded with oats	
	Seeding rate		Seeding rate	
	10 lb/A	20 lb/A	10 lb/A	20 lb/A
Seed Broadcast				
H_3PO_4	10.5 a*	10.1 a	9.1 a	9.5 a
0-18-0	10.5 a	10.9 a	10.2 a	9.8 a
Seed Drilled				
H_3PO_4	8.3 b	9.7 a	8.0 b	9.0 a
0-18-0	7.5 b	9.5 a	6.7 b	8.8 a

*Means followed by the same letter are not significantly different at the 0.05 level according to the Student-Newman-Keuls' Multiple Range Test.

Agri-File Field Crops 273.24

USE OF FORAGE CROPS FOR LIVESTOCK PRODUCTION IN ARIZONA

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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 (1,000 pound animal or its equivalent) would be the equivalent of 22 pounds of air dry feed (10% moisture) per day.

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

450 lb. calves - 11 lbs.
600 lb. cattle - 15 lbs.
850 lb. cattle - 20 lbs.
165 lb. ewes - 4 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 suggested for most of the irrigated land at the lower elevations. At the higher elevations, cool season grasses such as Tall fescuegrass and orchardgrass are better adapted. (See Bulletin A-49, "Establishment and Management of Irrigated Pastures in Arizona")

Table 1. Estimates Concerning Use of Warm and Cool Season Grasses for Permanent Pasture (Area III, Field Crops 222.0)

Annual Yield 1/ (lbs/acre)	Animal Units 2/ Per Acre (220 days)	Water Applied 3/ (Acre Feet Per Acre)
8,000	1.7	4.5
10,000	2.1	5.5
12,000	2.5	6.5

1/ Air dry forage actually consumed by animals. Grass contains 70 or more percent moisture depending upon stage of maturity, time of year and other factors.

2/ 4/10 to 11/15. Assumes animals weighing 1,000 pounds for 220-day period, consuming 22 pounds dry-matter daily.

3/ Will vary because of irrigation efficiency and other factors.

Winter Pasture

Ryegrass, barley, oats, wheat and rye may be used to provide winter pasture.

Table 2. Estimates Concerning the Use of Winter Pasture (Area III, Field Crops 222.0)

Yield 1/ (lbs./A.)	Animal Units/A. 2/	Water Applied 3/ (Acre Feet Per Acre)
4,000	1.3	2.5
5,000	1.7	3.0
6,000	2.0	3.5

1/ Air dry forage actually consumed by animals.

2/ 11/15 to 4/10. Assumes animals weighing 1,000 pounds, consuming 22 pounds dry-matter daily. Use of supplemental grain or silage would increase animal units per acre.

3/ Actual amount required may vary greatly from these values.

Silage

Forage sorghum, corn or other crops may be used to provide silage, usually for winter feeding.

Table 3. Estimates Concerning Use of Sorghum or Corn for Silage Feed (Area III, Field Crops 222.0)

Yield 1/ (Tons/A.)	Animal Units/Acre 2/	Water Applied 3/ (Acre Feet Per Acre)
18	3.2	4.0
24	4.3	4.5
30	5.4	5.0

1/ Yield of 30% dry-matter silage.

2/ Ration of 22 pounds of air dry feed per day for 4 1/2 months. Also assumes a 15% loss of dry-matter storage.

3/ Will vary because of irrigation efficiency and other factors.

Hay

Table 4. Estimates Concerning the Use of Alfalfa for Hay (Area III, Field Crops 222.0)

Annual Yield 1/ (Tons/Acre)	Animal Units 2/ Per Acre	Water Applied 3/ (Acre Feet Per Acre)
4	This alfalfa will be	3.5
6	used to supplement	5.0
8	pasture and silage	6.5

1/ Air dry forage harvested as hay. After storage for 60 days it will probably contain about 8% moisture. Many factors affect the rate of drying and the final equilibrium moisture achieved.

2/ Assumes animals weighing 1,000 pounds consuming about 22 pounds air dry feed daily for 8-month period.

3/ Will vary because of irrigation efficiency and other factors.

