

TECHNICAL NOTES

U.S. DEPARTMENT OF AGRICULTURE

Portland, Oregon

SOIL CONSERVATION SERVICE

Range No. 4 - Oregon

May, 1971

EVALUATING MULTIPLE ECONOMIC EFFECTS OF FORAGE DEVELOPMENT AND MANAGEMENT 1/

The objective of this Technical Note is to provide a working tool for resource workers to use for evaluating economic effects of potential land use adjustments, forage development and improved resource management in rangeland areas. This procedure is explained further in a paper having the same title and published in the Journal of Range Management, Vol. 24(3) May 1971. The authors are E. William Anderson, State Range Conservationist and Maurice L. Jernstedt, State Resource Economist, Soil Conservation Service, Portland, Oregon.

A successful range livestock operation involves several major activities. Two of these are: (1) producing forage, which is primarily a function of managing plants, water, and soils (i.e., resource management), and (2) converting a forage crop into products useful to humans. The latter is primarily a function of managing animals. More attention has been focused on animal management or husbandry than on land use adjustments and resource management. Not nearly enough attention has been given to coordinating the two phases.

We need to sharpen our thinking on how to assess fully the value of forage from range and pasture, particularly under multiple use management in which grazing is only one use of the land. We especially need to know the benefits that accrue throughout the entire year's operation of a ranching enterprise if a greater volume or better quality of forage is developed and is available when needed.

A per-acre crop income approach commonly has been used to assess forage and feed values. This approach deals in terms of animal unit months, pounds, bushels, or tons of production per acre which are converted to dollars and cents by applying a per-unit market value. This approach is oriented to the productivity of a specific area of land. It does not take into account the beneficial effects within the total ranching enterprise that result from increasing the volume and/or quality of forage at a season when it is especially needed. Forage can be improved nutritionally and its availability made more timely. The "per-acre" approach usually shows lower returns on investments in rangeland improvements than will be identified when all the benefits from a single improvement that accrue to the total ranching enterprise are considered.

Figures 1 through 9 provide working tools for emphasizing the economic importance of weaning weights, weaning percentages, cow costs, and size of herd. It seems obvious that everyone knows the relationship between these important factors and net income per cow.

1/ By E. William Anderson, State Range Conservationist, and Maurice L. Jernstedt, Watershed Work Plan Staff Leader.

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On the other hand, careful analysis reveals that the degree to which these factors affect net income per cow is not well known. Also the relationship of these factors to potential land use adjustments, resource development and management opportunities that exist on a ranch are commonly overlooked.

Figures 10 and 11 illustrate how to test the balance of forage and live-stock numbers seasonally and how to project opportunities for resource development and improvement into animal numbers.

Tables 1, 2, and 3 illustrate and compare two ways of summarizing the cost-benefits from resource development and improvement.

Figure 12 illustrates how to graphically summarize changes in resource management associated with a balanced program of land use adjustments, resource development and management.

It is important to understand the cost structure of a ranching operation. There are two types of costs included in determining annual operating cost per cow as used herein:

FIXED COSTS - Fixed costs are those that will continue to exist or will remain unchanged whether or not the ranch produces a marketable product. Examples include:

Land - Interest and taxes, lease fees and grazing permit fees if they must be paid whether or not used.

Improvements - Interest, taxes and depreciation on buildings, fences, water developments, corrals, chutes, feeders, irrigation systems, drainage systems.

Services - Electricity, fuel, phone, insurance, workmen's compensation, Social Security, labor for maintenance.

Materials - Miscellaneous operating and maintenance supplies; existing fertilizer, seed and pesticide costs.

Equipment - Interest, taxes and depreciation on pickups, trucks, tractors, farm machinery, shop equipment and supplies, stock-handling supplies such as veterinary equipment, rope, halters, riding gear, harnesses.

VARIABLE COSTS - Variable costs are those that vary as production varies. Some variable costs do not increase proportionately to added units of production. These include such costs as increases in Social Security, workmen's compensation, insurance, telephone, electricity, labor for feeding and moving livestock, marketing expense.

Other variable costs vary proportionately to added units of production. These include such costs as interest on investment and taxes on livestock, bull costs, hay and feed, salt and minerals, veterinary services and supplies, and labor for calving, branding, sorting shots, dehorning, etc.

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Weight of Calves at Weaning

Figure 1 illustrates the economic importance of weight of calves at weaning. It presents net income per cow from sale of calves at 25¢/lb where weaning weights vary from 300 to 600 lbs under situations of \$60, \$80, \$100 and \$120 cow costs with 70% and 80% calves weaned.

The important point to be thoughtfully considered when using this chart is "What opportunities exist within this ranching operation for making land use adjustments, developing resources and improving resource management that will contribute to increased weaning weights?" Animal husbandry alone cannot achieve the full potential. A plentiful nutritious supply of forage and feed seasonally balanced yearlong is a prime requirement. Coordinated resource planning based on a sound resource inventory is the way to identify the opportunities.

Origin of curves: Each curve was determined by locating two points using the following procedure: A 400-lb weaner selling at 25¢/lb is worth \$100. If 80% of the cows in the herd wean their calves, the income per cow is \$80 ($\$100 \times 80\%$). If annual cost of operation per cow is \$80, the ranch is just breaking even on sale of calves. For a second point from which to draw the curve, assume that the weaning weight is 500 lbs. At 25¢/lb this calf is worth \$125. With 80% calves weaned the income per cow is \$100 and, with \$80 annual cow cost, the net income per cow from sale of calves is \$20.

Use of curves: This chart provides an example of the degree to which an increase in average weaning weight significantly increases the net return per cow from sale of calves.

If current market price is 25¢/lb, or nearly this, these curves can be useful for roughly analyzing a specific ranching operation. Where market prices differ significantly, other similar curves representing specific conditions can be drawn easily. For determining price per pound required to break even under various situations, see Fig. 8 & 9.

Figure 2

This chart essentially is the same as Figure 1. It differs by presenting curves representing situations where 90% and 95% calves are weaned.

