IRRIGATED PASTURE PRODUCTION AND MANAGEMENT

Irrigated pasture was grown on 106,000 acres in Stanislaus and San Joaquin Counties in 1986. Most of this acreage is on soils not well suited to many other crops. These soils are often shallow and underlain with hardpan or tight subsoil clay layers. Pasture also is produced on heavy clay soils, on difficult slopes and, at times, for alkali reclamation. Yet, irrigated pasture forms an important part of the area livestock production system. Together with the rangeland, these pastures comprise most of the year-round feed supply for livestock operations.

To be productive, irrigated pasture needs considerable care and management. This publication outlines production and grazing management techniques that result in good yields of quality forage that are utilized efficiently.

ESTABLISHING THE PASTURE

Unless a dense pasture stand is established, optimum production will not be possible.

Seeding Time

October is the best time to plant a perennial irrigated pasture in the central valley of California. Historic weather records indicate that an average of about 1.8 inches of rain are received in October and November combined. This should be enough moisture for germination and early root development prior to hard frosts if seeded between October 15 and November 5. Later seedings may not germinate well because of cold soil temperatures, and seedlings will be subject to damage from freezing.

Occasionally, spring seedings are successful. They will probably require irrigation at short intervals for seedling roots to develop in soils that dry out as temperatures rise. Spring seedings have more difficulty competing with spring weeds than fall seedings. They also will not be sufficiently well established to graze until late in the normal grazing season.

Consequently, because of the small amount of first year forage, and the other problems associated with spring seedings, it is often advantageous to plant sudan grass or some other warm season annual crop in the spring and wait until October to plant the perennial pasture.

What to Plant

Grasses and legumes are usually grown in mixtures for irrigated pasture. Each plant species or variety in the mixture will have desirable qualities and probably some short-coming. However, a good mix will have a sufficient variety of adapted plant species to balance or complement each other.

Some of the commonly used plants adapted to this area include:

Ladino Clover - This large variety of perennial white clover has been used successfully in area irrigated pastures since the 1930s. In some of the early plantings no grass was added, and this resulted in heavy losses of livestock because of bloat. Ladino spreads by means of creeping stems that send roots down at the nodes and by natural reseeding. Most of its roots are in the top 6 to 12 inches of soil making it suitable for use on shallow soils, but requiring somewhat frequent irrigation. Ladino clover doesn't grow much in cold weather but grows rapidly in warm weather. Ladino produces an abundance of high quality legume forage which recovers rapidly after grazing.

Salina Strawberry Clover - This selection from the Palestine variety of strawberry clover is another perennial that somewhat resembles Ladino clover in growth habits. Its appearance is sometimes so much the same that the novice has difficulty distinguishing one from the other. It has nearly the same production level as Ladino and tends to cause less bloat. It has a more fully developed tap root than Ladino clover. Salina is more tolerant to drought, salinity and poorly drained conditions, making it a very versatile plant. The flower heads are similar to those of Ladino, but are more tightly packed and a little pink in color. The underside of all three leaflets of a Ladino clover leaf is shiny. On the underside of Salina strawberry clover, only the outer half of each side leaflet is shiny; the center leaflet is entirely dull on the underside.

Narrowleaf Trefoil - This long-lived perennial legume grows along the ground except in dense stands where competition for sunlight causes it to grow more upright. Narrowleaf trefoil grows under a wider variety of soil conditions than does Ladino. It is capable of producing good pasture under conditions of high salt and poor drainage. It is a legume which does not cause bloat.

Broadleaf Trefoil - This trefoil grows more upright and has broader leaves than narrowleaf trefoil. Broadleaf trefoil is winter dormant, more tolerant of the cold, deeper rooted than narrowleaf, and does well in foothill pastures where water is limited and soils are coarse textured.

Both types of trefoil are poor competitors with clover and grass where moisture and fertility are favorable for vigorous growth. They are used as supplementary legumes where there is not as much competition due to some unfavorable soil, moisture or management condition.

Orchardgrass - A perennial, this bunch type grass has a blue-green color and flattened stems. It is often difficult to get established in new pastures; but once established, produces a lot of very palatable, nutritious feed, particularly in the early growth stages. As it matures, it tends to become coarser stemmed and a bit clumpy. Managed properly, it is a very useful grass.

