MANAGEMENT OF SMALL PASTURES

INTRODUCTION

In recent years there has been an increase in small pasture holdings due to small acreage lot development. If you are a small pasture owner you may want to intensively manage your pasture, making economic and cultural inputs to maintain a high level of production just as commercial livestock operators do. Or you may prefer to minimize your management and accept less productivity. Whatever the objective, your activities must fit your equipment inventory, budget, and production goals. You also must decide whether you want to improve your land by adding more productive plants and whether you want to irrigate. How you manage your land for best production will depend on these basic decisions.

NON-IRRIGATED PASTURE

Productivity

Most non-irrigated pastures rely heavily on annual range plants which germinate with the first fall rains, grow slowly in the winter, and are most productive in March and April. These annuals set seed and die in late spring and early summer. They still can be used for dry feed in the summer, but their nutritive value to the grazing animal drops considerably. Therefore, in the summer you should also feed a green feed or commercial supplement to your livestock.

Your non-irrigated pasture may be of little use in winter because cold temperatures reduce plant growth. Further, some soils with high water-holding capacity, such as those with a high clay content, are not suitable for grazing during wet weather because animal hooves can punch holes in the plant cover and damage the pasture.

On the average, an acre of unimproved annual range will produce 1000 to 1200 pounds of herbage. This should yield enough forage to feed a large steer (700 to 900 pounds), or five mature sheep, for 1 month. Improved dry-land pasture on good soils can produce 3000 to 4000 pounds of herbage, enough to support a 700- to 900-pound steer for about 3 months. This capacity will be reduced considerably if rainfall is low, if land is grazed heavily, or if it is partly covered with brush or other plants having little grazing value.

Seeding

Non-irrigated pasture production can be increased by seeding to annual clovers or fertilizing with nitrogen, phosphorous and/or sulfur. Adding annual clovers such as subterranean and rose clovers is probably the best way to improve forage production. Clover seeds should be inoculated with nitrogen-fixing bacteria before planting. Inoculated seed can be purchased from farm supply stores or other commercial seed sources, or you can do your own inoculating.

The best time for seeding is in early fall. Grazing can begin the following spring. If the ground can be cultivated, it is often beneficial to grow a crop of sudangrass or grain the summer before you plant the clover; this reduces weeds and provides a firm seedbed. Seed can be sown directly into the stubble with no further seedbed preparation, and can be covered by using a roller or drag to make sure the seed is worked into the soil—uncovered seeds may be eaten by birds and rodents. Clover and small grass seeds should be planted about ¼-inch deep. Planting seeds too deep can be more harmful than having no covering at all.

Fertilizing

If the field to be planted has not been previously fertilized, or if the phosphorus content as determined by soil testing is less than 10 ppm, apply

about 500 pounds of single superphosphate fertilizer per acre; this will supply both phosphorus and sulfur. If you are not sure about the level of phosphorus in the soil, it is good insurance to use single superphosphate when seeding.

Established pastures that are predominantly grass should be fertilized with nitrogen and phosphorus, which are found in various commercial fertilizers. One common one contains 16 percent nitrogen and 20 percent phosphorus. It should be applied in early October at a rate that will provide 40 to 60 pounds of actual nitrogen per acre (a 100-pound bag of 16 percent nitrogen will contain 16 pounds of actual nitrogen).

Nitrogen fertilization of non-irrigated pastures is not too effective where annual rainfall is less than 12 inches. Heavier or more frequent applications will usually be needed where annual rainfall averages more than 35 inches.

Hay Production

You also might want to use your pasture for hay production. Each acre of adequately fertilized land can produce 1½ to 2 tons of oat hay or other grain hay. This is enough hay to feed a horse for 150 to 200 days at a rate of 20 pounds per day. Native grasses also can be harvested for hay but the quality is not as good as that of oat hay. Both grain and grass hay can be improved by adding a legume such as rose clover or Lana vetch to the planting.

When making the decision whether to produce some hay on your property, remember that unless you already have the equipment you will have to pay someone to cut and bale the crop and you will need to provide storage or protection from weather for the bales.

