TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE — Oregon State Office — SOIL CONSERVATION SERVICE

1220 S. W. Third — Portland, Oregon 97204

AGRONOMY - Technical Note No. 31 — August 1975

A GUIDE TO THE MANAGEMENT OF NONIRRIGATED PASTURES IN WESTERN OREGON

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INTRODUCTION

This handbook is a guide for SCS personnel in providing technical assistance on western Oregon hill and other nonirrigated pasture on the footslopes and bottomlands of the Cascade and Coast Ranges. 1/

This handbook should be used in conjunction with field office technical guides that provide specific information for local soil types, land capabilities, and seeding techniques.

IMPORTANCE AND VALUE OF PASTURES

Western Oregon sheep numbers were 479,000 in 1960 and 319,000 in 1971. Beef numbers were 435,000 in 1960 and 466,000 in 1971. Western Oregon has about 60% of Oregon's sheep and about 30% of the state's beef. Many of these make use of the footslope pastures.

State-wide value of sheep (gross income) has been about $8,000,000 per year for the past 10 years. Gross income for beef in Oregon was $83,000,000 in 1960 and $171,000,000 in 1971.

According to the Conservation Needs Inventory (CNI), the acreage of all types of pasture in western Oregon is 450,000 acres with 260,000 acres of this needing treatment. CNI also lists 1,200,000 acres of grazed woodland. 2/

INVENTORY, EVALUATION, AND PLANNING

Evaluate, with the farm operator, his immediate and long-term goals and plans. Evaluate the operating unit, land class, land use, and condition. Consider various grazing alternatives with land capability limitations.

An evaluation, during the planning process, should be made of the following items:

1. Costs and benefits of various grazing alternatives. 3/
2. Nutritional needs of the livestock and the effect of better pasture on feed concentrate needs.
3. Cost of buying feed versus pasture improvement.

1/ See Appendix 1 for a list of counties covered by handbook recommendations.

2/ See Appendix 1 for list of beef and sheep numbers, value of income, and pasture acreage by county.

3/ See Appendix 2 for Enterprise Data Sheets for sheep and cattle. Current figures can be obtained from Extension Service, Oregon State University, Corvallis, Oregon 97331.

PASTURE ESTABLISHMENT

A weed-free, firm seedbed should be prepared, preferably for a fall seeding. Fertilize according to soil test results and county agent recommendations. Consult the "Oregon Interagency Guide for Conservation and Forage Plantings" (Seeding Guide) for species and seeding recommendations.

PASTURE MANAGEMENT

Fertilization

Phosphate and sulfur used annually are vital to the success of most grass-legume pastures.

The economics of nitrogen application should be considered carefully before it is recommended for a grass-legume pasture. Nitrogen fertilization usually is a poor investment on established grass-legume pasture because it inhibits legume root nodulation and encourages annual grasses.

Fall and spring nitrogen application is recommended on ryegrass for lambing pasture 4/or pure grass pasture. Nitrogen will give proportionately greater yields with increasing amounts applied, up to 100 pounds on pure grass pasture.

Lime usually should be applied every five years, or according to soil test recommendations. Molybdenum, potassium, magnesium, and boron may be used upon county agent recommendations. 5/

Rotation Grazing

Rotation grazing, the use of three or more pastures in a sequential manner, is recommended to help maintain the pasture. Higher protein content of the forage will result if there is a two or three week regrowth period in May before final close grazing. Summer regrowth is greater when grass is mowed at four to eight inches or before early flower stage.

Grass should be allowed to set seed every one-to-three years to allow renewed plant vigor. Pasture should be closely grazed or mowed after subclover seed is set and before fall rains to allow subclover seed to germinate in a mineral seedbed.

Stocking Rates and Utilization

The stocking rate for various classes and sizes of livestock can be calculated based upon yield of the pasture, requirements of the animal, and percentage utilization of the pasture.

4/ Ryegrass is usually recommended for lambing pasture because it is a winter-growing grass.

5/ See Appendix 3 for fertilizer recommendations for subclover.

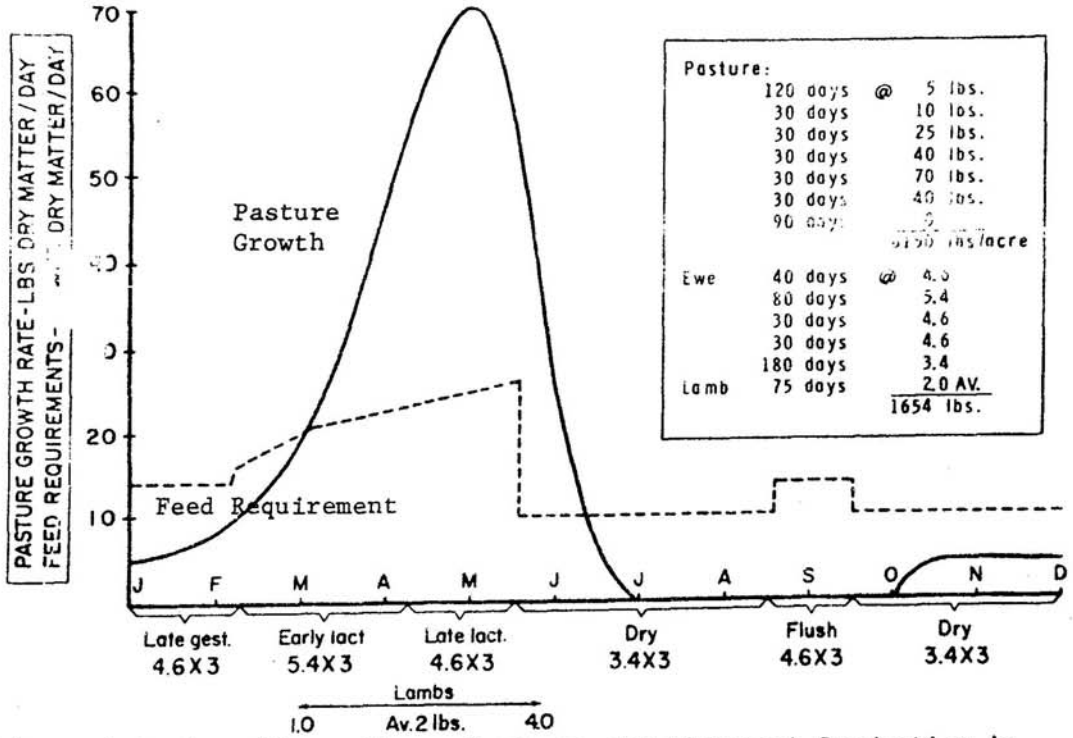
Percentage utilization varies greatly, depending on the operator's management and the stocking rate. Eighty percent is the utilization amount assumed in computing hay yield. It is also the amount assumed in computing stocking rates in Table 1. This figure allows for dung and urine patches, trampling effect, and weeds.

Table 1. Stocking Rates

Animal	Animal Units	Annual Dry Matter Needs	Stocking Rate/Acre 1/ Improved Pasture	Unimproved Pasture
		(pounds)		
Ewe (140 lbs. + lamb).....	.20	1700	3 ewe-lamb units	½ ewe
Lamb.....		150		
Cow (1000 lbs. + calf).....	1	8000	½ cow-calf	1/16 cow-calf unit
Half-grown steer or heifer.....	.5	4000	1 steer or 1 heifer	1/8 steer or 1/8 heifer

1/ Table assumes pasture utilization at 80%. Table compiled from material in: Hughes, Heath and Metcalf, Forage. National Academy of Sciences, Nutrient Requirements of Domestic Livestock, Sheep and Beef. M. D. Dawson and W. S. McGuire, Grass-Clover Pastures and Livestock Production in Oregon, 1973, O.S.U.