Annual Domestic Ryegrass - Probably under irrigated conditions, many of these plants are short-lived perennials due to hybridization or mixing with perennial ryegrass. All strains of annual ryegrass can be distinguished from perennial ryegrass by their emerging leaves which are rolled, while in the perennial they are folded. Generally there are short bristles (awns) on the annual ryegrass seeds, but not on the perennial; but this characteristic varies widely. Annual ryegrass is a palatable shiny, narrow leafed plant which has high production and early-spring growing habits. It is a good competitor with the flush spring growth of Ladino Clover, so is a valuable bloat preventive plant. It does tend to become dormant in late summer. It is more stemmy than perennial ryegrass.

Perenniel Ryegrass - This fine stemmed, shiny bright green leafed plant is leafier than annual ryegrass, fully as palatable and grows later in the summer. It likely does not produce as much feed as orchardgrass. It has an advantage of remaining palatable late in the grazing season when the other grasses begin to mature.

Tall Fescue - This is a deep rooted perennial grass with a long growing season and high forage yields. It tends to clump badly and is not as palatable as either orchard or ryegrass. It is difficult to manage because of these latter characteristics and consquently seldom recommended for pastures. It is sometimes used for small horse pastures or calving areas, but must be managed to keep from clumping too badly.

Other Pasture Plants - Occasionally commercial mixes will include other plants. Most are not as well adapted as those discussed above. Some of them are: Red clover, often found in horse pasture mixes. Red clover tends to be short lived, less competitive and somewhat coarser stemmed than Salina and Ladino clovers. Alsike clover is less productive in this area, especially on lighter soils. Alfalfa is often found in commercial mixes, but because it has a deeper root system than other common pasture plants, it requires less frequent irrigation. It is also not as competitive as clovers, hence dies out early. Occasionally other grasses such as bluegrass, Timothy Bermudagrass and others are tried. Most all are less productive or not adapted to the area. Hybrid bermudas are occasionally used, usually alone in small horse pastures where durability is required, but production levels are not very high.

Seed Mix

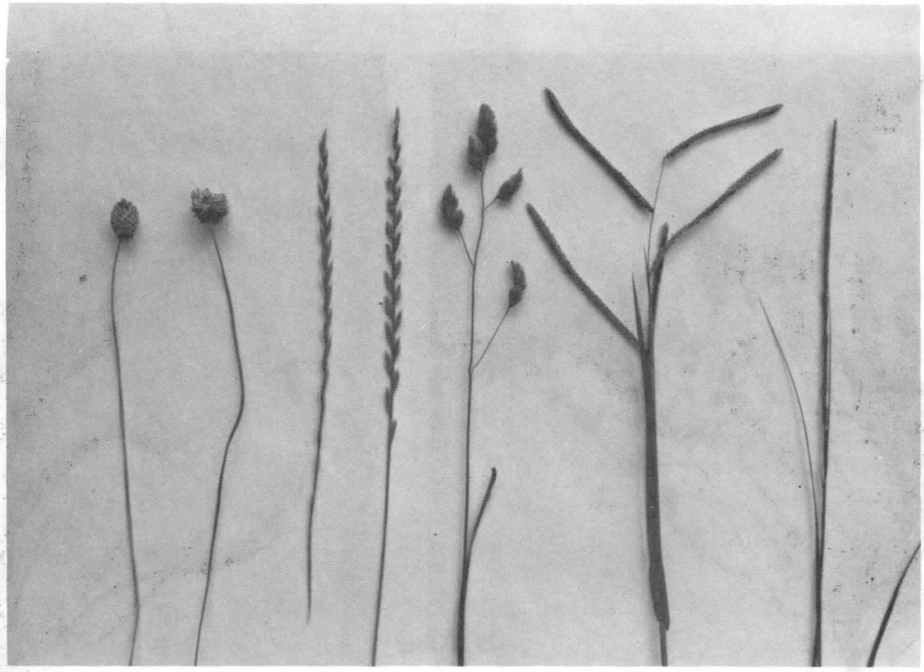
Here is a seed mix which has proven to be very good for most livestock uses under most soil conditions.

Salina Strawberry Clover	3-4	pounds per acre
Annual Ryegrass	3	pounds per acre
Perennial Ryegrass	4	pounds per acre
Akaroa Orchardgrass	5	pounds per acre
TOTAL	15	pounds per acre

Some people may wish to use 2 pounds of Salina strawberry and 2 pounds of Ladino clover rather than only Salina. Since Salina is more drought tolerant and adapted to a wider variety of soil conditions than Ladino, we've used only the Salina clover. Many commercial mixes include the trefoils. Since under most conditions, Salina strawberry clover is much more productive, and because Salina doesn't cause bloat nearly as badly as Ladino clover, the trefoils have been omitted from our standard recommended mix. Under conditions which vary from typical, the seed mix can vary accordingly.