IRRIGATED PASTURE

On small irrigated pastures, irrigation is the one input that cannot be neglected. Proper mowing, fertilization, and manure spreading can vastly improve pasture productivity, but neglecting them will not result in the immediate loss of your pasture although it could contribute to a gradual decline in the pasture's productivity and quality.

Pasture Establishment

The choice of irrigation system, if one is not already in place, depends on several factors. First, determine if water is available from an irrigation district. District water delivered through a ditch system is usually the least expensive. If ditch water is not available, consider drilling a well and purchasing a pump capable of delivering adequate water for your purposes.

After determining the most suitable delivery system, the next factor of importance is the topography of the land to be irrigated. Flat land on a ditch system should be irrigated by the border and check method but hilly land can be irrigated by the wild-flood method (see "Glossary", end of publication) from a ditch or by a sprinkler irrigation system. Sprinkler irrigation systems for irrigated pasture vary in cost and convenience. The hand-move system costs less than a solid-set sprinkler system but requires labor to change the sprinklers. A solid-set sprinkler system is expensive initially, but is convenient to use. If you must develop an irrigation system, you should gain additional information from several U.C. Cooperative Extension publications listed at the end of this leaflet.

Where flood irrigation is to be used on a pasture, the land must be leveled and graded with a slope of 0.1 to 0.4 of a foot per 100 feet of length. Land grading will increase irrigation efficiency and reduce weed and mosquito problems caused by poorly drained low spots. Length and width of the checks depends on the soil type, head of water, and slope and direction of irrigation—length and width should be regulated so checks can be irrigated and drained before mosquitoes can develop. Water should not stand on a pasture for over 24 hours. A water supply of 10 gallons per minute per acre is desirable when irrigating by the border method. A sprinkler irrigation system requires less surface grading but is more expensive than border irrigation systems, unless extensive grading is required. Sprinkler irrigation is best if the water supply is limited or expensive, the soil shallow or sandy, or the terrain rough or steep.

However, sprinklers are difficult to manage in areas of strong winds. A water supply of 6 gallons per minute for each acre is adequate for sprinkler irrigation. A sprinkler system is more convenient because it requires less time and labor during irrigation.

Weed control before seeding is a major consideration. Land grading will reduce low spots where weeds tend to establish. In commercial operations if the land has not been farmed, or in irrigated pasture, weeds are commonly reduced by growing a hay crop or grain crop prior to seeding the pasture. Weed control can also be accomplished by irrigating weeds up and discing them under early in seedbed preparation. Herbicides may be used to reduce weeds before and during pasture

establishment. Contact your local farm advisor, agricultural commissioner or pest control advisor about current herbicide regulations.

Once land preparation for the irrigation and drainage system is completed and weeds are reduced, a seedbed can be prepared. First the ground should be irrigated to test the irrigation system and to moisten the soil to 10 inches. Then a fine, firm, clod-free seedbed should be prepared by plowing or chiseling, followed by discing, harrowing and rolling. It is important that these steps be followed to reduce soil compaction, break up hardpans, and produce a good seedbed.

If fertilizer is to be applied, incorporate it near the end of seedbed preparation just prior to planting. Seed can be planted with a seed drill or by broadcasting, taking care not to place the seed more than ¼ inch deep. Broadcasting requires care to uniformly spread the seed. Spreading half of the seed in one direction and half in the opposite direction usually insures adequate placement. The ground should then be dragged with a chain, piece of chain link fence, ring roller, or spike-toothed harrow to help cover the seed; seed should be covered only about ¼ of an inch.

The best seed mix is usually a combination of grasses and legumes. Legumes produce excellent feed and supply additional nitrogen to the soil. For small acreages, there are several seed company mixes that can be used to plant permanent irrigated pasture. Make sure that the legume seed in the mixes has been inoculated shortly before seeding—inoculation helps to insure the nitrogen-fixation capability of these plants.

Pasture seed mixes contain a combination of grasses and legumes. This combination evens out the production through the growing season and over different soil types, as some plants grow best in the cooler part of the year or on different soil types. The most common pasture seeds will be grasses such as orchardgrass, annual and perennial ryegrass, tall fescue, and dallisgrass; and legumes such as Ladino clover, Salina strawberry clover, and trefoil. Seeding rates of 15 to 20 pounds per acre are common. Consult your farm advisor for a seeding recommendation that fits your local conditions.