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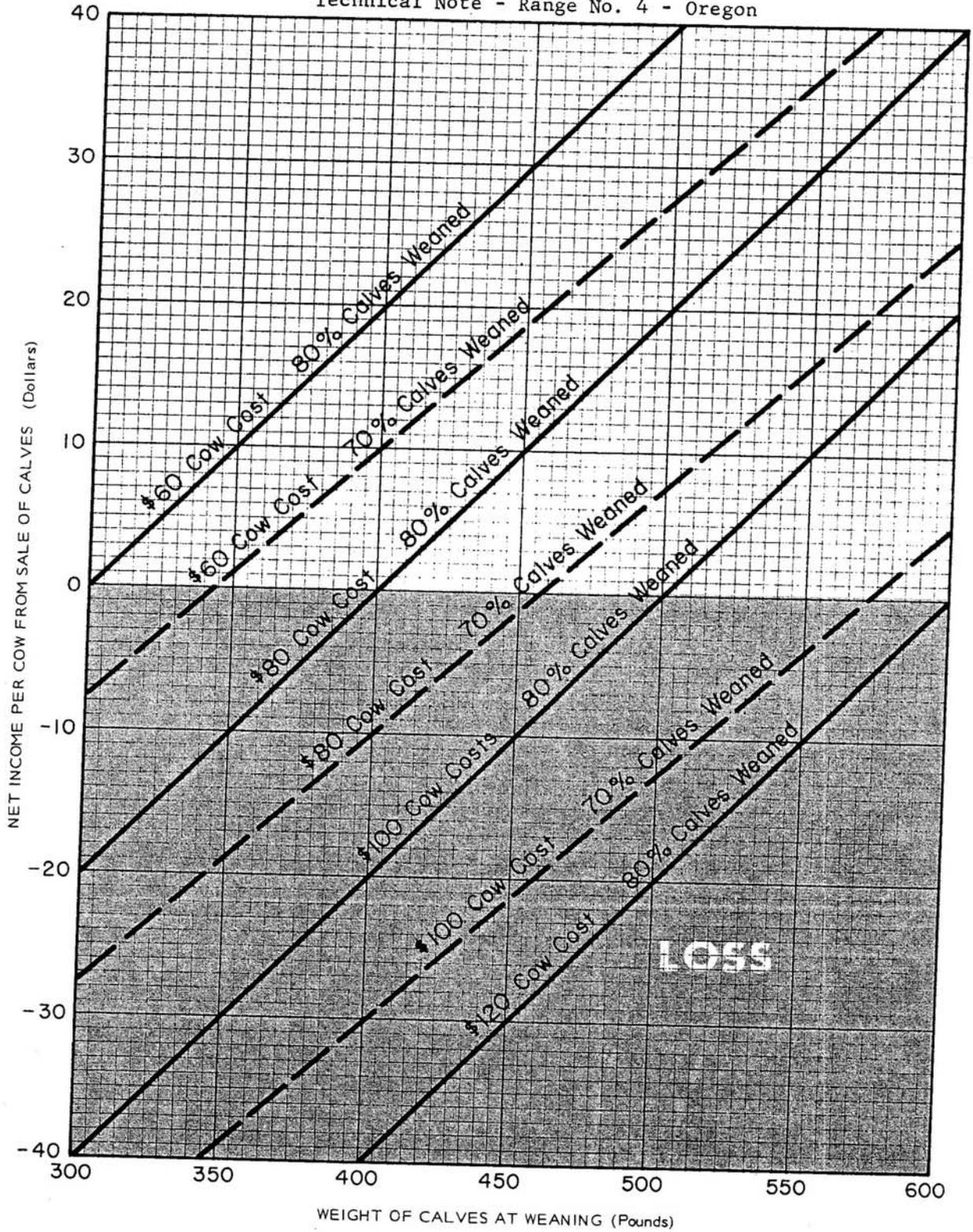


FIGURE 1: Net income per cow from sale of calves as related to weight of calves at weaning and annual operating cost per cow. (Based on 25¢/lb. value.)

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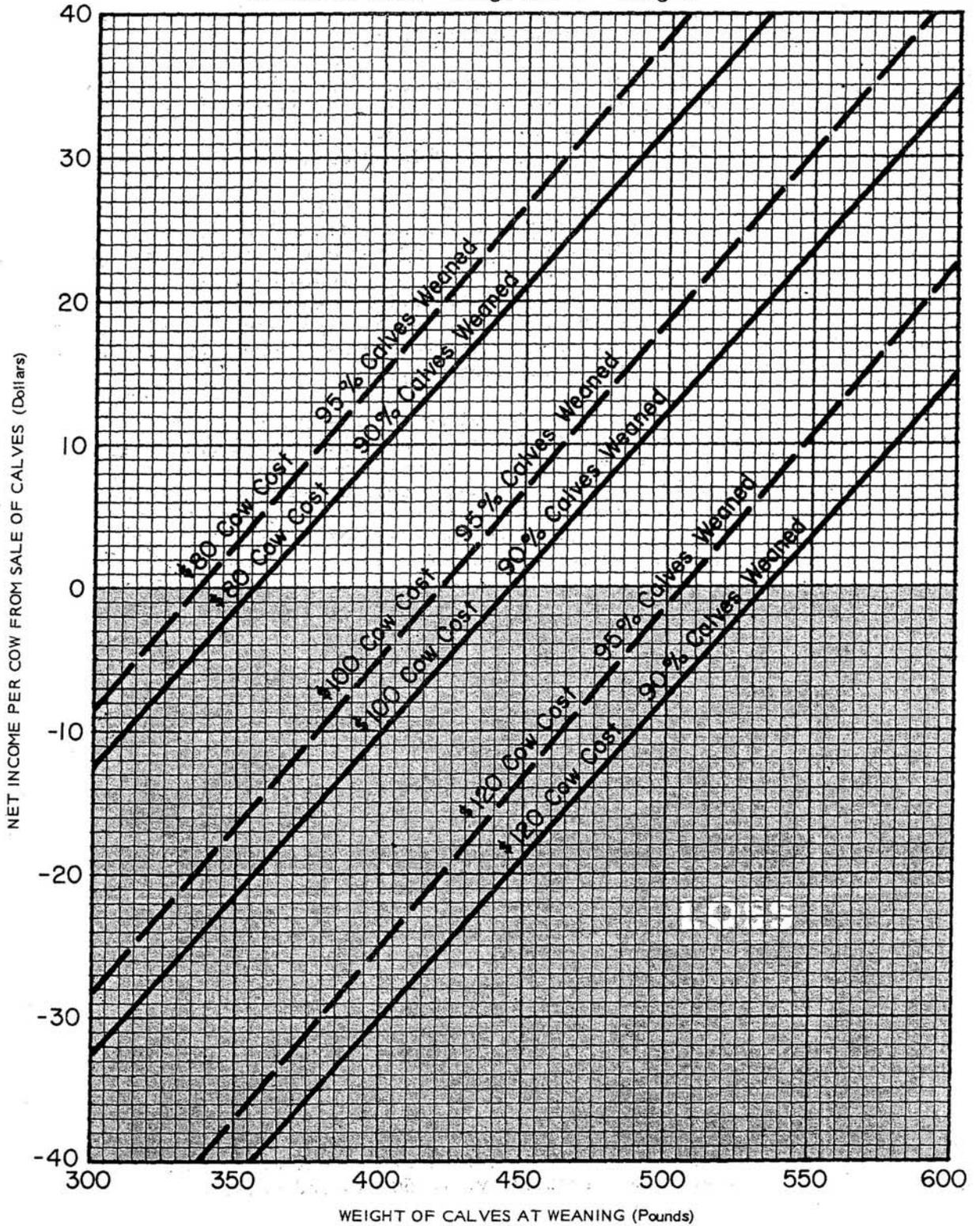


FIGURE 2: Net income per cow from sale of calves as related to weight of calves at weaning and annual operating cost per cow. (Based on 25¢ value.)

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Percent Calves Weaned

Figure 3 illustrates the economic importance of percent calves weaned. It presents net income per cow from sale of calves at 25¢/lb where percent calves weaned varies from 65% to 95% under situations of \$60, \$80, and \$100 cow costs with 300-lb and 400-lbs weaning weights.