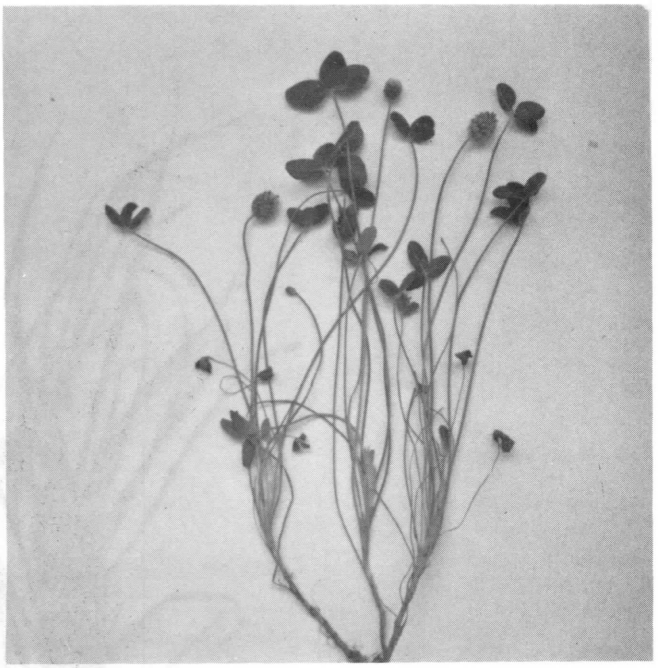
Buy seed from reputable dealers. Be assured before purchase that seed is of high germination and purity. Check the label for these qualities including freedom from noxious weeds. If a commercial mix is purchased rather than a custom mix, be sure it contains the desired, adapted species.

Legume seed should be inoculated with nitrogen-fixing rhizobia bacteria before planting. Inoculation helps ensure normal, vigorous legume growth.



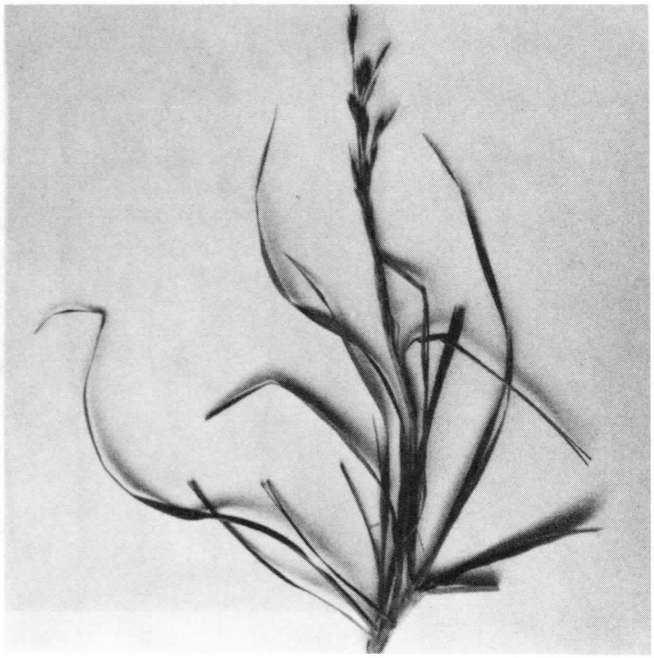
Strawberry Clover, Ladino Clover, Perenniel Ryegrass, Annual Ryegrass, Orchard Grass, Dallis Grass, Deer Grass.

Ladino Clover



Salina Strawberry Clover

Narrowleaf Trefoil



Tall Fescue

Annual Domestic Ryegrass

Deer Grass
(A common weedy invader)

Orchard Grass

LAND AND SEEDBED PREPARATION

More pasture failures occur because of improper seedbed preparation than from anything else. Pasture plant seeds are very small -- especially clover seeds. For a seed to germinate and grow, it must have contact with soil and water. A good seedbed is firm enough that the soil particles are in close contact with the seed. The seedbed must contain sufficient moisture to germinate the seed and to support plant life until rainfall or irrigation occurs. A loose, fluffy seedbed will not provide these requirements. Likewise, a rough, uneven seedbed with clods is undesireable.

Preliminary operations include land grading, chiseling, discing and harrowing. Work the ground when dry enough to avoid compaction. Methods of sowing include drilling, ground or airplane broadcasting, or the use of a ringroller with a sowing attachment. Any method that will give an even distribution of seeds sown no deeper than 1/2 inch is satisfactory. Ring rolling or cultipacking should follow broadcast seedings to ensure seed coverage and good contact with soil. If a ringroller or similar equipment is not available, a spike toothed harrow can do a fairly nice job of seed coverage without covering them too deep.