Fall seedings can be established with little or no irrigation if winter rains come regularly and hot spells are not a problem. It is safest, however, to have the irrigation system ready to go at seeding time in case rains are insufficient. For spring plantings, frequent irrigations are often essential to allow plants to grow through the critical period from germination until a good root system is established. Irrigating two or three times a week may be necessary during hot weather in order to keep the seed and root zone moist. To reduce the amount of irrigation and yet not subject new plants to cold winter weather before they are big enough to take it, the best time to seed is October.

Irrigation and Drainage

The method of irrigation is usually determined during the land preparation phase, but on small pastures sprinkler irrigation may be initiated after pasture establishment is complete. Irrigation amounts and frequency vary according to weather, soil type, rooting depths, and presence of subsoil impervious layers. In hot summer periods, 3 inches of water every 1 to 2 weeks may be required to maintain a productive pasture. Irrigation amounts and frequency will be lower in cooler coastal regions and in spring and fall. However, it is important to start spring irrigation before the soil is dried out. In the fall, irrigation should be continued until cold weather stops plant growth and the rainy season begins.

Sandy soils lose water rapidly and therefore require more frequent irrigation. Clay soils are not porous and hold water for longer periods, thus requiring less-frequent irrigation. Loam soils generally have water-holding capacities intermediate to those of sandy and clay soils.

Soil moisture can be determined using a soil tube, auger, or shovel. Soil moisture should be checked throughout the rooting zone of the species in the pasture. Clovers can use moisture down to a depth of about 2 feet, while grasses extract water down to 3 to 4 feet, and alfalfa may extract water down to 6 feet. Adequate soil moisture should be maintained throughout the root zone of all the plants in the pasture. This requires irrigation often enough to keep shallow-rooted clovers growing vigorously and deep enough for longer grass roots. For clovers, keep the top 6 inches of the soil from becoming completely dry. Remember that subsurface hardpans can restrict rooting depths of pasture plants and movement of water.

Standing water should drain in about 24 hours—this will reduce the chances of a mosquito problem and the invasion of water-loving weeds. Stock should not be in the pasture during irrigation and while the surface is wet. Wet soils are compacted by trampling, thus retarding root growth and water infriltration: this is a major source of

pasture abuse, but it is easily avoided by corraling animals or moving them to a dry pasture.

Fertilization

Commercial fertilizers influence both forage quantity and quality, and may extend the green forage season.

Irrigated pastures commonly require application of phosphorus to maintain or improve the growth of legumes (alfalfa, clover, trefoil). Where soils are acutely phosphorus deficient, 20 to 55 pounds of phosphorus may be required annually to satisfy the growth requirement of legumes; moderately deficient soils require only 10 to 35 pounds of phosphorus. Phosphorus is commonly applied as single superphosphate or treble superphosphate by broadcast application before the start of spring growth.

Sulfur deficiencies may also be alleviated by adding single superphosphate which also contains sulfur, or by adding gypsum or elemental sulfur. If sulfur and phosphorus are in short supply, the application of one or both of these elements will increase the amount and proportion of legumes in the mixture. This improves forage quality as well as the quantity.

Besides improving forage quality, legumes also fix nitrogen from the air, making it available to plants and, therefore, providing nitrogen without applying a nitrogen fertilizer. Where legumes are present in the pasture, applying of nitrogen fertilizer generally causes the grasses to increase and gradually replace the legumes. If grass-dominated pastures are desirable, it is best to apply nitrogen periodically through the growing season. Under average irrigation conditions, a single application of 30 to 40 pounds of nitrogen per acre will be effective for approximately a month. Instead of monthly applications it is possible to apply reduced amounts in the irrigation water, but this requires special equipment which usually is not available, or is too expensive for most small-pasture managers. If early spring feed is needed, a late-winter application of nitrogen will usually provide earlier grass growth and, frequently, more total feed. If legumes predominate and a threat of bloat exists, a nitrogen application can be used to increase the growth of grass present.