The important point to be thoughtfully considered when using this chart is "What opportunities exist within this ranching operation for making land use adjustments, developing resources and improving resource management that will contribute to increased calving percentages?" Animal husbandry alone cannot achieve the full potential. A plentiful, nutritious supply of forage and feed seasonally balanced yearlong is a prime requirement. Coordinated resource planning based on a sound resource inventory is the way to identify the opportunities.

Origin of curves: Each curve was determined by locating two points using the following procedure: A 400-lb weaner selling at 25¢/lb is worth \$100: If 80% of the cows in the herd wean their calves, the income per cow is \$80 ($\$100 \times 80\%$). If annual cost of operation per cow is \$80, the ranch is just breaking even on sale of calves. For a second point from which to draw this curve, assume that 90% of the cows wean their calves. The income per cow now is \$90 and, with an \$80 cow cost, the net income per cow from sale of calves is \$10.

Use of curves: This chart provides an example of the degree to which an increase in percent calves weaned significantly increases the net return per cow from sale of calves.

If current market price is 25¢/lb, or nearly this, these curves can be useful for roughly analyzing a specific ranching operation. Where market prices differ significantly, other similar curves representing specific conditions can be drawn easily. For determining price per pound required to break even under various situations, see Figures 8 and 9.

An item of importance is pointed out by the crossing curves in this chart. For example, a ranch with \$60 cow cost and 300-lb weaners makes as much net income per cow from sale of calves as a ranch that has \$80 cow costs and 400-lb weaners, if both ranches have 80% calves weaned. A ranch with low cow costs and light weaners may be making more net income per cow than a ranch that has increased its cow costs and weaner weights. Obviously, all three factors - cow costs, weaner weights and percent calves weaned - must be taken into account.

Figure 4

This chart essentially is the same as Figure 3. It differs by presenting curves representing situations where 500-lb and 600-lb weaners are marketed.

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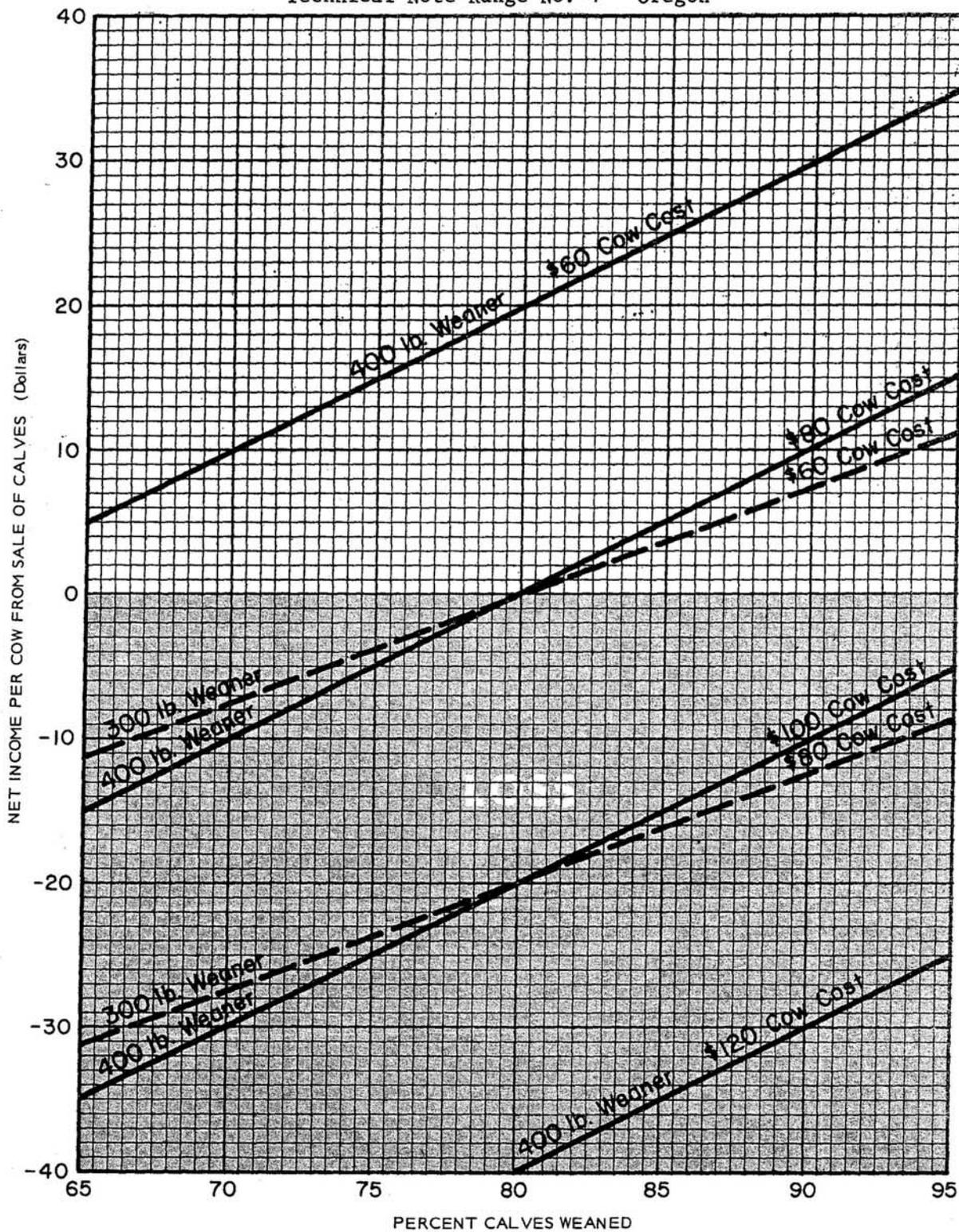


FIGURE 3: Net income per cow from sale of calves as related to percent calves weaned and annual operating cost per cow. (Based on 25¢/lb. value.)