FIG. 1-GROWTH CURVES FOR SUBCLOVER-GRASS PASTURE (APPROX.) AND SHEEP FEED REQUIREMENTS (3 PER ACRE)



1/ Figure 1 is from "Grass-Clover Pastures and Livestock Production in Oregon" M. D. Dawson and W. S. McGuire.

PASTURE GROWTH AND FEED REQUIREMENTS

The growth rate of grasses and legumes varies through the year according to species, fertility level, and weather. Non-irrigated pasture, fertilized for legume production, has a growth curve as shown in Figure 1, page 3.

Non-irrigated Pasture

As shown in Figure 1, there is enough pasture growth during most winters to maintain one ewe per acre. Increased nutrition is needed during a ewe's late gestation period; another increase is needed during lactation. The additional feed for the lamb also is included. Feed requirements drop to that required for ewe maintenance if the lamb is sold.

There will be a winter feed shortage if pasture is stocked at a higher rate. Turnips, annual ryegrass, winter-growing perennials, or hand feeding will be necessary to maintain stock over the winter. An alternative to any of the above would be to buy sheep or calves early in the spring and sell them when the pasture is fully utilized.

Irrigated Pasture

Irrigated pasture can be used to supplement non-irrigated hill pasture. Surplus feed occurs from June to August as compared to April through early June on non-irrigated pasture.

MEAT PRODUCTION PER ACRE

Meat production can be calculated by estimated Total Digestible Nutrients (TDN) and conversion to meat, or by calculation of animal dry matter requirements. For example, a 600-pound steer gaining 2.4 pounds per day requires 18 pounds dry matter per day. Non-irrigated pasture, at 80% utilization, yields 4,800 pounds dry matter of 266 (4,800 ÷ 18 = 266) steer grazing-days. Therefore, a pasture could produce over 600 pounds of beef per acre if the weight gain is 2.4 pounds per day and if the pasture is utilized at its best protein quality.

DUAL USE OF PASTURES

Use of both sheep and beef on the same pasture may be advantageous. There have been reports of greater total per acre meat production using sheep and cattle. There is a noticeable difference in pasture utilization by cattle and sheep, and stand composition can be more easily held constant through use of both breeds.

See Appendix 4 for a summarization of recent research.

Appendix 1

	Pasture	Pasture Needing Treatment	Woodland Grazed
* Clatsop	3,894 acres	3,294 acres	0 acres
Columbia	10,000	2,273	5,000
Tillamook	11,004	8,804	0
Yamhill	29,061	23,200	37,000
Washington	7,109	4,535	25,000
Multnomah	12,949	9,949	26,500
Clackamas	5,200	1,999	35,000
Marion	26,000	19,929	10,500
Polk	23,143	16,198	18,027
Lincoln	10,105	0	2,067
Linn	44,000	32,500	60,000
Benton	21,800	11,000	13,000
Lane	12,000	7,190	43,500
Douglas	125,944	37,297	22,000
Coos	51,120	37,753	25,094
Curry	26,643	17,407	177,864
Josephine	19,602	15,682	85,000 Range Exclud.
Jackson	13,000	11,258	600,000 " "
TOTAL	452,574	260,268	1,185,552

	Pasture	Pasture Needing Treatment	Woodland Grazed
Willamette Valley	191,262	128,773	273,527
Mid & North Coast	25,003	12,098	2,067
Coos-Curry	77,763	55,160	202,958
Jackson-Josephine	32,602	26,940	685,000
Douglas	125,944	37,297	22,000

* The Conservation Needs Inventory shows for western Oregon the total pasture, pasture needing treatment, and woodland grazed, which gives an idea of the size of the area. (See above.)

Appendix 1
(Continued)

Livestock Numbers in Western Oregon, Oregon* and United States

County	Sheep		Beef Cattle	
	1960	1971	1960	1971
Clatsop	800	400	10,000	9,000
Columbia	7,500	4,000	23,000	23,000
Tillamook	1,200	300	28,000	26,000
Yamhill	28,000	16,000	21,000	23,000
Washington	6,000	5,000	28,000	27,000
Multnomah	2,700	1,400	14,000	10,000
Clackamas	37,000	23,000	40,000	41,000
Marion	43,000	25,000	33,000	39,000
Polk	30,500	22,000	14,000	19,000
Lincoln	5,800	3,200	9,000	9,000
Linn	62,000	40,000	34,000	39,000
Benton	31,000	12,000	13,000	12,000
Lane	39,000	26,000	36,000	41,000
Douglas	116,000	96,000	26,000	44,000
Coos	23,500	20,000	32,000	34,000
Curry	32,000	19,000	7,500	11,000
Josephine	1,600	1,300	17,000	15,000
Jackson	11,000	4,000	49,000	44,000
TOTAL, West. Ore.	478,600	318,600	434,500	466,000
TOTAL, Oregon	**566,000	517,000	**1,593,000	1,593,000
TOTAL, U. S.	**22,000,000	18,500,000	**109,000,000	117,000,000
Willamette Valley	286,700	174,400	256,000	274,000
Mid & North Coast	7,800	3,900	47,000	44,000
Coos-Curry	55,500	39,000	39,500	45,000
Jackson-Josephine	12,600	5,300	66,000	59,000
Douglas	116,000	96,000	26,000	44,000

* Oregon Commodity Data Sheet OSU Ext. Service Oct. 1972
** 1967 Figures

Appendix 2
Douglas Co. 11/70

Oregon State University

SHEEP
Enterprise Data Sheet

Cooperative Extension Service

Based On:

1. 1,000 ewes (2 yrs. and older) 90% lamb crop
2. 200 ewe lambs for replacement
3. Breeding ewe lambs; 50% lamb crop
4. 35 rams (3.5/100 ewes)
5. 8% ewe death loss
6. 500 acres improved pasture

		$ Total	$/Ewe	Your Figures
Receipts:				
800 lambs	90 lbs/hd @ 25¢ 1/	$18,000		
124 cull ewes and rams	$8/hd	960		
1,155 fleeces; ewes and rams	7 lbs/hd @ 70¢	5,660		
200 fleeces; ewe lambs	3 lbs/hd @ 60¢	360		
Unshorn lamb wool incentive	90¢/hd	720		
Total receipts		$25,700	$25.70	$
Cash Expenses:				
Hired labor				
Shearing	50¢/hd	$ 680	$ .68	
Tagging (1½ times/yr)	15¢/hd	260	.26	
Other hired labor	75¢/ewe	750	.75	
Pelleted feed	72 ton @ $40	2,880	2.88	
Mineralized salt		120	.12	
Veterinary and medicine		1,200	1.20	
ilizer and application	$6.50/acre	3,250	3.25	
	10 hd/yr @ $100	1,000	1.00	
Repairs and maintenance (fence, bldgs., & equip)		2,000	2.00	
Marketing		180	.18	
Personal property tax		300	.30	
Real estate tax		500	.50	
Other cash expenses 2/		1,500	1.50	
Total cash expenses		$14,620	$14.62	$
Cash receipts--cash expenses		$11,080	$11.08	$
Non-cash expenses:				
Interest on investment				
Land--500 acres @ $200	$100,000			
Buildings & equip. (ave. value)	9,000			
Ewes and rams, $25/hd ave. value	25,875			
Ewe lamb, $35/hd ave value	7,000			
Total investment	$141,875 @ 6%	$ 8,510	$ 8.51	
Operator's labor (one man, ½ time)		3,000	3.00	
Total non-cash expenses		$11,510	$11.51	$
Total expenses (cash and non-cash)		$26,130	$26.13	$
Return to management		$ - 430	$- .43	$

1/ Net price after transportation and marketing costs subtracted.
Includes interest on operating capital, supplies, insurance, and misc. overhead.

These data were obtained and computed by County Agent Wayne Mosher and Farm Management Technologist Stanley Miles in cooperation with Douglas County sheep producers in November, 1970.