Spreading manure onto irrigated pastures also provides nitrogen, phosphorus, potassium, sulfur and other nutrients in varying amounts. Generally, manure application can be expected to stimulate grasses to a greater degree than legumes.

Soil nutrient deficiencies can be evaluated by submitting soil samples to commercial laboratories for analysis, although the cost may be prohibitive to the small-pasture owner. It is generally less expensive, and more convincing, to make trial applications of various fertilizer types and amounts in small plots or strips around the pasture for visual comparison of forage production. For example, if single superphosphate at 200 pounds per acre were applied in a strip in an irrigated pasture and productivity increased along that strip, the pasture manager might decide to use that material on the entire pasture the following year.

Weed Control and Mowing

Whole-pasture treatment with herbicides is expensive and requires special implements—also, if pastures consist of a mixture of grass and legumes damage to one or the other is likely to result. Because of this, consider using some of the following methods of weed control.

If weed invasions have been recently discovered, early spot treatments with recommended chemicals may provide adequate control. In some cases, spot treatment with fire may be useful. A shovel or hoe may be the surest way of removing invading weeds.

Mowing annual weeds before they flower and set seeds is one of the best control methods, although mowing will not control or kill perennial weeds such as dock and sedge. Occasional mowing promotes even cropping and full utilization of forage by removing coarse, unpalatable residue that the animals have not used. Mowing is commonly done with a hay mower attached to a tractor, but small-pasture owners who do not own a tractor can use a lawn mower set at its highest level. Because a lawn mower clips the pasture more closely, the pasture should be rested after mowing until it has regrown to 6 inches in height. If no mechanized equipment is available, periodic clipping of coarse, overgrown plants with a hand implement is suggested.

One of the major causes of weed invasion into irrigated pasture is poor drainage. As pastures get older and soil becomes more compacted, vertical drainage slows and the amount and standing time of surface water increases. If water frequently stands for longer than 24 hours, growth of water-loving plants such as dock, nutgrass and sedge is favored.

Improvement of drainage is generally expensive. At worst it requires plowing and surface regrading prior to replanting. If surface grade is adequate, plowing and discing will reduce compaction and improve drainage. In some cases, digging

trenches from a standing-water area to a drainage ditch should lessen the problem and discourage reinvasion of water-loving weeds.

The best and least expensive method of weed control in irrigated pasture is good cultural and grazing management to maintain maximum productivity and vigor—this discourages weed invasion. If pastures have become dominated by weeds despite several years of mowing and good management, the most practical course of action may be to plow up the cover and replant.

Livestock Management

Plants growing around livestock droppings are often unpalatable. Spreading these manure droppings with a rake or harrow helps to improve forage quality. This should be done periodically just before irrigation.

Care should be taken not to place too many animals on too-little pasture. A good irrigated pasture should support about 1½ animal units per acre from March through September. The table which follows provides animal unit conversions for various kinds and ages of livestock. For example, a 1000-pound cow or steer, or five mature sheep weighing about 120 pounds apiece, would constitute about one animal unit. Immature animals will be gaining weight, so their animal unit value will increase throughout the season. One acre of pasture should feed two steers during the growing season, although pasture feed may have to be supplemented with hay and some grain. As the growing season approaches its end in late summer or early fall, the ration may be shifted to a larger amount of grain to finish the steers for slaughter and to begin to make less use of the pasture.

Supplementation of pasture may be necessary in a number of situations. When the pasture is in a low-production period, such as early in spring or early fall, animals may need supplementation with hay and grain. Where bloat is a danger, supplementation with dry roughage can help reduce the threat. Steers being fattened while on pasture require a grain supplement to make satisfactory gains. At the end of the pasture season as productivity declines, beef animals should be gradually shifted to a dry finishing ration. On new, lush pasture scouring is often a problem, but with judicious grazing and hay supplementation it can be kept at a minimum. On unusually lush pasture supplemental hay or good quality straw may be needed to provide adequate dry-matter intake. Finally, it is generally necessary to make a salt block mineral supplement available free choice.

Grazing management by pasture rotation is a common and desirable technique for small pastures. Pasture rotation provides an opportunity for the pasture to rest after grazing use, and also allows the owner to irrigate part of the pasture while animals are grazing on another. Even if an owner has only 1 or 2 acres he should attempt to cross-fence the pasture into two smaller units to accommodate a rotation system.