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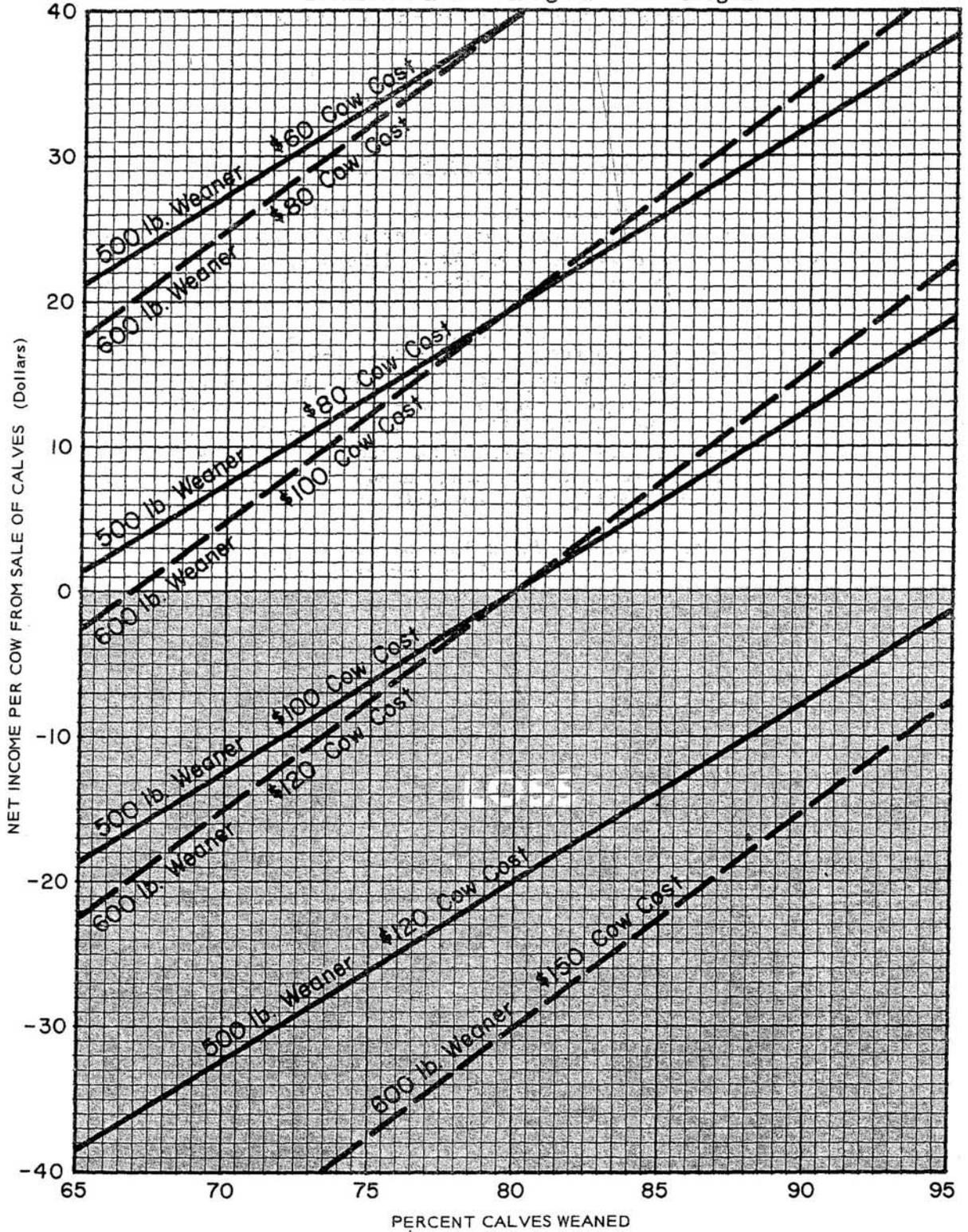


FIGURE 4: Net income per cow from sale of calves as related to percent calves weaned and annual operating cost per cow. (Based on 25¢/lb. value.,

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Annual Operating Cost Per Cow

Figure 5 illustrates the economic importance of annual operating cost per cow. It presents net income per cow from sale of calves at 25¢/lb value where annual cow cost varies from \$60 to \$120 under situations of 70%, 80% and 90% calves weaned with 300-lb and 400-lb weaning weights.

The important point to be considered thoughtfully when using this chart is "What opportunities exist within this ranching operation for making land use adjustments, developing resources and improving resource management that will contribute to lower annual operating cost per cow?" Animal husbandry alone cannot achieve the full potential. A plentiful, nutritious supply of forage and feed seasonally balanced yearlong is a prime requirement. Coordinated resource planning based on a sound resource inventory is the way to identify the opportunities.

Origin of curves: Each curve was determined by locating two points using the following procedure: A 400-lb weaner selling at 25¢/lb is worth \$100. If 80% of the cows in a herd wean their calves, the income per cow is \$80 ($\$100 \times 80\%$). If annual cost of operation per cow is \$80, the ranch is just breaking even on sale of calves. For a second point from which to draw this curve, assume that the annual cow cost is \$70. The net income per cow now is \$10.

Use of curves: This chart provides an example of the degree to which a reduction in annual operating cost per cow significantly increases the net return per cow from sale of calves.

If current market price is 25¢/lb, or nearly this, this curve can be useful for roughly analyzing a specific ranching operation. Where market prices differ significantly, other similar curves representing specific situations can be drawn easily. For determining price per pound required to break even under various situations, see Figures 8 and 9. Ranching costs included in determining the annual cow cost as used herein are discussed on Page (ii).

Figure 6

This chart essentially is the same as Figure 5. It differs by presenting situations where cow costs vary from \$80 to \$140; calves weaned vary from 80% to 95% with 500-lb and 600-lb weaning weights.

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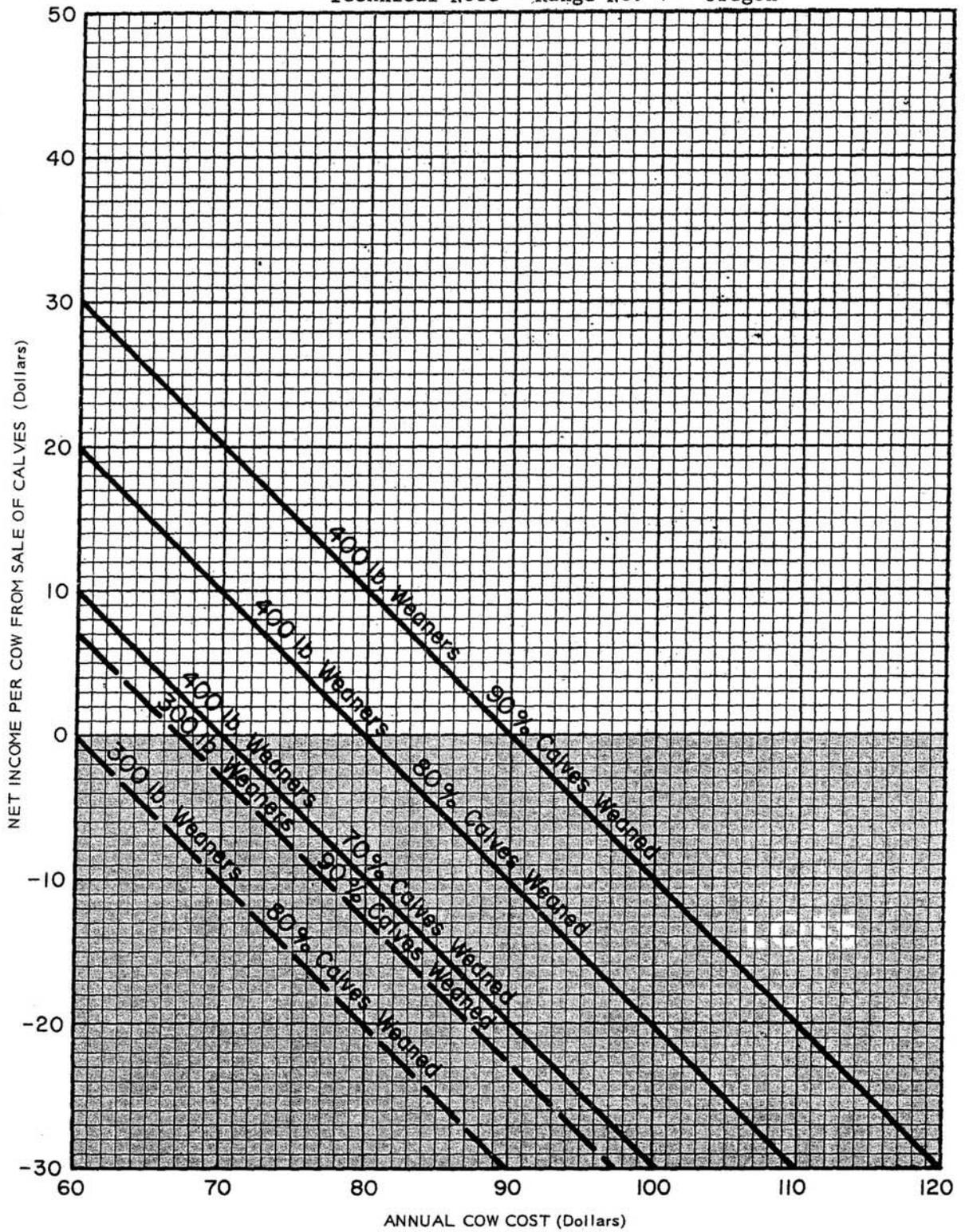