FERTILIZATION

Several U. C. Extension trials run from 1937 to 1959 in Stanislaus County show consistent dramatic yield increases from fertilization; some more than doubling production. Mixed fertilizers containing Nitrogen (N), Phosphorus (P), Potassium (K), and Sulfur (S) gave highest yields, as we might expect. However, the additional yield provided by nitrogen or potassium over that provided by phosphorus or phosphorus and sulfur usually could not pay for the added cost of nitrogen or potassium. Yields from phosphorus alone or nitrogen alone usually were quite similar. Commercial nitrogen applications remain effective for no more than 30 to 60 days. Repeated applications become quite expensive. Continual nitrogen applications tend to change species composition from legumes to grasses and broadleaf weeds, ultimately reducing total production. Local experience would verify that the best animal weight gains come from clover pastures with just enough grass to keep from having a bloat problem.

Therefore, unless there are some unusual soil characteristics or production goals, we've found that an annual winter application of 300 to 400 pounds per acre of single superphosphate (60 to 80 lbs. P_2O_5) provides as good a pasture and livestock growth response as any other fertilization program.

Increasingly, single superphosphate is unavailable. In that case, treble superphosphate or a fertilizer with a low ratio of nitrogen to phosphorus should be substituted. Diammonium phosphate and monoammonuim phosphate are acceptable substitutes.

It should be noted, that forage quality will not likely change enough with fertilization to raise the average daily gain of livestock. Fertilizer costs won't be recovered fully unless stocking rate is adjusted to meet the increased production.

IRRIGATION

Irrigated pastures use about 49 inches of water each year. About 42 inches of this amount will have to be supplied by irrigation.

Irrigation influences production more than any other practice. Yet, it is one of the more difficult practices to control. Some steep slopes with underlying hardpan can't be corrected. In irrigation districts where water is available at only certain time intervals, it is difficult to control water volume and the number of days between waterings.

The good manager should, within these types of constraints, try to apply 2-1/2 inches of water every 10 days. The pasture will use 1/4 inch of water per day from mid-May through August with lesser amounts before and after this period.

Three common faults in irrigation management occur quite frequently:

1. Failure to irrigate early enough in the spring;

2. Livestock walking in wet conditions will break through the turf and compact the soil, making water penetration difficult and reducing production;

3. Failure to control water! Broken down borders, high and low spots, letting water run too long, failure to repair ditches or leaking valves, and lack of return flow systems all contribute to water waste, high water cost, weed infestation, poor production, internal parasites, etc.

Time must be spent in the field observing, controlling and using that important pasture management tool--the shovel. Have pastures graded to the correct slope, and control water flow properly. Return-flow systems are increasingly important to conserve water. Either sprinkler or flood irrigation can be used. Sprinklers have the advantage of better control of water volume applied. The disadvantage is that they are quite expensive. Consequently sprinklers are usually found in small pastures where non-pasture income pays the cost. For flood irrigation, proper slope, check width and length are related to water volume and soil type. Your farm advisor can help you with that information.

Water management to control water waste is important not only from the production standpoint, but also for economic reasons. In 1986, irrigation water cost $24.00 per acre in Oakdale Irrigation District; less in Modesto and Turlock Irrigation Districts; but outside the districts, pumping costs were in excess of $60.00 per acre. As power and water costs rise, water management becomes critically important.

WEED CONTROL

Unwanted plants reduce forage quality and quantity. For every weed in a pasture, a desirable plant could be in it's place if it weren't there. Some poorly managed, weedy pastures produce at only half their potential.

There's an old saying that there are two essential pasture management tools. One is the shovel, mentioned above under irrigation, but also useful for digging out scattered weeds. The other is the mower.

Mowing weeds before they set seed is one of the best methods of preventing their spreading. Mowing not only aids in weed control, but also can clip off old, mature and fibrous grasses which livestock have left. This encourages new, more palatable and nutritious growth.

Rotational or controlled grazing can accomplish similar results as increased numbers of livestock grazing for short periods of time have a "mower-like" effect on the pasture.

Judicious water use discourages many water-loving weeds such as dock and sedges. Many weed problems are related to over-or under-watering.

Proper land grading before the pasture is ever planted can provide the proper slope, and eliminate high and low spots where weeds grow. Proper slope helps prevent over or under watering and therefore discourages weeds and encourages pasture forage growth.