Appendix 2
(Continued)

Return to Operator's Labor and Management
with Varying Lambing Percentages and Stocking Rates*

Stocking Rate / Lambing Percentage (ewes)	1 ewe/acre		2 ewes/acre		3 ewes/acre		Your Figures ___ewes/A	
	$Total	$/Ewe	$Total	$/Ewe	$Total	$/Ewe	$Total	$/Ewe
90%	-3,930	-3.93	2,570	2.57	4,740	4.74	_____	_____
110%	750	.75	7,250	7.25	9,420	9.42	_____	_____
130%	5,430	5.43	11,930	11.93	14,100	14.10	_____	_____
150%	10,110	10.11	16,610	16.61	18,780	18.78	_____	_____

* This assumes constant costs except for interest on investment in land and taxes on land.

Oregon State University

SHEEP
Enterprise Data Sheet

Cooperative Extension Service

Based On:

1. 400 ewes (2 yrs. and older)
2. 12 rams (3/100 ewes)
3. 95% lamb crop
4. 70 ewe lambs kept for replacement
5. 7% ewe death loss
6. 300 acres of improved pasture

		$ Total	$/Ewe	Your Figures
Receipts:				
310 lambs	90 lbs/hd @ 25¢ 1/	$ 6,975		
44 cull rams and ewes	$6.50/hd 1/	286		
460 fleeces (ewes and rams)	7 lbs/hd @ 70¢ 2/	2,254		
70 fleeces (repl. lambs)	3 lbs/hd @ 60¢ 2/	126		
Rhinshorn lamb wool incentive	90¢/hd	279		
Total receipts		$ 9,920	$24.80	$
Cash Expenses:				
Hired labor				
Shearing	50¢/hd	$ 265	$ .66	
Tagging	15¢/hd	69	.17	
Other hired labor				
Grain	10 ton @ $50	500	1.25	
Hay	25 ton @ $20	500	1.25	
Pasture maintenance (fert., seed, etc)		1,700	4.25	
Salt and minerals		150	.38	
Lambs	3 each yr @ $100	300	.75	
Veterinary and medicine	$2/ewe	800	2.00	
Repairs and maintenance (fence, bldgs, & equip.)		400	1.00	
Supplies	50¢/ewe	200	.50	
Gas and oil		200	.50	
Insurance		100	.25	
Personal property tax		150	.38	
Real estate tax	$2/acre	600	1.50	
Misc. overhead expenses 3/		400	1.00	
Total cash expenses		$ 6,334	$15.84	$
Cash receipts--cash expenses		$ 3,586	$ 8.96	$
Non-cash expenses:				
Interest on investment				
Land--300 acres @ $200	$60,000 @ 6%	$ 3,600	$ 9.00	
Buildings & equip. (ave value)	5,000 @ 6%	300	.75	
Ewes and rams (ave. value $25/hd)	10.250 @ 8%	820	2.05	
Ewes lambs--$30/hd	2,100 @ 8%	168	.42	
Total investment	$77,350			
Operator's labor, ave. about 16 hrs./week, $3/hr.		2,400	6.00	
Total non-cash costs		$ 7,288	$18.22	$
Total expenses (cash and non-cash)		$13,622	$34.06	$
Return to management		$-3,702	$-9.26	$

1/ Net price after transportation and marketing costs are subtracted.
2/ Includes wool incentive payment.
3/ Includes interest on operating capital.

Appendix 2
(Continued)

Return to Operator's Labor and Management
with Varying Lambing Percentages and Stocking Rates*

Lambing Percentage \ Stocking Rate	1 ewe/acre		2 ewes/acre		3 ewes/acre		Your Figures ___ ewes/A	
	$Total	$/Ewe	$Total	$/Ewe	$Total	$/Ewe	$Total	$/Ewe
95%	-2,702	-6.75	98	.25	1,036	2.60	_____	_____
110%	-1,298	-3.25	1,502	3.75	2,440	6.10	_____	_____
130%	574	1.45	3,374	8.45	4,312	10.80	_____	_____
150%	2,446	6.10	5,246	13.10	6,184	15.45	_____	_____

*This assumes constant costs except for interest on investment in land and taxes on land.

These data were obtained and computed by County Agent, Wayne Mosher and Farm Management Technologist, Stanley Miles in cooperation with Douglas County Sheep Producers in November 1970.

COOPERATIVE EXTENSION SERVICE
OREGON STATE UNIVERSITY
Oregon Counties and the U. S. Department of Agriculture Cooperating

Oregon State University Fertilizer Guide for

FG 4
June 1970

Subclover-Grass Pastures

(Western Oregon -- West of Cascades)

Subclover-grass seedings constitute the largest acreage of improved, non-irrigated pastures in Western Oregon. Grasses recommended for seeding with subclover are perennial ryegrass, tall fescue, or orchardgrass.

Key points in the management of subclover-grass pastures are:

1. Inoculation. Inoculate subclover seed immediately before seeding using the following methods:
   Use subclover inoculant which has been refrigerator stored and use inoculant prior to the expiry date on container.
   Sticker: Dampen seed with milk or sugar solution, spread in layer, sprinkle liberal amounts (two or more times the recommended rate) of inoculant and mix thoroughly.
   Following mixing avoid exposure of the inoculated seed to the sun and plant seed immediately into moist soil.
2. Recommended seeding methods, rates, mixtures, and varieties should be used.
3. Complete removal of forage and residue by hard summer grazing or mechanical harvesting favors clover establishment with first autumn rains.
4. Graze as available or cut as silage before maturity. Hay can be harvested in June even after early spring grazing.
5. If grass makes excessive growth, it will crowd out the clover. This is particularly the case where nitrogen has been applied in the spring.
6. Rotation grazing with short periods of heavy use will help maintain desirable grasses.

NITROGEN (N)

N should not be applied in amounts sufficient to produce an unfavorable balance of grass to clover and a subsequent loss of clover from the stand.

20 to 40 lbs of N/A may be applied each year in February or early March when it is desirable to increase the early spring growth of grass. The subclover will furnish most of the N for the grass after good clover growth starts.

N fertilization should not be a substitute for good management such as proper inoculation and maintenance of an adequate stand of clover.

PHOSPHORUS (P)

With new seedings, where pH is 5.5 or above, P should be banded 1/2" to 1" to the side or below seed, if possible. In addition to superphosphate good results have been obtained when P has been supplied using ammonium phosphate materials with N:P_2O_5 ratios between 1:3 and 1:5. Superphosphate-nitrogen fertilizer material mixes should not be used for this application.

Some soil should separate the fertilizer from the seed. When P cannot be banded it should be worked into the seedbed before seeding.

When pH is below 5.5 P can be applied with lime as described in the section on "lime".

With established stands P should be broadcast in the fall.

If OSU soil test for P reads (ppm):	Apply this amount (lb/A) P_2O_5 x 0.44 = P	
0 to 10	60-90	26-40
10 to 20	40-60	18-26
20 to 40	30-40	13-18
over 40	none	

POTASSIUM (K)

On established stands K should be broadcast in the fall.

On new seedings K should be worked into the seedbed before seeding.

If OSU soil test for K reads (ppm):	Apply this amount (lb/A) K_2O x 0.83 = K	
0 to 75	60-100	50-83
75 to 150	40- 60	33-50
over 150	none	

SULFUR (S)

The annual fertilizer program should include 20 to 30 lbs S/A except on the "Red Hill" soils where such S applications may be made every third year.

MAGNESIUM (Mg)

To date, little yield response from the application of Mg to subclover-grass pastures has

Cooperative Extension work in Agriculture and Home Economics, Joseph R. Cox, acting director. Oregon State University and the United States Department of Agriculture cooperating. Printed and distributed in furtherance of the Acts of Congress of May 8 and June 30, 1914.