FIGURE 5: Net income per cow from sale of calves as related to annual operating cost per cow and percent calves weaned. (Based on 25¢/lb. value.)

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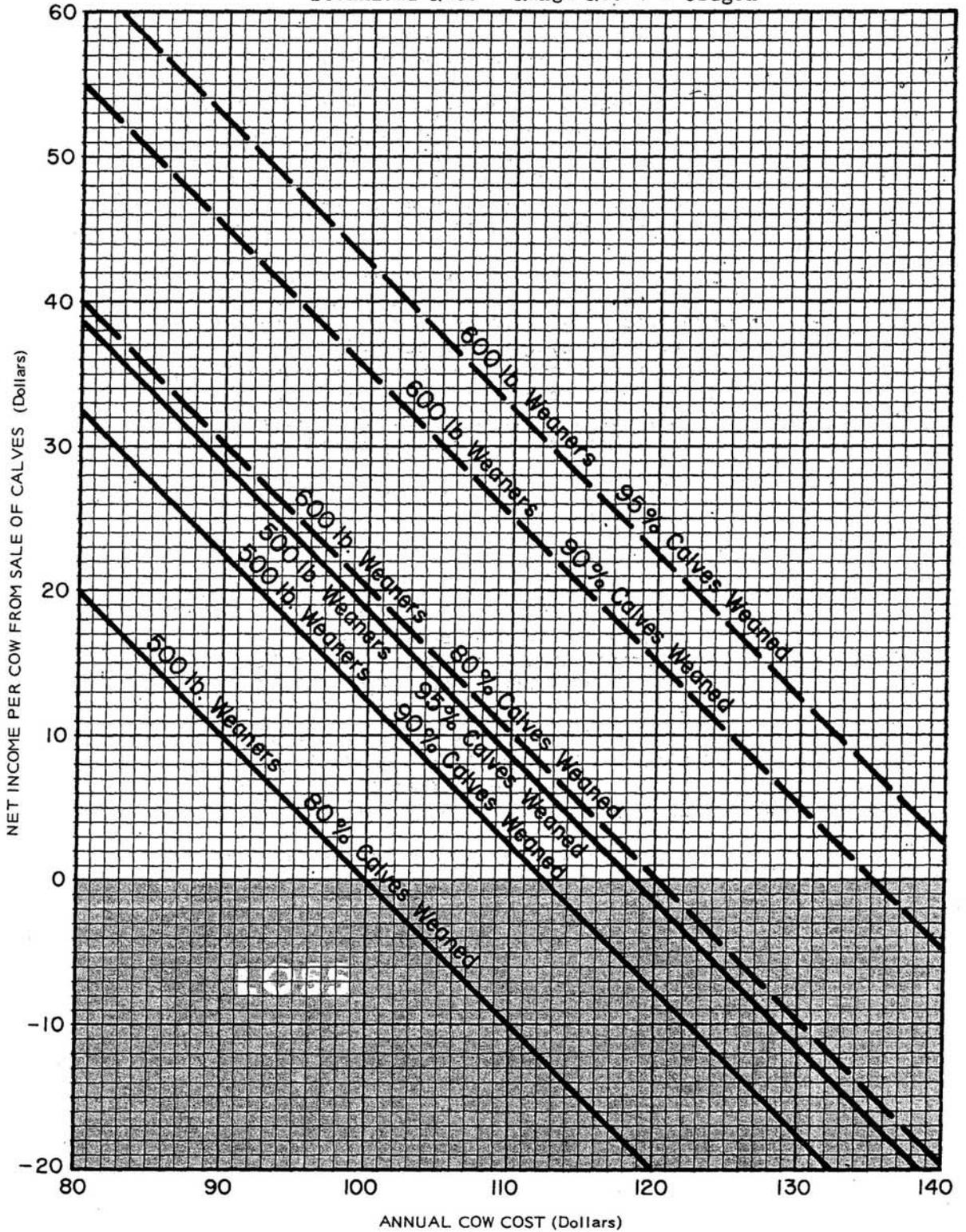


FIGURE 6: Net income per cow from sale of calves as related to annual operating cost per cow and percent calves weaned. (Based on 25¢/lb. value.)

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Increased Cow Numbers

Figure 7 illustrates the economic importance of adding additional cows to the herd if this can be done without increasing the fixed costs and without causing deterioration of the resources. It presents the reduction in fixed operating cost per cow that takes place when the number of cows in the herd can be increased. The fixed cost is merely proportioned among more cows, which lowers the per-cow cost.

The important point to be thoughtfully considered when using this chart is "What opportunities exist within this ranching operation for making land use adjustments, developing resources and improving resource management that will contribute to increasing the numbers of cows in the herd?" Even though this also may increase some fixed costs, the over-all net gain is important. A plentiful nutritious supply of forage and feed seasonally balanced yearlong is a prime requirement. Coordinated resource planning based on a sound resource inventory is the way to identify the opportunities.

Origin of curves: Each curve was determined by locating several points using the following procedure:

	<u>Fixed Cost/Cow</u>
Initial.	\$50.00
10% increase in cow numbers (\$50 + 110%) . .	45.45
20% increase in cow numbers (\$50 + 120%) . .	41.66
50% increase in cow numbers (\$50 + 150%) . .	33.33

Use of curves: This chart provides an example of the degree to which an increase of cows in the herd reduces annual cow cost provided the fixed costs per cow are not also increased. REMEMBER -- This chart deals only with the fixed-cost portion of the annual operating cost per cow.

If the initial fixed cost per cow is \$50 and the cow herd could be increased by 20% without increasing fixed costs, there would be a reduction in annual cow cost of \$8.34 (\$50 minus \$41.66). A reduction in cost is the same as an increase in net income per cow.

An important item is pointed out by these curves. For example, a ranch having \$70 fixed costs per cow reduced its cow cost \$23.34 by increasing cow numbers 50% without increasing fixed costs. A ranch having \$30 fixed costs per cow reduces its cow cost only \$10 by a 50% increase in cow numbers. This points out that ranches having high initial fixed costs per cow benefit more dollar-wise from increasing the number of cows than do ranches with low initial fixed costs.

