Texas Agricultural Extension Service
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Irrigated Forages

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Irrigation and forages are a very useful combination. The ability to eliminate drought as a potential in livestock production is a desirable result. The added production that results from irrigation is a secondary benefit compared to drought elimination. Management of irrigated forages is the key to a successful operation.

Advantages

Increased production is one result of irrigation of forages. Irrigation allows a manager to apply high levels of fertility with the expectation of getting high levels of forage production without worrying about rainfall. In a hay producing operation, the increased production effects are very evident with increasing rates of fertilizer.

Table 1. Forage Quality and Yield

Fertility (lbs. N/Acre)	Yield Tons/Acre	Percent Crude Prot.
0	2.67	7.9
100	4.38	9.1
200	5.93	10.5
400	8.59	11.7
600	10.65	12.4

Fisher and Caldwell, 1958, TAES

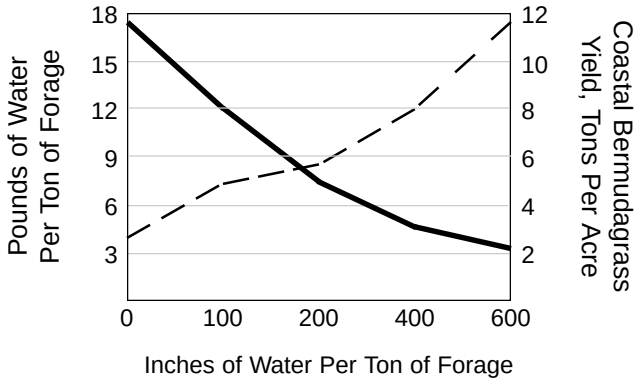
Table 2. Dry Matter Yield of Grass Varieties, Weslaco (1977-78)

Variety	Yield Per/A, Lbs. Dry Forage	
	Irrigated	Non-Irrigated
Gordo	16445	7490
Bell Rhodes	16405	9635
Klein 75	13070	6615

From PR-3590, 1979, TAES

Another benefit from high fertilization levels is the increased efficiency of water use. As higher levels of fertility are applied , water used decreases per ton of hay produced.

Figure 1. Fertilizer Improves Forages' Use of Water



Fisher and Caldwell, 1958, TAES

In an irrigated pasture operation , new growth is available for grazing throughout the warm-season. There are no drought periods when no new growth occurs. Growth may be slower during the hot midsummer period, but it will still be available for grazing. Dryland pasture will effectively stop growth during that same period with resulting low performance in livestock.

Forage quality is a factor that is under-emphasized in irrigated pasture. The new green growth that occurs as a result of irrigation is a quality forage that would not be available in non-irrigated dry pastures. This may be seen in the average daily gain of animals on irrigated pasture vs. those on dryland pastures of the same type.

Table 3. Average Daily Gain by Month (Calves)

	May	June	July	Aug.	Sept.
Irrigated Berm.*	1.50	1.0	1.09	0.56	2.07
Dryland Berm.**	1.60	1.0	0.35	-0.8	0.90

**Hoverson and Rupp, 1977, unpublished data*
***Conrad, 1976, RM6C, TAES*

Pasture irrigation generally results in an increased shocking rate. The use of higher fertility rates plus the ability to grow forage through the season allows for higher stocking rates. Even with irrigation, these vary during the season and rarely should an operator try to set a single stocking rate for the entire grazing season. Forage production will always be highest during the spring and early summer months due to optimum environmental growing conditions. Whenever excessive heat or cold weather occur, growth of forage plant is reduced so reduced stocking rates are necessary. Unless an operation is set up to vary stocking rates, making hay during the spring rapid growth period on a portion of the irrigated pasture is a good way to utilize excess forage production. There will be periods of low production when stored forage will be useful.