Herbicides are difficult to use on pastures because pastures have both broadleaf and grass non-target species, and because of herbicide label restrictions and safety precautions. 2,4-D amine works quite well on many broad leaf weeds. It should be used only in established pastures in the spring after the legumes have started growing well. It could harm or kill new, establishing legumes. Glyphosate (Roundup) is labeled for restricted pasture use. It is effective on many weeds, but also kills most desired pasture plants. Therefore, it is useful primarily for spot treatment or wiper application. Animals must be removed for 14 days following treatment. Always follow all label directions and safety precautions when using herbicides.

GRAZING MANAGEMENT

Grazing can be likened to harvesting the crop. There are some similarities. For example, what grower of a field or orchard crop would harvest continually year-round, or harvest while irrigating, or harvest only part of a crop? The point is that grazing must be managed in a manner that optimizes forage utilization. To do this, some pasture growth principles should be explained.

Growth Principles

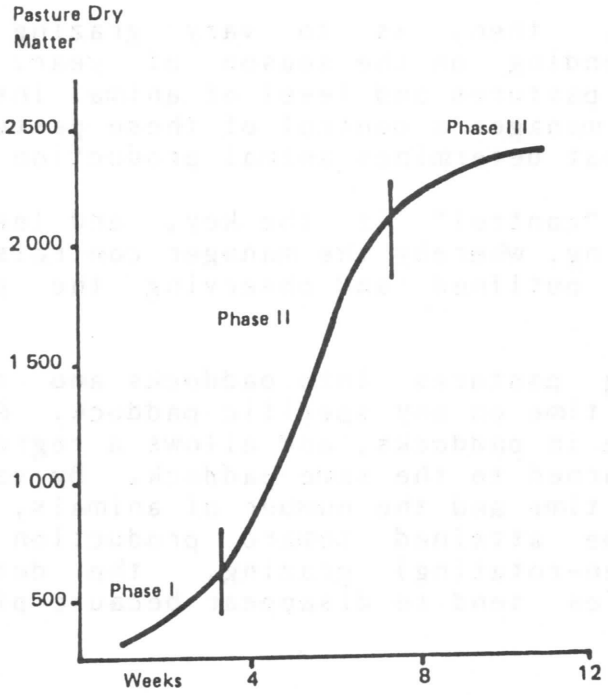
When pasture is grazed hard the rate of regrowth follows an "S" shaped curve (Figure 1). This growth can be divided into three phases.

* Phase I is slow, tentative growth after severe overgrazing. Most of the leaf area of the plant has been eaten and the rate of photosynthesis is low.

* Phase II is the period for most rapid growth when the leaf area is greatest and little sunlight is wasted by falling on bare ground. There is a lapse of time before this phase begins after hard grazing but it can occur immediately after light grazing.

* Phase III is a period when grass growth slows, as the pasture plant height increases and more leaves become shaded. Leaves begin to yellow and decay. The death rate of plant tissue starts to exceed growth rate and the proportion of dead, low quality feed becomes high.

Figure 1



Rate of pasture regrowth following grazing

If maximum pasture production was the only objective, a grazing system that keeps pastures in phase II would be best. In central California, we're still learning exactly how tall the pasture is when it's in phase II, but it's somewhere between 2 and 7 inches for mixed clover and grass irrigated pasture. The objective usually is optimum utilization and animal production per acre. Therefore, allowances must be made for animal factors which influence utilization.

Seedhead formation rapidly depletes plant nutrient reserves. Control of seedhead production, particularly in the early part of the grazing season will increase pasture production greatly. New Zealand pasture experts suggest that as much as 30 percent increase in summer and autumn production can occur by controlling late spring seedhead formation.

Repeated hard or heavy grazing also tends to deplete plant reserves. Reserve nutrients and energy are held in the tillers of grass and stolons of clovers; and while they may only play a small part in stimulating new growth, they are probably very important in assisting a plant's persistence in time of stress. After such intense grazing, plants need a recovery period long enough to replenish plant reserves.

The opposite, repeated or continual light grazing reduces the photosynthetic capacity of plants, because many plants will be in phase III with shading of lower leaves, and a few plants will be in phase I with most leaf area grazed off. The result is slower growth.

Graze to Achieve Best Utilization

The need, then, is to vary grazing intensities and severities depending on the season of year, composition and productivity of pastures and level of animal intake required. It is the pasture manager's control of these pasture/animal inter-relationships that determines animal production per acre.

The word "control" is the key, and leads to the term controlled grazing, whereby the manager controls grazing based on the principles outlined and observing the plant and animal responses.

Subdividing pastures into paddocks and rotating paddocks reduces grazing time on any specific paddock. Rotating increases grazing pressure in paddocks, and allows a regrowth period before animals are returned to the same paddock. By varying the grazing time, the rest time and the number of animals, a good degree of control can be attained toward production goals. Under continuous (non-rotating) grazing, the desirable and more palatable species tend to disappear because plants are grazed continually.