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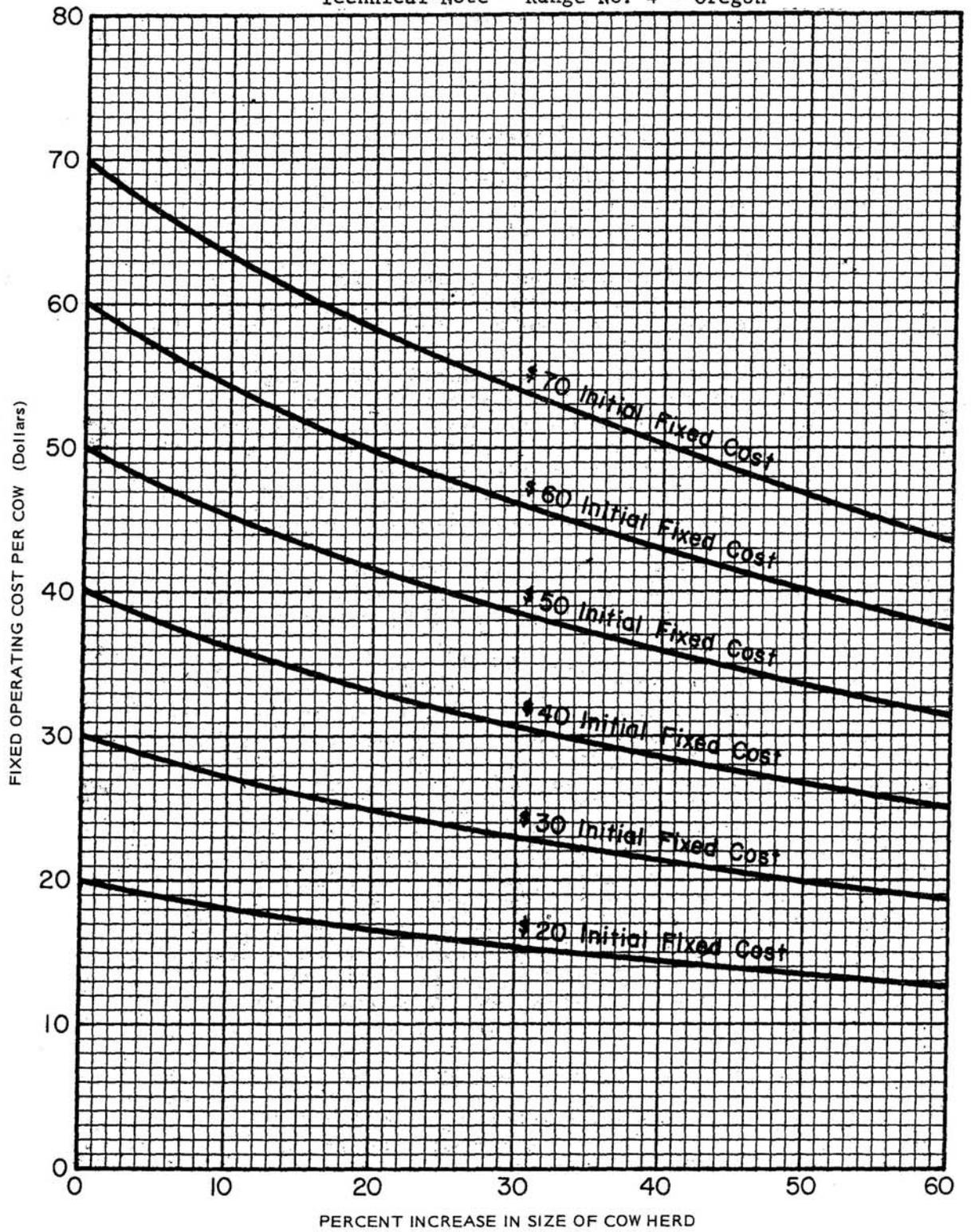


FIGURE 7: Reduction in fixed operating costs per cow resulting from increased number of cows in the herd.

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Price Required to Break Even

Figure 8 illustrates the economic importance of annual cow cost, weaner weight, and percent calves weaned in relation to the price required in order to break even from sale of calves.

It presents price per hundredweight required to break even where annual costs of operating per cow vary from \$70 to \$130 under situations of 70% and 80% calves weaned with 300-lb to 600-lb weaning weights.

Origin of curves: Each curve was determined by locating two points using the following procedure: A 400-lb weaner selling for \$25/cwt is worth \$100. If 80% of the cows in the herd wean their calves, the income per cow is \$80 ($\$100 \times 80\%$). If annual operating cost per cow is \$80, the ranch is just breaking even from sale of calves. If the annual cow cost is \$100, the calf must sell for \$125 ($\100 divided by 80%) or \$31.25/cwt ($\125 divided by 400 lbs) to break even from sale of calves.

Use of Curves: This chart provides an example of the degree to which the total package - annual cow cost, weaner weight and calving percentage - affects the price required to break even from sale of calves.

If a ranch has a cow cost of \$80, 400-lb weaners and 70% calves weaned, the break-even price is \$28.57 ($\80 divided by 70% equals \$114.29 the selling price of the calf which, for a 400-lb calf is \$28.57/cwt). A comparison between the price required and current market prices indicates the margin of net profit or loss from sale of calves. Since the market cannot be changed by a single rancher, the important point to be thoughtfully considered when using this chart is that the major alternative the ranch operator has for deliberately improving his economic situation is to take advantage of the opportunities for making land use adjustments, developing resources and improving resource management, along with good animal husbandry, to increase percent calves weaned, increase weaning weights, decrease annual cow costs, and increase cow numbers. A plentiful, nutritious supply of forage and feed seasonally balanced yearlong is a prime requirement. Coordinated resource planning, based on a good resource inventory, is the judicious way to identify opportunities.

Figure 9

This chart essentially is the same as Figure 8. It differs by presenting curves representing situations where weaning weights vary from 400-lb to 600-lb with 90% and 95% calves weaned.