Appendix 3 (Continued)

been observed in Western Oregon. Trial applications of Mg are suggested when the soil test values are less than 0.8 meq Mg/100g soil. Magnesium can be applied in the form of dolomite lime.

BORON (B)

Fertilizer materials which contain B should not be banded. B deficiency is less apparent on subclover than on perennial legumes.

If OSU soil test for B reads (ppm):	Apply this amount of B (lb/A)
0 to 0.5	1 to 2
0.5 to 1.0	1
over 1.0	none

MOLYBDENUM (Mo)

Mo deficiencies usually occur on unlimed, acid soils. Mo can replace the need for lime on some acid soils provided the legume is well nodulated.

Slight excesses of Mo in forage however, can be toxic to livestock. For this reason, the following recommendations for Mo should be closely adhered to:

1. Mo <u>should not</u> be applied under the following conditions:
   To fields on the West side of the Coast Range which have been limed.
   To fields on the East side of the Willamette Valley.
   When fields have been treated with Mo within 5 years.
   To fields having a pH of 6.0 or higher.
   To any field where the forage content of Mo exceeds 0.5 ppm on a dry matter basis. This forage content of Mo may be slightly higher in some parts of Coos County.
   To fields where the liming program is likely to increase the pH to 6.0.
2. An application of 6 oz. Mo/A (1 lb. sodium molybdate) with the fertilizer is recommended where none of the items listed under (1) above are applicable.

LIME

Effective subclover nodulation and seedling establishment is difficult in acid soil. It is, therefore, important that where the pH is below 5.5, the soil acidity should be reduced in the vicinity of the seed. This can be accomplished in the following ways:

<u>On New Seedings</u>:

1. If P is required the superphosphate can be mixed with an equal amount of agricultural limestone and drilled in contact with the inoculated seed at the rate which the drill will allow. P requirement above that applied in the mixture can be broadcast. The lime-P mixture should be allowed to "cure" for 7 to 10 days before using.
2. Use lime pelleted seed which can be drilled with or banded above superphosphates. This method is effective above pH 5.2.
3. Apply 1 to 2 tons of lime/A and mix into surface 1 to 2 inches of the seedbed.

<u>On Established Stands</u>:

Subclover is an annual and reseeds itself each year with the seeds germinating in the immediate soil surface. Top dressings of lime to established stands are, therefore, more effective in the case of subclover than with perennial legumes.

If the pH of the surface soil is below 5.5 and there is ineffective nodulation, a broadcast application of 1 to 2 tons of lime/A should be made to established stands. This application should be followed by disking.

Liming will not increase yields if effective nodulation does not occur. If effective nodulation does not take place following liming, the field should be reseeded with properly inoculated seed.

P, K, Mg, B, and lime fertilizer guides are based on soil test values from the Soil Testing Laboratory, OSU, Corvallis, Oregon.

This fertilizer guide is based on research conducted by T. L. Jackson, M. D. Dawson and W. S. McGuire, and field trials conducted by Oregon Extension Agents.

Prepared by Hugh Gardner, Soils, Harold Youngberg, Farm Crops, Cooperative Extension; T. L. Jackson M. D. Dawson, Soils and W. S. McGuire, Farm Crops, Agricultural Experiment Station, Oregon State University. Reviewed by a committee of Western Oregon County Extension Agents.

Appendix 4

Dual Use - Oregon State University Research

Cattle and sheep both graze selectively and dual grazing may result in greater production.

Sheep prefer subclover to tall fescue through June; after June they prefer tall fescue. They also prefer clover to ryegrass even when the clover is dry. Cattle prefer grass all season but they will eat a considerable amount of clover.

Lamb and steer gains on ryegrass-clover pasture were greater when stocked at a ratio of 2.3:1 than at 1:1.

Gains for dual use were comparable to single use gains when stocked at other ratios or when on other forage combinations.

Recommendations:

1. For fescue-subclover pasture stock cattle only or heavy cattle with light sheep use. Sheep can be increased in summer when they will prefer the green basal leaf of fescue. There is probably no weight gain advantage by grazing sheep with cattle.

2. For ryegrass-subclover pasture, either or both kinds of livestock may be used. Sheep appear necessary to make better use of the clover. More weight gain may result if cattle graze with sheep during May and June.

For further information consult:

Oregon Agricultural Experiment Station
August 1970, Technical Paper No. 2849,
Thomas E. Bedell.