Solving a Practical Problem Concerning the Number of Animal Units that May be Supported

Assumptions

1. 1,400 acre feet of water available annually
2. 70% delivery efficiency of irrigation water
3. Use of intermediate level of production

Animal Units

1. Livestock feed

Crop	Acres	(About 7 1/2 Months) Water Use (Acre feet)	Animal Units
Permanent pasture	110	550	230
Alfalfa (for Hay)	40	200	100
			330

2. Livestock feed

Crop	Acres	(About 4 1/2 Months) Water Use (Acre feet)	Animal Units
Alfalfa	40	200	150
Ryegrass, barley, oats, wheat or rye	30	90	50
Silage 1/	30	135	130
			330 2/

1/ Double crop. At the lower evevations, an alternative is to plant a dual purpose sorghum about March 15. Use first crop for grain and second crop for forage.

2/ Deficiency to be met with purchased feed, grazing of permanent pasture, or sorghum grain in alternate years on fallow land receiving a minimum of water.

Total acres used:	Permanent pasture	110
	Alfalfa	80
	Silage and winter pasture	30
		220 acres

The 220 acres supported 330 animal units for a full 12 months = 1 1/2 animal units per acre year.

Increasing Animal Units

The number of animal units could be increase by:

1. Produce higher crop yields.
2. More efficient use of water than estimated. (A larger area could be irrigated)
3. Use of supplementary feed.
4. Improving pasture and efficiency.
5. Controlling parasites and providing shade to increase animal efficiency.
6. Extending feed supply by using non-marketable by-product roughages, such as sorghum stover or barley or wheat straw.

Feeding Forage (alfalfa) to Feedlot Cattle

Feedlot cattle can be finished very efficiently on relatively high roughage (forage) rations. This is born out by a summary of a recent trial at the Arizona Station designed to test this type of program.

Two previous trials with 400 lb. steer calves have shown that a feeding system containing approximately 38% roughage for the entire feeding results in similar performance and carcass grade, as does a low roughage system containing 12% roughage. As expected, feed requirements per unit of gain favored the lower roughage systems. In the high roughage system, the high roughage levels are fed during the latter portions of the trial, and during the latter portions of the trial, a low roughage diet is fed. It appeared desirable to substantiate the findings of the first two trials and to feed a higher roughage level than was fed in those two trials.

The latest trial involved 144 head of 460 lb. steer calves fed the following experimental diets:

12% alfalfa + either milo or wheat
20% " " " "
30% " " " "
40% " " " "

The length of the feeding trial was 194 days.

Results

With milo as the source of grain, the highest feed requirement (673 lb.) was with the 40% alfalfa diet. Compared to the other three alfalfa levels, the feed requirements were nearly 10% higher (763 vs. 613 lb.). When the 30, 20 and 12% alfalfa levels were compared, the highest feed requirement was on the 20% level. This may be due to the fact that the lowest rate of gain of the four 12% alfalfa levels were very similar (609 and 593 lb.). In general, these data agree with those of the previous trial with calves, in that utilization of alfalfa hay with the feeding systems used is higher than previously estimated. Daily gain on the milo diets based on shrunk basis was 2.76 lb. for the 194 day feeding period which can be considered excellent. The low feed requirement noted, no doubt, relates to the high feed intake and very high rates of gain. Feed cost per hundred pound of gain was highest on the high alfalfa level and very similar for the 30 and 12% alfalfa levels. Feed cost of gains were very low and this was due primarily to the low feed requirements for all groups of cattle.

Alfalfa as a Source of Roughage for Finishing Cattle

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A survey of feed analysis tables that list the common roughages fed beef cattle show alfalfa hay has the highest energy availability (table 1). When harvested as hay, certain other legumes also have a high energy value, however, the total volume is usually small and is relatively unimportant as an overall hay crop. When evaluated on a TDN or net energy of production basis, alfalfa hay is clearly more desirable than any other roughage. The difference in feeding value between alfalfa hay and the other roughages cannot be accounted for by its crude fiber content, although some of the low quality roughages are higher in crude fiber than alfalfa hay. From a standpoint of economics, another decided advantage of alfalfa hay is its high protein content. The high protein content, however, does not necessarily relate to the high energy utilization of alfalfa hay.