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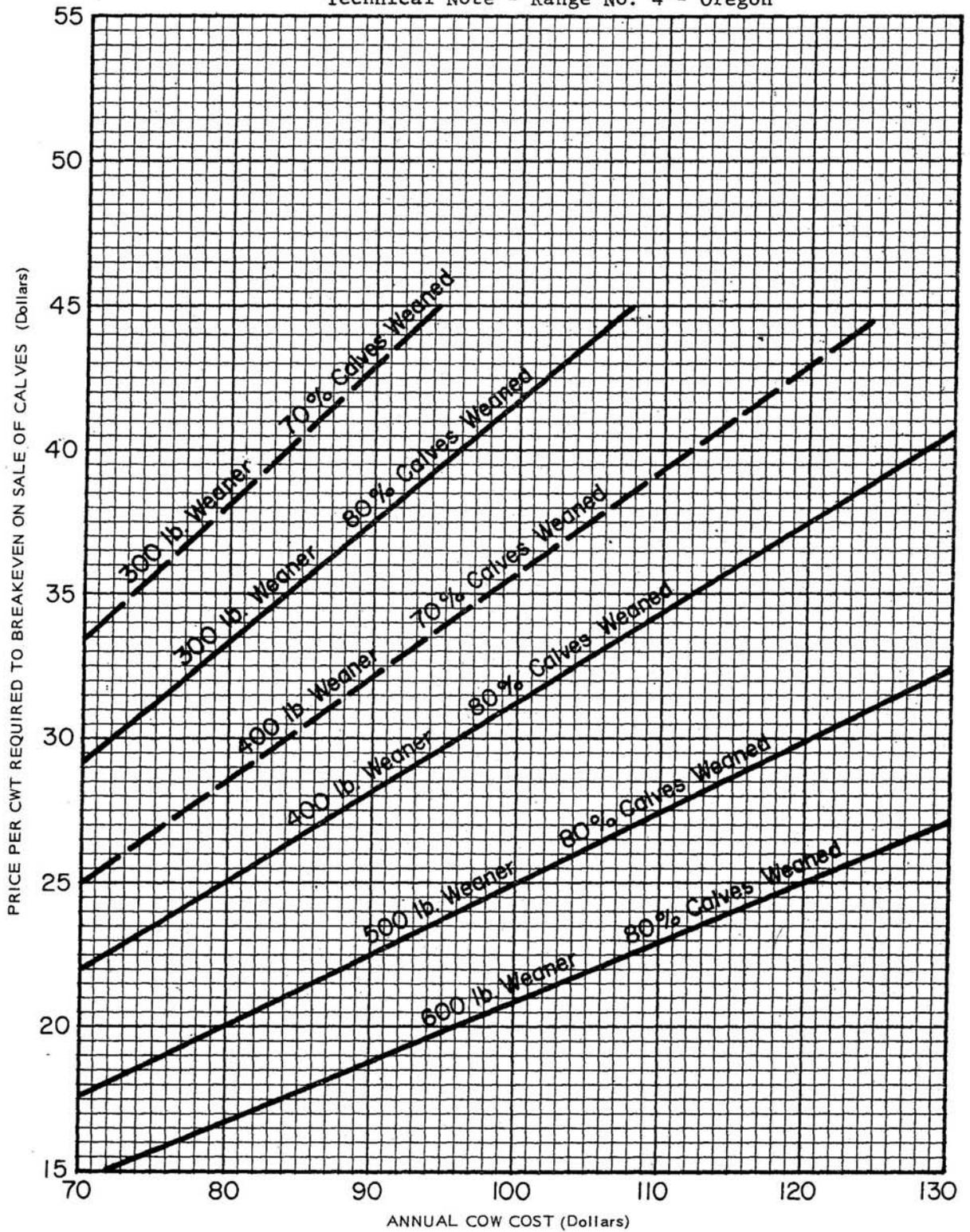


FIGURE 8: Price per hundred weight required to break even on sale of calves as related to annual cow cost.

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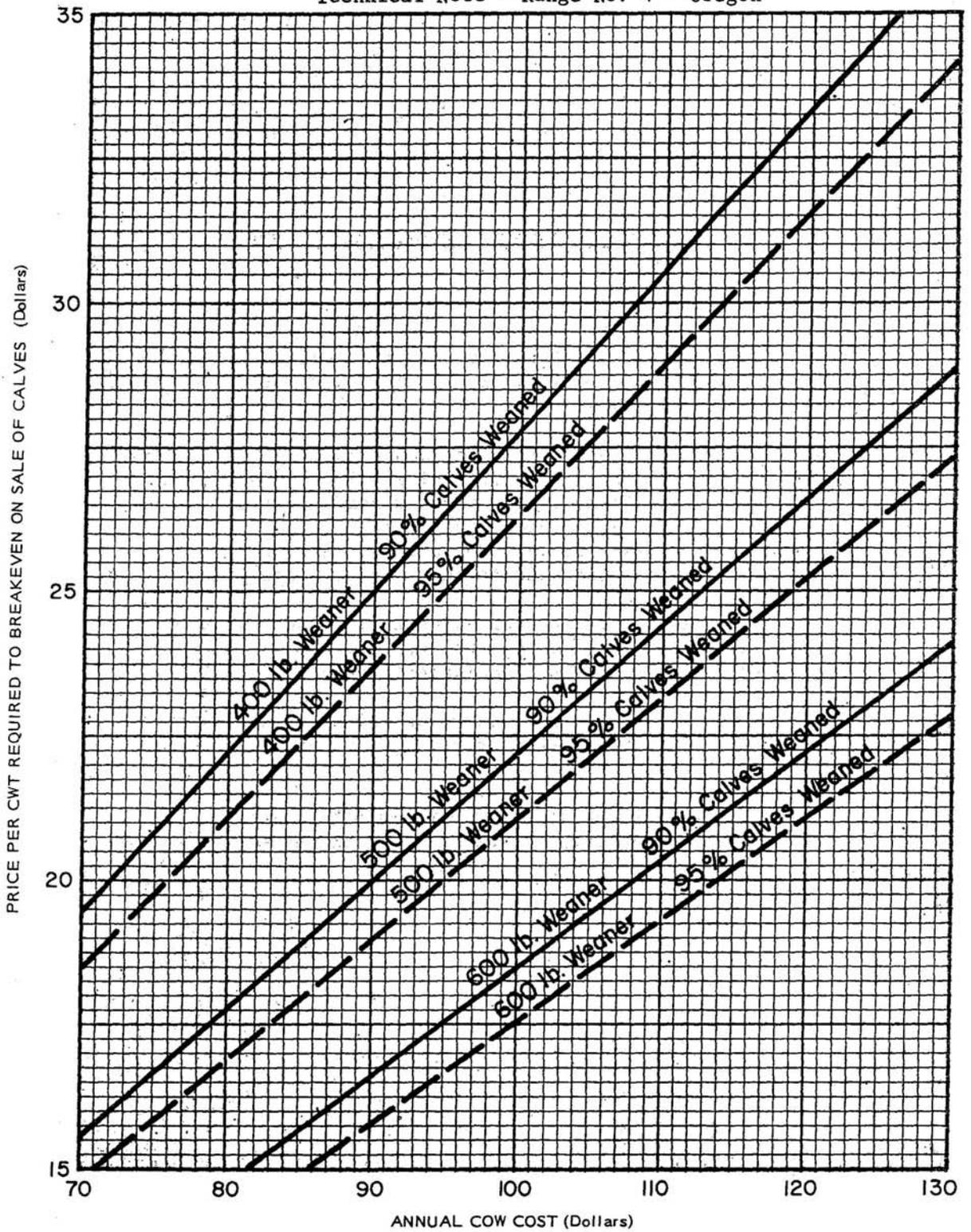


FIGURE 9: Price per hundred weight required to breakeven on sale of calves as related to annual cow cost.

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Summary of Current Ranching Operation

This work sheet (Figure 10) illustrates how to make a summary of a ranch operation for the purpose of analyzing the current seasonal balance of feed and forage produced as compared with livestock requirements yearlong. The procedure normally followed is:

Step 1. Record the numbers of animals in each class of livestock that are normally on the ranch yearlong. If additional classes are needed that are not shown on the form, delete present headings in columns not applicable and insert the needed headings. Minor fluctuations in stock numbers from season to season or year to year or exact numbers are to be avoided because this is not intended to be a detailed analysis.