Appendix 5

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ALFALFA GRASS PASTURE

FIGURE 1 Three Pasture System

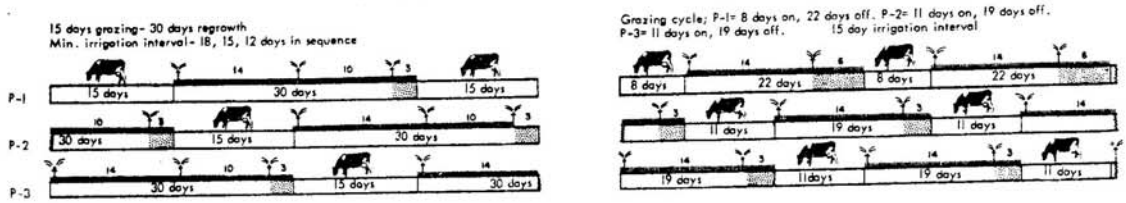


FIGURE 2 Four Pasture System

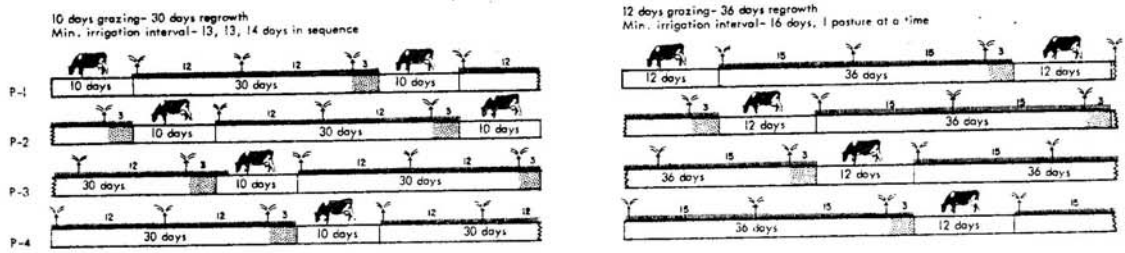


FIGURE 3 Five Pasture System

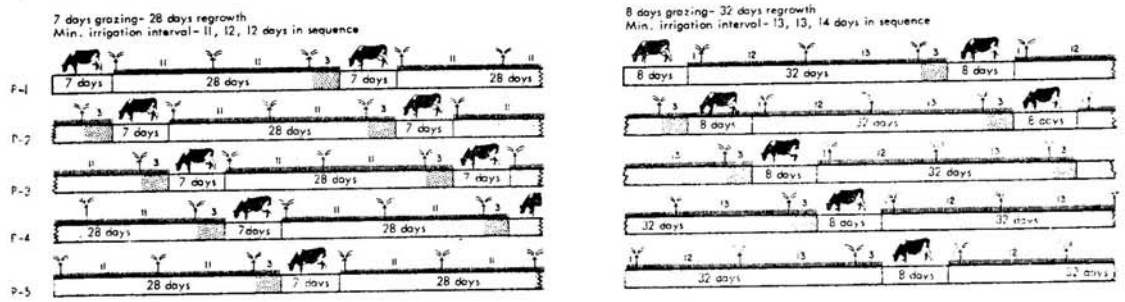


FIGURE 4 Five Pasture System

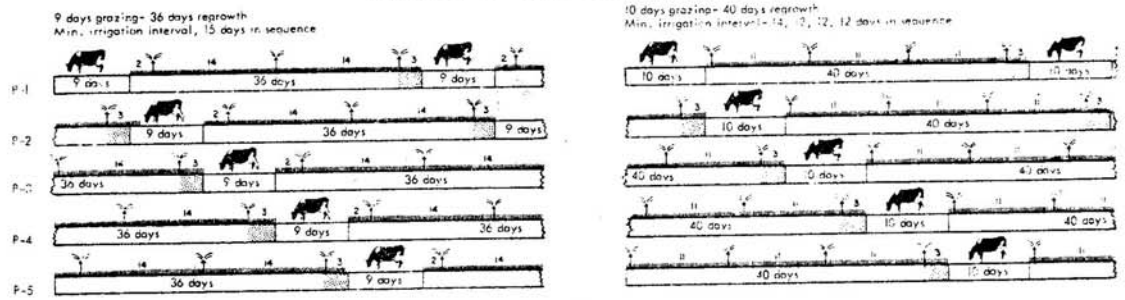
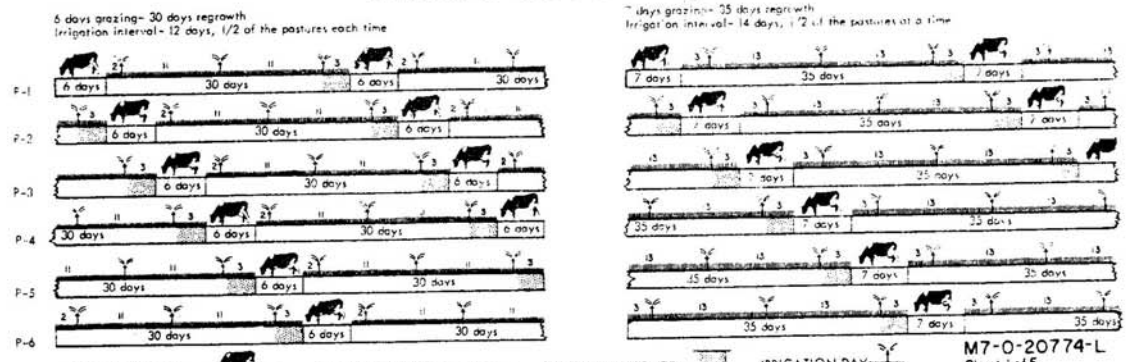


FIGURE 5 Six Pasture System



GRAZING PERIOD REGROWTH PERIOD DRYING OUT PERIOD IRRIGATION DAY

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FIGURE 6 Six Pasture System

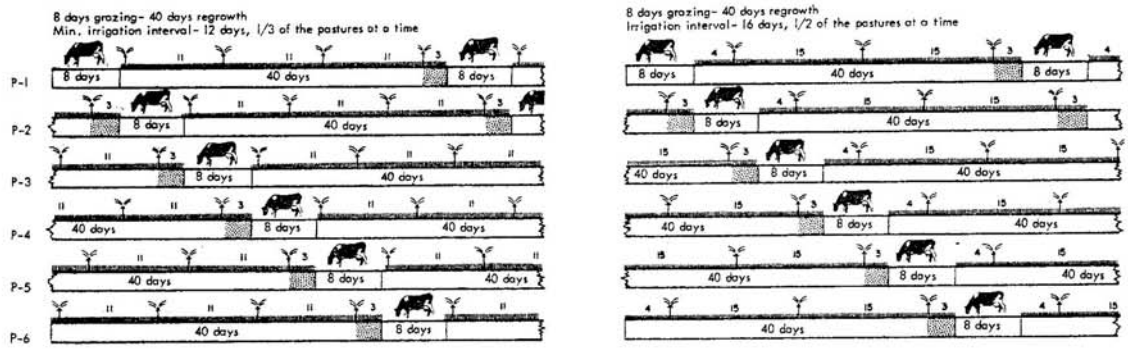

FIGURE 7 Seven Pasture System

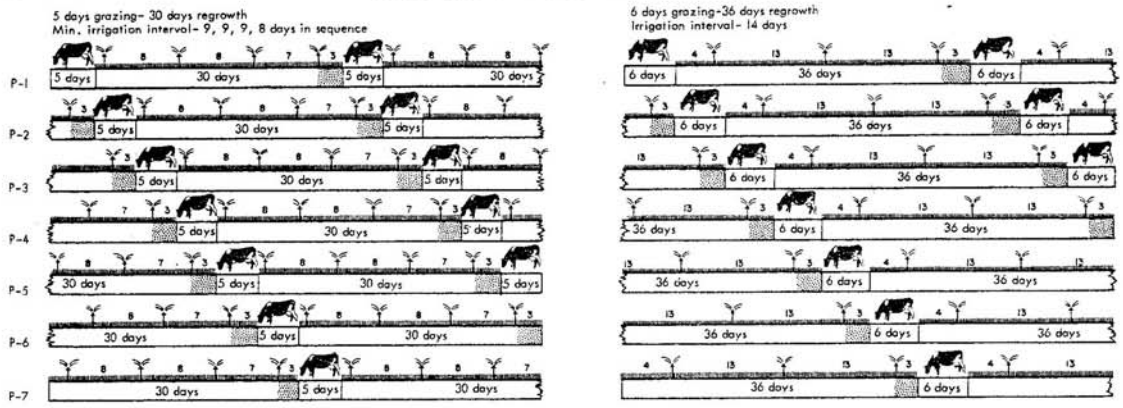

FIGURE 8 Seven Pasture System

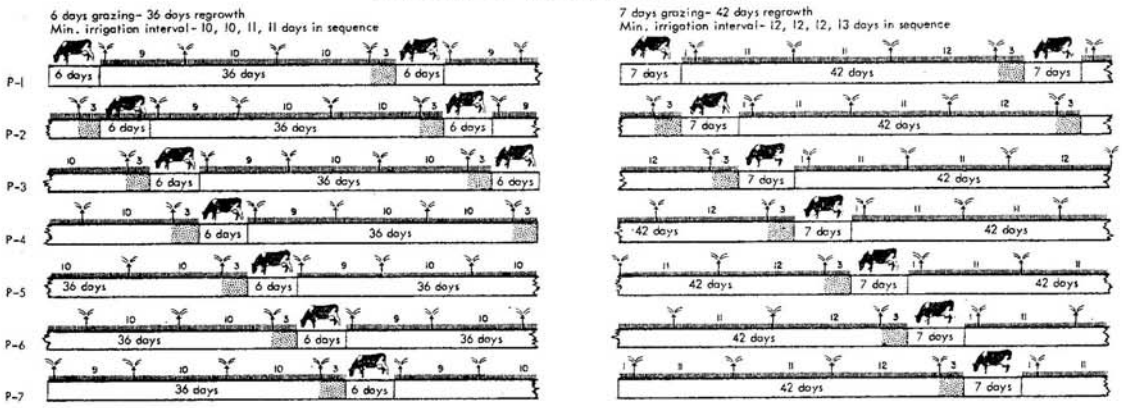

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FIGURE 9 Eight Pasture System