Weight gain per acre is one way to measure productivity of a pasture. Using stocker calves, most individuals with dryland pastures would be satisfied with 300 to 400 pounds of gain per acre. With irrigated pastures, gains of 1,400 to 1,800 pounds per acre have been documented. There can be no doubt that irrigated pastures can be highly productive. The value of the product determines the profitability of the operation.

CONSIDERATIONS

Irrigation of forages adds a basic expense that must be overcome for the operation to be profitable. Higher fertility levels, additional livestock investment and higher labor requirements are all a part of irrigated pastures compared to dryland pastures. Careful planning and good management are necessary for irrigated pastures to be viable systems.

The environment is a large factor in pasture production. Irrigation accounts for only a portion of the environment effect on forage production. Temperature and sunlight (day length) are still major factors in forage growth and production. This means that there will be wide variations in forage production even with irrigation. In Bermuda grass pastures, rapid spring growth is followed by a short period of rapid growth in the early fall, then the winter dormant period furnish no growth. Winter pastures will have a moderate fall growth , low production in winter and excellent spring production. Regardless of species of forage , these variations occur and must be taken into account in both planning and management of pasture.

The quality or nutritional value of forages varies with the time of the year much like the production of volume, but not always for the same reason. Forage quality is highest when the growth is young, leafy and actively growing. Forage quality declines as the plant gets older, produces stem and fiber increases. Plant quality also decreases rapidly when the plant goes dormant or dies. Midsummer is a period of lowered production because of heat stress on the forage plants. This is also a time of lowered forage quality due to fiber build up. These reactions during the midsummer grazing period can be referred to as a summer slump and result in a lowering of animal gain.

Table 4. Bermudagrass Forage Quality and Daily Gain of Stocker Heifers

Grazing Period	Digestible Matter (%)	Crude Prot. (%)	Average Daily Gain/Heifer (lbs.)
3/22 - 4/19	70.4	17.2	1.19
4/19 - 5/17	68.6	20.6	1.50
5/17 -- 6/16	67.8	17.2	1.00
6/16 - 7/13	64.8	15.0	0.70
7/13 - 8/10	65.8	15.0	1.09
8/10 - 9/7	67.0	17.1	0.56
9/7 - 10/4	70.1	18.2	2.07
10/4 - 11/2	70.9	18.8	1.24

Hoverson and Rupp, 1977, unpublished data, Weslaco.

Increased stocking rates on irrigated pastures can cause some additional management concerns. The higher density of animals may cause animal health problems to be intensified. The higher density of animals can cause manure to become a problem on pastures unless a scattering operation is implemented. The higher density of animals can intensify any soil compaction problem that might occur so pasture renovation may become part of the management plan.

Fertilizer management is intensified in an irrigated pasture. For the most efficient use of nitrogen fertilizer, split applications of 60 to 80 pounds of actual nitrogen per acre should be made throughout the growing season for each grazing or hay cutting. If needed, phosphorus, potassium, and other elements may be applied once or twice during the season depending on how much is needed.

Grazing management is a much discussed issue. Continuous grazing generally provides slightly better average daily gain per head, but does not optimize gain per acre. Fertilizing and irrigating the continuously grazed pasture present problems. Rotation grazing provides a rest period on each pasture when fertilizer and water can be applied. Rotation grazing with 4 to 16 or more pastures or padlocks are currently being used. The number of pastures in a rotation system should be adapted to each individuals objectives and management criteria.

Any type of irrigation system can be utilized for irrigated pastures. Flood irrigation has the longest history of use simply because it is the oldest system. Modern center pivot systems lend themselves to a multi-pasture rapid rotation grazing method plus have the corner areas where mineral, supplements and shade can be provided for livestock. A consideration in planning is the need during July and August to apply 4 to 5 inches of water/acre every two weeks.

The production of forages, especially irrigated pasture, is not a tightly controlled system. With the environment influence on both the pasture and the grazing animal, production performance can be predicted with limited accuracy. The decision maker must use the guidelines of research and experience to make the best possible decision at any given time. Good management and good decisions can make irrigated forages a productive enterprise.