Animal Unit Equivalents

Kind and age of stock	Average weight	Animal units per head	Head per animal unit
Beef cows, steers over 2 years	1000	1.00	1.0
Yearlings 1 to 2 years, average	627	.75	1.3
Calves 3 months to 1 year	400	.50	2.0
Dairy cows (350# prod.)	1100	1.25	0.8
Dairy heifers 1 to 2 years	600	.70	1.4
Dairy calves 3 months to 1 year	300	.40	2.5
Sows*	350	.50	2.0
Pigs after weaning	70	.25	4.0
Pigs fattening	150	.40	2.5
Ewes and mature sheep	120	.20	5.0
Lambs and goats under 1 year	70	.16	6.0
Horses, light work	1200	1.00	1.0

*All swine are shown in full animal unit equivalents although they would not get all the feed required from pasture. A sow can get up to 50% so would be figured at half the .50 shown, or at .25, if getting half of the feed from pasture.

GLOSSARY

Annual plant—A plant that grows from seed each year, such as annual ryegrass, cereal grains and the clovers used in non-irrigated pasture.

Bloat—Accumulation of gases causing expansion of the rumen. Severe cases usually result in death. Commonly occurs on lush legumes pastures such as alfalfa and Ladino clover.

Herbicides—Chemicals used to kill weeds and brush.

Infiltration—Movement of water into the soil.

Legumes—Plants in the pea family (including alfalfa, clover, and trefoil) which form nitrogen-fixing nodules on their roots, thus making use of atmospheric nitrogen.

Nitrogen fixation—Process that changes nitrogen gas in the air to a chemical form available to plants. Most plants with this capability are legumes.

Non-irrigated pastures—Annual and perennial range plants in these pastures depend on rainfall for water. They are productive in late winter and spring, depending on the amount and time of precipitation.

Pasture rotation—Method of using only part of your pasture at any one time, which allows other parts to rest and regrow. This can be done by cross fencing.

Perennial plants—Plants that survive for several years (such as most of the plants used in irrigated pasture seedings).

Range—All land not classified as cropland or pastureland which supports vegetation useful as forage for grazing or browsing animals.

Roughage—Fibrous plant material such as hay, silage, fodder, and straw—usually low in digestible nutrients.

Rumen—Largest of four distinct stomachs in ruminant animals such as cattle, sheep and goats. Enables these species to digest cellulose from most roughages.

Scours—Diarrhea caused by disease or diet. Sudden change to lush, irrigated pasture can cause scours in grazing animals.

Seed inoculation—Usually refers to coating legume seeds with proper microorganisms to insure development of nitrogen fixing root nodules.

Small pastures—Pastures on rural subdivisions that are too small to support a commercial grazing operation. These pastures may belong to people of various income levels and are used to support small herds of livestock and horses.

Supplements—Additional feed used to balance the nutritional intake of livestock.

Topography—Physical features of the land surface, such as hills, valleys, and stream channels.

Water-loving plants—Plants that are adapted to growth and survival in wet, undrained conditions.

Wild flooding—Irrigation method used in rough, hilly terrain where grading is impractical. Water is distributed from ditches that follow the grade along ridges and hillsides. Water is released from selected points along the ditch, and drainage is collected in the next lower distribution ditch. Inexpensive, but requires a careful experienced irrigator.

Additional Information

Additional information related to pasture production and horse husbandry is available in the following U.C. Cooperative Extension publications:

"Permanent Sprinklers for Hilly Pastures"—Leaflet 2662.

"Grading Land for Surface Irrigation"—Leaflet 2692.

"Drainage of Irrigated Land"—Leaflet 2691.

"Irrigation Costs"—Leaflet 2875.

"Management of Clovers on California Annual Grasslands"—Leaflet 2661.

"Growers Weed Identification Handbook"—Priced Publication 4030. ($25.00)

"Methods of Analysis for Soils, Plants and Water"—Priced Publication 4034. ($2.50)

"Establishing and Managing Irrigated Pastures for Horses"—Leaflet 21164.