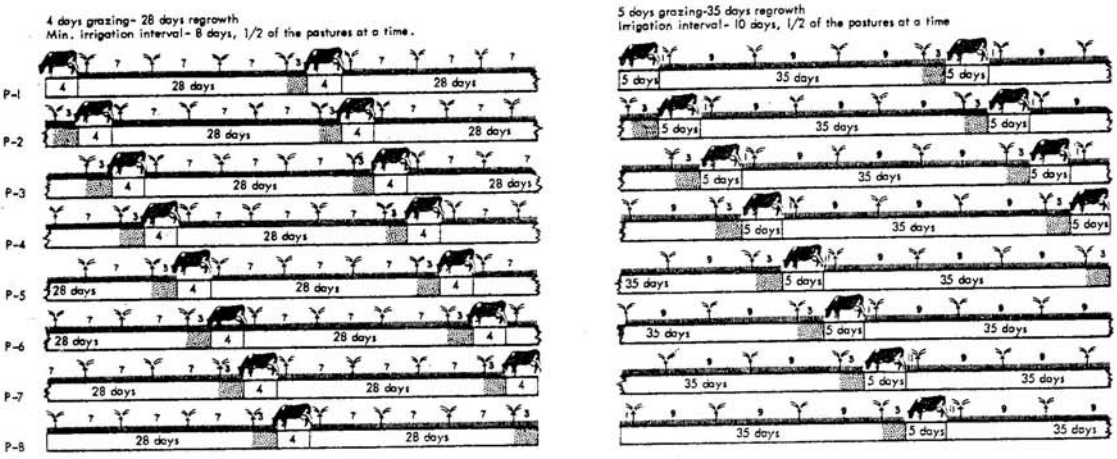

FIGURE 10 Eight Pasture System

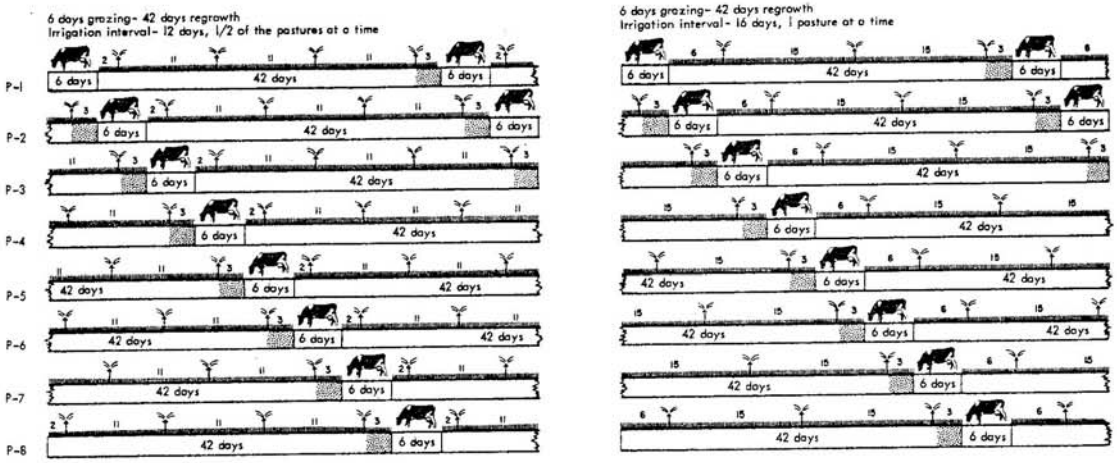

FIGURE 11 Nine Pasture System

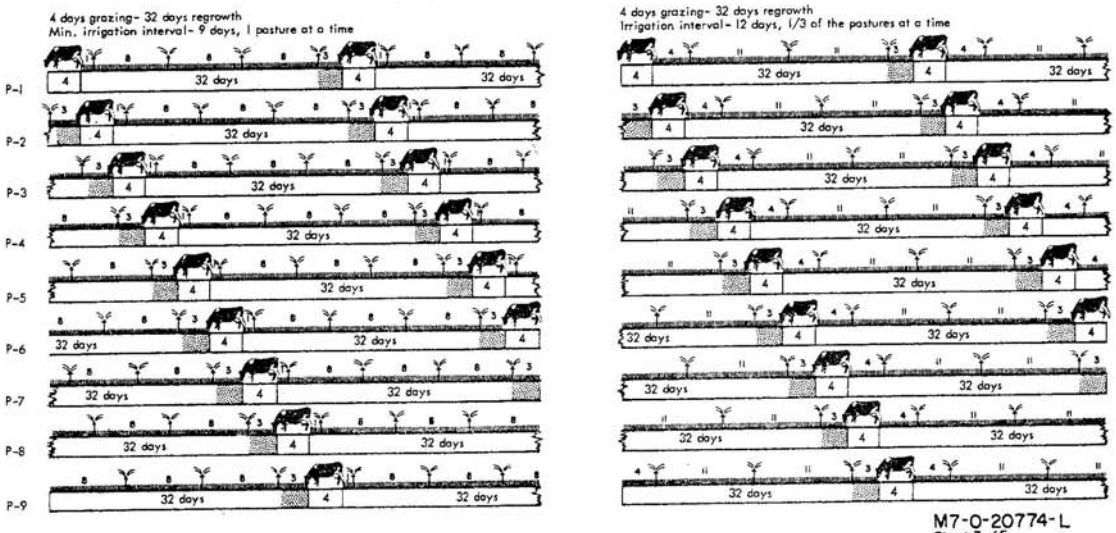

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FIGURE 12 Nine Pasture System