* * Features of rotational grazing include:

1) Allows control of grazing days and rest days.

2) Can avoid having cattle in a field while irrigating.

3) Normally allows higher carrying capacities.

4) Discourages weeds; encourages desirable plants.

5) Helps achieve maximum or optimum production per acre, but not necessarily per animal.

6) Requires more management than continuous grazing.

7) Allows more flexible use of pastures.

8) Diminishes the need for mowing pastures.

* * Features of continuous grazing include:

1) Encourages optimum gain or production per animal but not per acre.

2) Requires less investment in fencing and drinking water facilities.

3) Does not allow for cattle to be out of the pasture during irrigation.

4) Provides little contol of which phase of growth plants will be in when grazed, because animals are selective in grazing habits. Thus mature, young, and overgrazed plants co-exist, weeds increase, desirables decrease and production level declines.

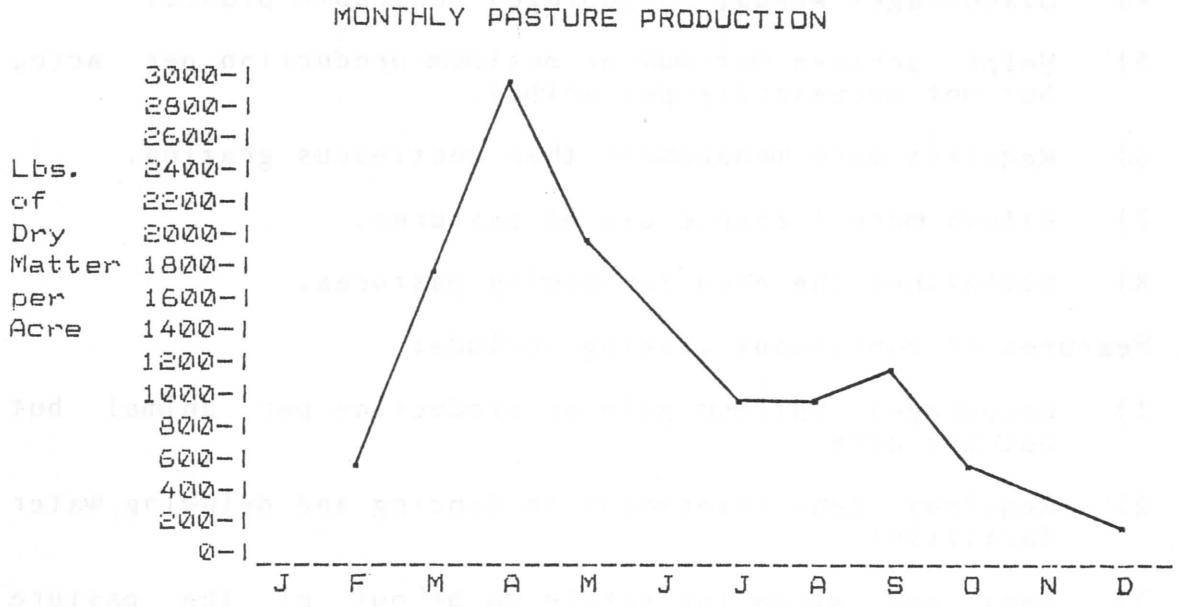
5) Mowing for weed control and removal of old, fibrous growth is needed.

One system that takes advantage of maximum gains per head and per acre is a rotationally controlled system where a group of animals targeted for rapid gains are stocked at a light rate to "Top" the forage and rotated, and another group of animals which require a lower quality feed are rotated immediately behind the first group to utilize the remaining forage.

The number of fields or paddocks in a rotational grazing plan will depend on individual ranch conditions. In general, the more fields available, the greater the flexibility and versatility. Enough fields to allow 20 to 30 days of regrowth after grazing usually works quite satisfactory.

Seasonal Use

All of the irrigated pasture plants normally used are seasonal in growth habits. Growth begins in early spring, peaks in late spring and slowly declines during summer and autumn. Winter growth is practically nil (Figure 2).



Stocking rates of necessity, then, must be adjusted seasonally. Animals grazing on wet pastures tend to break down the crowns of the plants and cause soil compaction. In wet, winter months, they should be removed to allow the plants a recovery period. While Figure 2 shows a slight production increase in September, local experience weighing cattle monthly shows that animal gains begin to decline quickly in September. This indicates that pasture quality begins declining before growth rate substantially declines. Adjustments in numbers or class of livestock grazing will help achieve production goals.