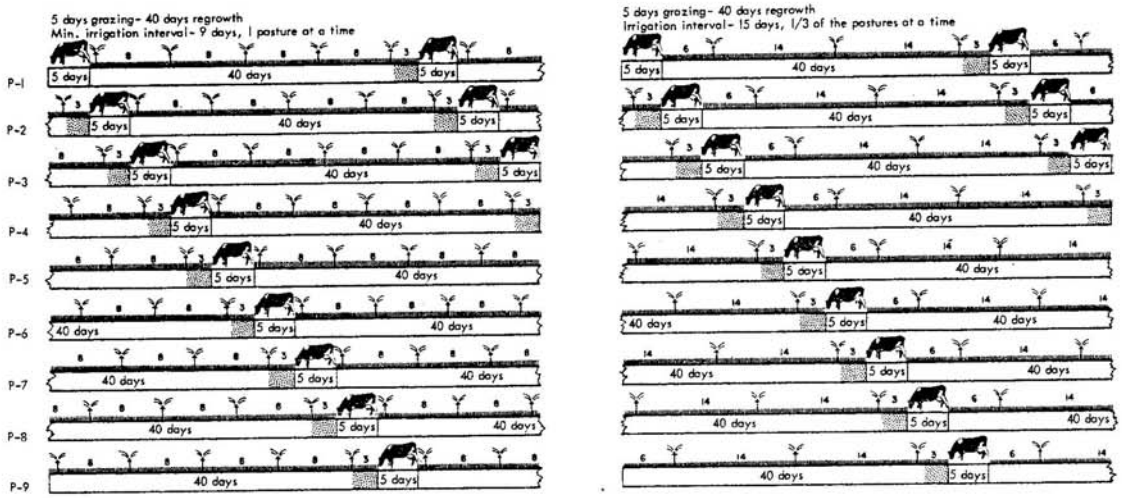


FIGURE 13 Ten Pasture System

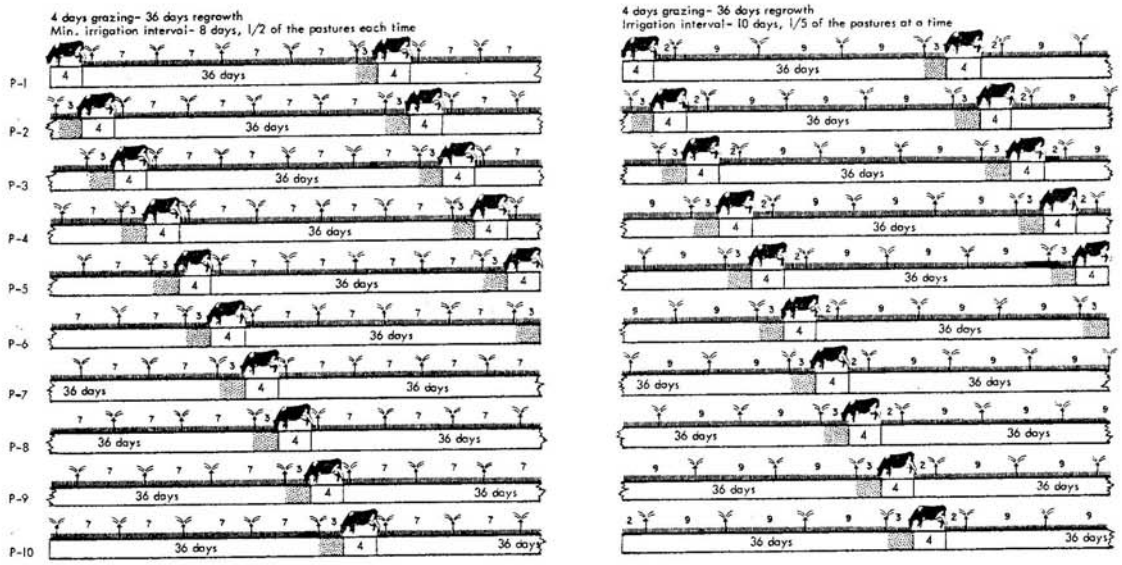


FIGURE 14 Eleven Pasture System

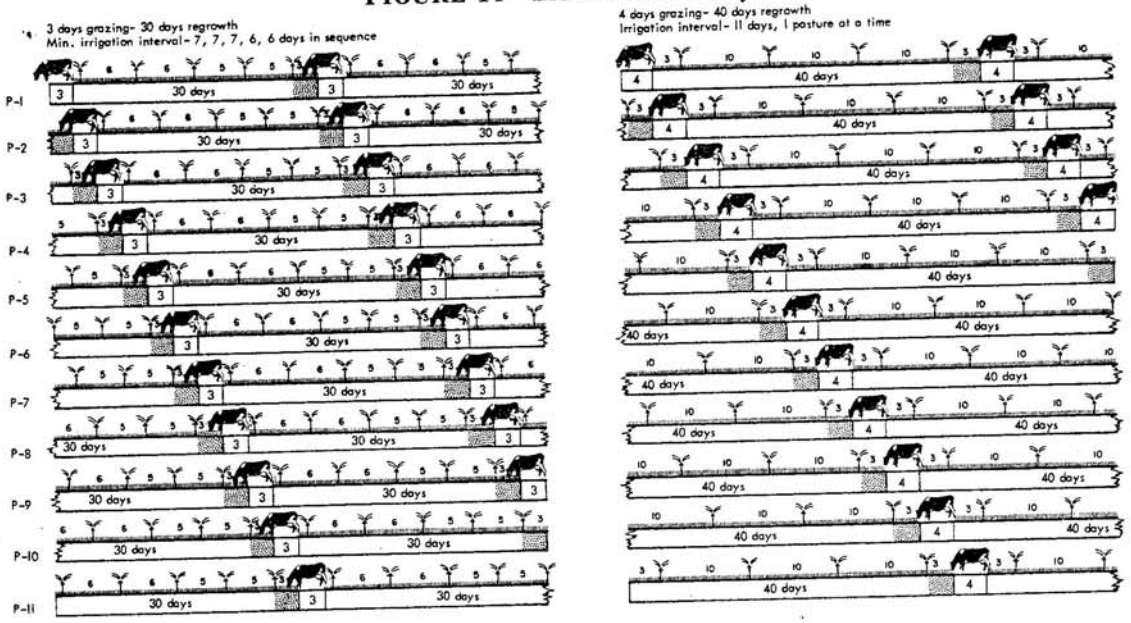
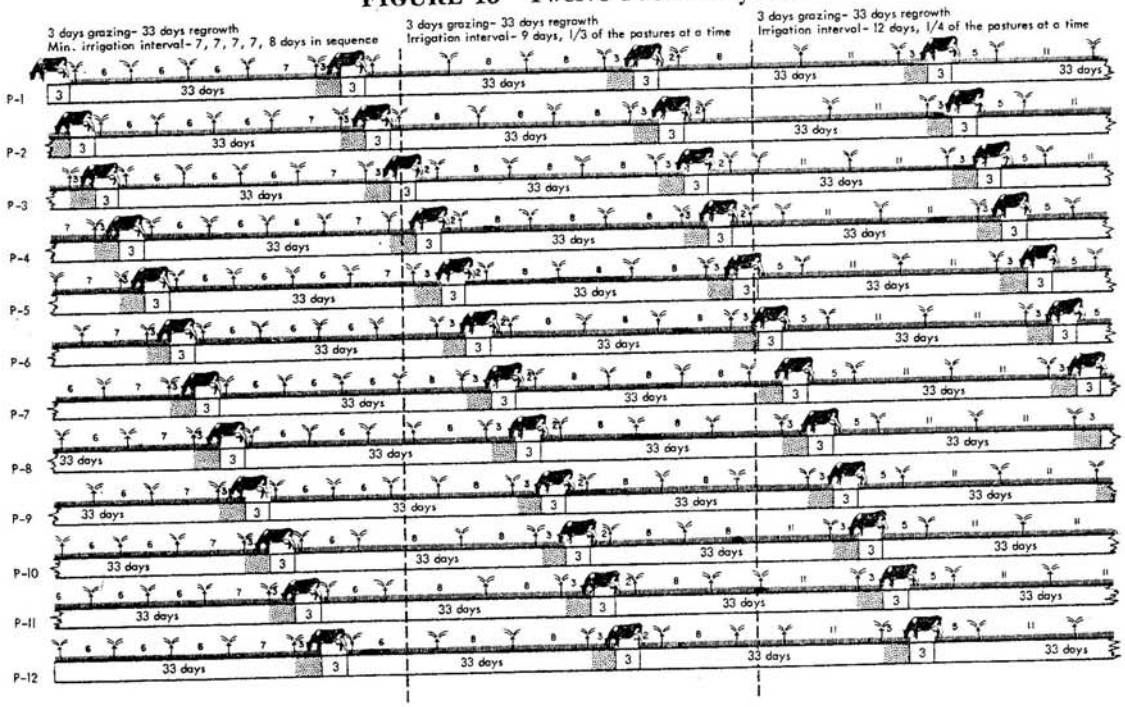