Fencing

Modern electric fencing using high tensile steel wire and low amperage, high voltage, very quick pulse energizers has made cross fencing much less expensive than barbed wire systems. These fences are far superior to old-style electric fences. They rarely short out. Solar power can be used if needed. One or two strands of wire are sufficient for cross fencing. They can be used very well in a rotational grazing scheme. They are the "state of the art" in fencing. Some producers build a four-wire high tensile electric fence around one "training" paddock which accustoms cattle to the electric fence; all other paddocks are wired with one-wire cross fences. This seems to work quite well.

Corner posts must be braced well to stand up under the high tension of this wire, but fewer fence line posts are required. Fiberglass or other light weight, inexpensive posts are sufficient and require less exacting insulators because fiberglass does not carry electric current. Another innovation which has made cross fencing, especially for strip grazing, simpler and less expensive is the development of "poly" wire portable fencing. Poly wire is a woven polymer plastic with a strand of stainless steel conductor wire woven into it. It's weighs only 1/10 the weight of all-steel wire. It is extremely simple to move as it rolls and unrolls easily from spools or reels. An entire length of fence including lightweight fiberglass posts can be carried in two hands. Breaks are simply tied with a double overhand knot. This portable fencing is quite useful when electrified and used for grazing systems where frequent moving of livestock and fences is desirable. The cost of many permanent cross fences is eliminated with temporary fencing.

HAYING

During the spring months when growth is rapid (Figure 2), some ranches will not have enough livestock available to graze all the growth. Rather than allow the pasture to reach phase III (Figure 1) which is tall, fibrous and of lower nutritional value, good managers cut a crop of hay or silage from all or part of their pastures. This is a good practice in that the plants can be harvested at an optimum growth stage and stored for feeding during a time when more feed is needed. Pasture hay put up properly from a clover and grass pasture will vary some in nutrient content but may average about 15% crude protein, 58.5% TDN and about 32 Megacalories of net energy for gain on a 90% dry matter basis.

One difficulty when making pasture hay is getting the hay dry enough to bale and haul off the field before another irrigation is required. Missing an irrigation on the short, new-mown pasture slows regrowth time. Excellent timing of hay making operations and the use of crimping devices or conditioners on the swather will help alleviate the problem.

Pasture silage is made succesfu1ly by some producers. One problem is that pasture is often too moist to make good quality silage unless dry matter is added or the pasture is swathed and allowed to wilt for a day prior to chopping. Preservatives may also help high moisture (above 70%) pasture to ensile properly.

MEASURING PRODUCTION

Every production management decision needs to be based on facts. Those facts are mostly found in adequate records which show not only costs but production level. One cannot begin to know whether or not the pasture is profitable unless records are available showing production as well as costs.

Production can be measured in several ways. All require accurate, complete records. Some measures of production are:

* * Carrying capacity - - - This is often recorded as head per acre. This is inadequate unless the kind, age or weight of livestock are also recorded. The best measure is probably body weight carried per acre. For growing animals, the best measures are made by weighing livestock in, weighing each month and weighing out. These weights provide both monthly and total utilization of the pasture by animals.

* * Animal Unit Month (AUM) - - - A rather standard measure, an AUM is the amount of TDN required to maintain a 1,000 pound cow for one month. It is roughly equivalent to 400 lbs. of TDN or 800 lbs. of hay equivalent. The typical pasture in the area produces 11 to 13 AUM's annually. Twelve AUM's is enough feed to support 1 cow for one year. Figure 2 demonstrates the seasonal nature of the production.

* * Animal weight gain per acre - - - This is a very useful measure, because it measures the actual animal product produced by the pasture. The gain will vary, with size, health, condition, etc. of the animals, all of which influence weight gain as well as by pasture growth.

* * Head-days per acre - - - Head-days are simply the number of head times the number of days grazing. Accurate accounting of dates and numbers of animals added or removed from the pasture is necessary. Coupled with body weights in and out, most other measures of production can be made.

* * Herbage mass of forage on offer (Lbs./Acre) - - - Weighing of sample areas, or other measurements or accurate estimates of how much forage is currently available can improve near term forage allocation to livestock. If the expected monthly available forage mass is known, long-term (one-year) pasture planning and management is possible.

* * Others - - - Perhaps milk production, hay tonnage, or other measures will be appropriate. It is important with all the above measures to account for animal production due to any supplemental feeding that might have been done. Each operator will want to develp some accurate measure of pasture production to evaluate management practices and profits.

COSTS OF PRODUCTION

The costs of establishing and producing irrigated pasture will be different for everyone. Costs will certainly also change with time. The costs reported in Table 1 are merely representative costs at the time of publication to use as a guide in figuring individual ranch costs. Note that in the example cost data, the extra first year establishment costs are amortized over a 10 year period of production.

Cost data is needed along with production data to evaluate cost effectiveness of each production or management practice.

SAMPLE COSTS TO ESTABLISH AN IRRIGATED PASTURE
(Land preparation & additional first year costs)
STANISLAUS & SAN JOAQUIN COUNTIES
AUGUST 1, 1987

CASH COSTS			DOLLARS PER ACRE SAMPLE COST	YOUR COST
Land preparation: disc, level, chisel, border work	3.25 hrs.		59.80	
Repairs to equipment			3.00	
Seed: 14 lbs. @	1.50 $/lb.		21.00	
Plant: man & tractor	.33 hrs.		5.12	
Two clippings: man & tractor	.5 hrs.		7.68	
TOTAL CASH COSTS			96.59	
Depreciation on tractor: 3.83 hrs. @	2.00 $/hr.		7.66	
Interest on tractor: 3.83 hrs. @	1.05 $/hr.		4.02	
TOTAL FIRST YR. ESTABLISHMENT COSTS			108.27	

SAMPLE COSTS TO PRODUCE IRRIGATED PASTURE
STANISLAUS AND SAN JOAQUIN COUNTIES
AUGUST 1, 1987
Bill van Riet, Farm Advisor

CASH COSTS			DOLLARS PER ACRE SAMPLE COST	YOUR COST
Mow, fertilize, fence work, etc.:				
3 man and	1.5 tractor hours		31.65	
Irrigation labor:				
6 hrs. @	5.75 $/hr.		34.50	
Irrigation water- power & district tax:			24.00	
Fertilizer: 300 lbs. @	200 $/ton		30.00	
Property taxes:			10.50	
Misc. cash costs:			10.00	
TOTAL CASH COSTS			140.65	
DEPRECIATION:				
Irrigation system (gravity):				
original cost- $ 185.00		20 yr. life	9.25	
Tractor: 1.5 hrs. @	2.00 $/hr.		3.00	
Fences: cost- $ 87.50		20 yr. life	4.38	
Past. stand: cost-$ 108.27		10 yr. life	10.83	
TOTAL DEPRECIATION			27.45	
TOTAL CASH & DEPRECIATION			168.10	
INTEREST ON INVESTMENT @	9 %:			
Land: @	1500.00 $/acre		135.00	
Irrigation system: 1/2 cost	185.00 $/acre		8.33	
Tractor: 1.5 hrs. @	1.05 $/hr.		1.58	
Fences: 1/2 cost	87.50 $/acre		3.94	
Past. stand: 1/2 cost	108.27 $/acre		4.87	
TOTAL INTEREST ON INVESTMENT			153.71	
TOTAL COST OF PRODUCTION			321.81	

*
COST PER ANIMAL UNIT MONTH AT VARYING PRODUCTION LEVELS

Production level(AUM)	8	10	12	14	16
Cash & Depr. Cost	21.01	16.81	14.01	12.01	10.51
TOTAL COST	40.23	32.18	26.82	22.99	20.11

*
Animal Unit Month (AUM)= 400 pounds total digestible nutrients or 0.8 tons of hay. Any added costs per acre would increase AUM costs accordingly.

SUPPLEMENTAL FEEDING

Many supplemental feeding trials have been conducted throughout the years by Cooperative Extension and others. Growing cattle invariably respond with faster weight gains. The amount of response depends on the condition of the pasture, the amount and type of supplement and the livestock.

An example of what might occur is from a 1978 trial with 560 pound choice quality beef heifers. In a 135 day grazing period, heifers receiving 2 pounds of concentrate each day gained 0.26 pounds per head per day more than heifers receiving only pasture and minerals. Another group receiving 2 pounds of concentrate containing the ionophore Rumensin , gained 0.45 lbs/head/day more than the non-supplemented heifers. At the feed and beef prices prevailing at the time of the trial, the added gain just paid for the supplement alone but brought a profit over the supplement with Rumensin .

The relative prices of beef and of supplement will ultimately determine whether or not to supplement. Certainly, an efficiency enhancing ionophore added to the supplement will make the practice more likely to be profitable. Supplements, to truly be a "supplement," should be fed only to a level which will supplement nutrient deficiencies of pasture in meeting a certain animal performance goal. If fed beyond that level, it should be considered a substitute rather than a supplement, and this causes inefficient pasture utilization.

Also, if animal growth or production targets can be met without supplemental feeding, there is no need for it unless it reduces the cost of gain.