FIGURE 15 Twelve Pasture System



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CLOVER - GRASS PASTURE

FIGURE 1 Three Pasture System

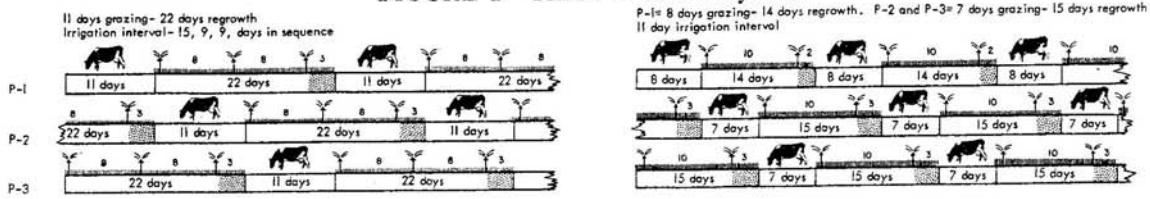


FIGURE 2 Four Pasture System

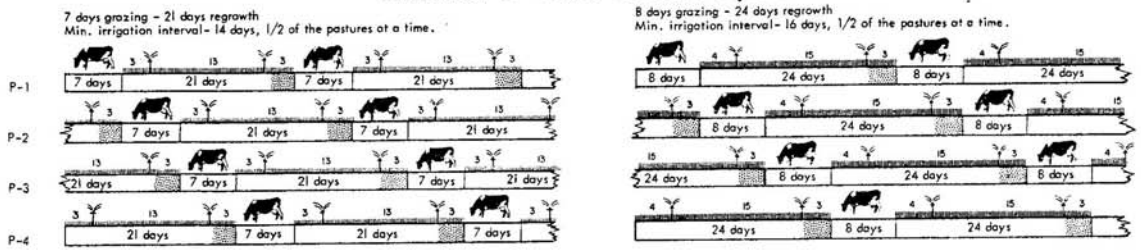


FIGURE 3 Five Pasture System

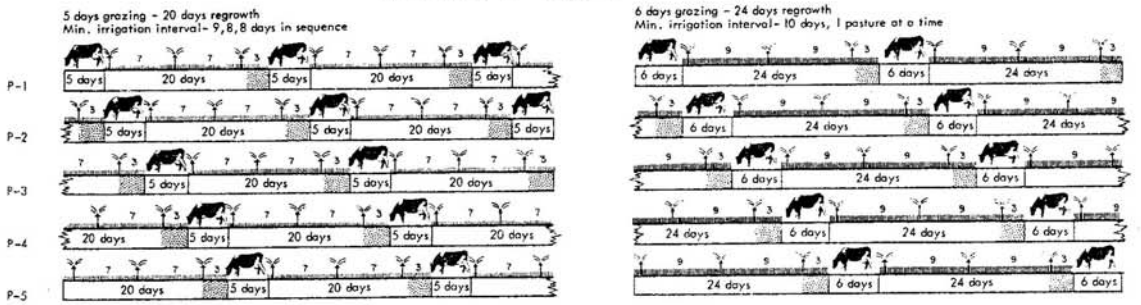
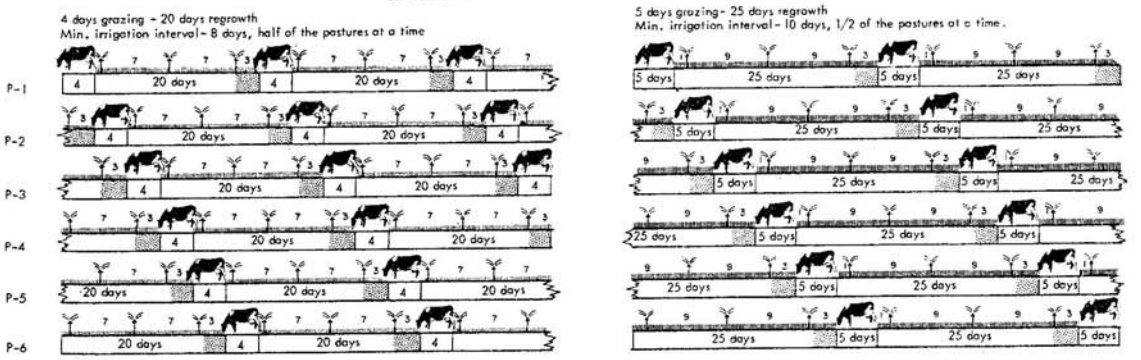


FIGURE 4 Six Pasture System



GRAZING PERIOD IRRIGATION DAY DRYING OUT PERIOD REGROWTH PERIOD

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FIGURE 5 Seven Pasture System

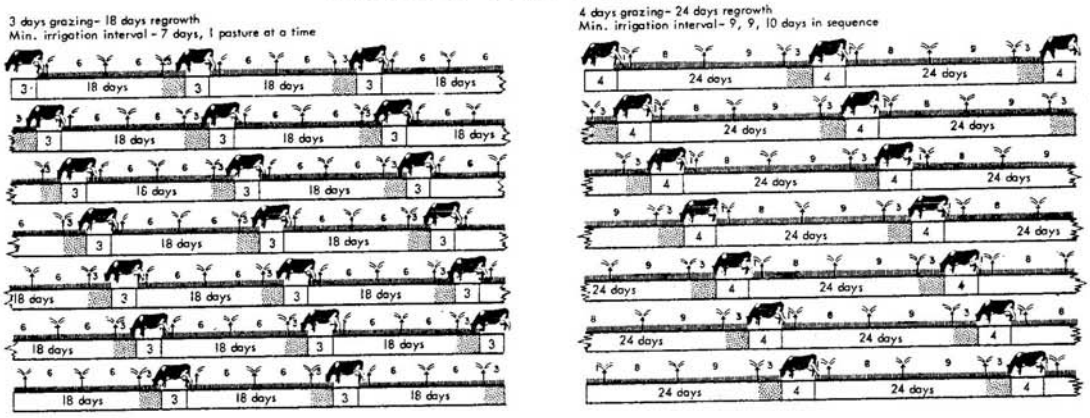


FIGURE 6 Eight Pasture System

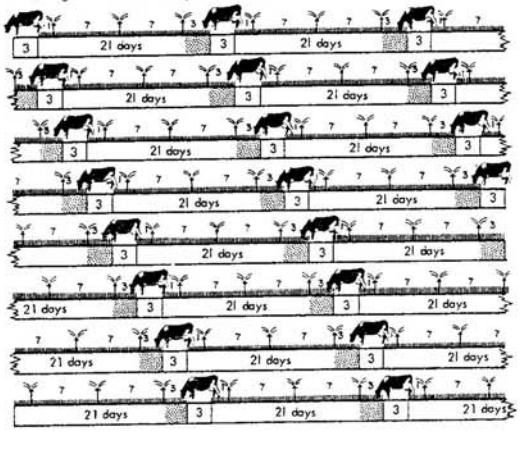


FIGURE 7 Nine Pasture System

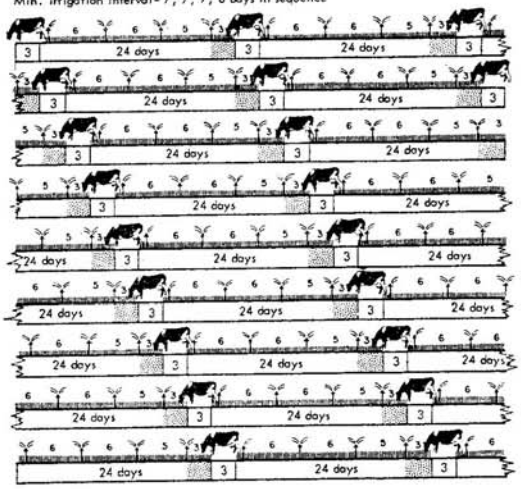
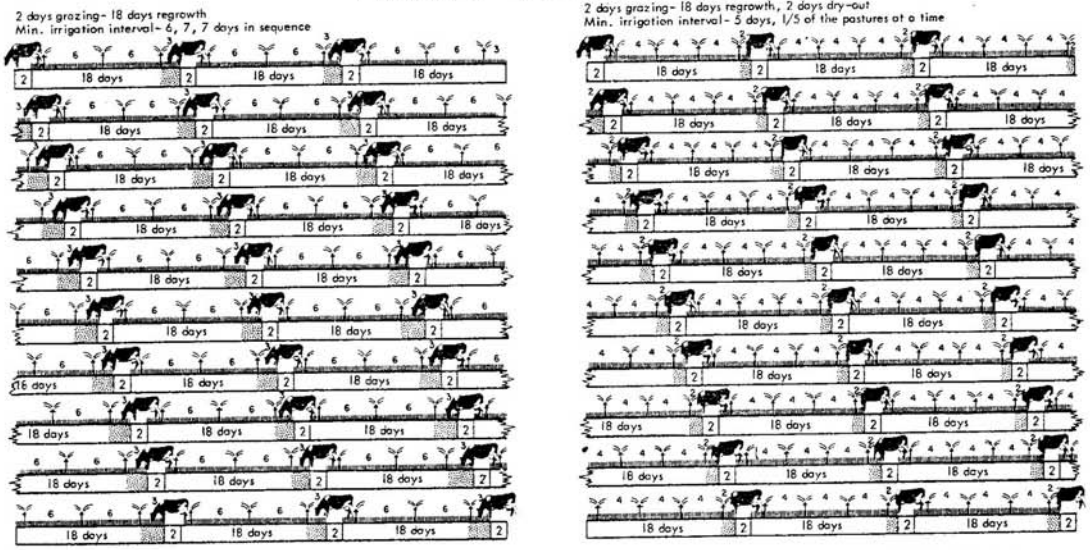


FIGURE 8 Ten Pasture System



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