Step 2. Convert animal numbers to Animal Units for each class of livestock, so that animal requirements can be expressed in Animal Unit Months (Normal number X Animal Unit equivalent equals Animal Units).

Step 3. Record briefly in spaces beneath each class of stock the usual dates and kinds of forage they graze in spring, summer, fall and winter.

Step 4. Record the amount and kinds of hay and other feeds usually fed to each class of stock to round out the synopsis of ranch operations.

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US DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
Oregon

OR-RANGE-2 (Formerly OR-3)
3/71
(File Code RANGE -14)

SUMMARY OF RANCH OPERATIONS & LIVESTOCK FEED (INITIAL SITUATION)
RANCH Sample

S.C.D. TECHNICIAN Anderson - Jernstedt

Usual No. Calves	COWS	BULLS	REPLACE. HEIFERS	MARKET STOCK			HORSES				
				WEANERS 80%	YRLNGS.	2 YR. OLDS		BUCKS	LAMBS	EWES	
1.0	1.3	10	0.6	0.6	0.6	1.0	0.25	**	0.2	1.25	
200	10	13	30	160	18	24				6	
200			18								8
Insert below usual dates of use and source of feed such as BLM or FS permit; deeded or leased range, dryland seeding, irrigated pasture, crop aftermath, feedlot											
SPRING:	3/15 - 5/15 low-elev. range	3/15 - 5/15 low-elev. range	3/15 - 4/15 low-elev. range	with cows		with cows					Kept close to home
SUMMER:	5/15 - 10/30 High-elev. range	5/15 - 10/30 high-elev. range	4/15 - 10/30 Irrig pasture 25 Ac								
FALL:	11/1 - 11/30 Hay aftermath	11/1 - 11/30 Hay aftermath	11/1 - 11/30 Hay aftermath			Sold in October before					
WINTER:	12/1 - 3/15 Feedlot	12/1 - 3/15 Feedlot	12/1 - 3/15 Feedlot								INITIAL SITUATION
(Insert below usual amounts fed)											
Legume hay T	300 T	15 T	40 T								
Native hay T											
Grain hay											
Concentrates											

FIGURE 10: Summary of initial ranch operations showing seasonal balance between forage produced and livestock requirements yearlong.

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SUMMARY OF ESTIMATED FEED PRODUCTION FOR THE PLANNED NUMBER OF STOCK
(INITIAL SITUATION)

	COWS	BULLS	REPLACE YRLNG. HEIFERS	MARKET STOCK				HORSES				
				WEANERS 80%	YRLNGS.	2 YR. OLDS	COWS /2%		LAMBS	BUCKS	EWES	
An. Unit Equiv.	1.0	1.3	0.6	0.6	0.6	1.0	1.0					
Planned No.	200	10	30	160			24				0.25	1.25
Animal Units	200	13	18									8

PASTURE (dates)	400 AUM	26 AUM	36 AUM	TOTALS
Spring 3/15 - 5/15				460 AUM
Summer 5/15 - 10/31	1,100 AUM	70 AUM	100 AUM	1,270 AUM
Fall 11/1 - 11/30	200 AUM	13 AUM	18 AUM	230 AUM
Winter				1960
HAY 12/1 - 3/15	300 T	15 T	40 T	355 T
CONCENTRATES				

(Insert below the estimated feed requirements in AUMs or Tons for each kind of stock)

(Insert below the estimated feed production based on the conservation program)

	ACRES	EST. PRODUCTION		SEASONAL AVAILABILITY OF USE				REMARKS
		PER ACRE	TOTAL	SPRING	SUMMER	FALL	WINTER	
BLM permit AUMs	xxx	xxx	xxx					
ES. permit	xxx	xxx	xxx					
Range seeding	5, 12.5	10A/AUM	515 AUM	515				
Range seeding	5, 750	5A/AUM	1,150 AUM		1,150			
Dryland pasture								
Irrig. pasture	25	6 AUM/Ac	150 AUM		150			
Crop aftermath	125	2 AUM/Ac	250 AUM			250		
Legume hay Tons				575	1,300	250	250	
Native hay "	87	4 T/Ac	350 T					
Grain hay "								
Concentrates "								
Cropland	13							

10-year Crop Rotation: 8 yrs hay; 1 yr clean-up crop; 1 yr new seeding

FIGURE 10 (reverse side): Summary of initial ranch operations showing seasonal balance between forage produced and livestock requirements yearlong.

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The reverse side of this work sheet (Figure 10) is used to analyze the current seasonal balance of feed and forage produced in the ranching operation relative to the yearlong livestock requirements. The procedure normally followed is:

Step 5. Obtain animal numbers and animal units from the front side which are duplicated in block 1 for convenience. Normal dates for each grazing season also are obtained from the front side.

Step 6. For each class of livestock, record in block 2 the AUMs required for each season of pasturing and the amount of hay and other feeds usually fed. For example, 50 cows (50 AUs) to be grazed 5/1 to 6/10 (1.33 months) in a pasture will require 67 AUMs of available forage (50 AUs X 1.33 mos.) Total the AUMs for each season horizontally across the page. This gives the seasonal requirements for forage and feed of the current livestock herd on the ranch.

Step 7. Record in block 3 the approximate acres and per-acre production of each kind of forage, hay and feed in the ranching operation. Acres and per-acre estimates for grazing permits on Federal range may be omitted because only the permitted number of AUMs is needed. Compute AUMs being produced in the ranching operation (Acres X production). Then indicate the season of availability for each kind of forage by placing the AUMs, or portions thereof, in appropriate season columns. Total these columns vertically to obtain a comparison of the seasonal availability of forage and feed produced in the ranching operation with the seasonal requirements of the livestock being run on the ranch (right-hand side, block 2).

Note that this illustration (Figure 10) represents a typical ranching operation developed as an example. Its seasonal livestock requirements are balanced by the estimated forage production with some to spare. Actual ranching operations commonly do not balance. A significant surplus or shortage in one or more particular seasons is often apparent. Such shortages or surpluses pinpoint priority items for further consideration in analyzing the resources, potentials, alternatives and opportunities and for eventually planning land use adjustments, resource development and management.

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Summary of Planned Ranching Operation

This work sheet (Figure 11) illustrates how to summarize the planned ranching operation. It takes into account those potential land use adjustments, resource developments and changes in management that seem to be feasible after analyzing the resource inventory of the total ranching operation. The procedure used for completing Figure 11 is almost the reverse of that used to summarize the current ranching operation (Figure 10).

Step 1. Start on the reverse side by filling out the first part of block 3. Proposed land use adjustments, improved production and other resource-based opportunities that appear to be feasible should be recorded. Convert acres to AUMs (Acres X production).

Step 2. Determine the approximate number of animals of each class that the forage supply will support yearlong. This is block 1. As a place to start determining animal numbers, use the following procedure: Add the AUMs of forage (do not include winter feed) available in block 3 and divide this total by the number of months in the grazing season. For example, 3,530 AUMs divided by 9 months of grazing equals about 390 Animal Units of livestock that can be supported theoretically. In block 1 the total Animal Units of livestock are proportioned according to cows, bulls, replacements, horses, etc. needed for a balanced operation. A guideline for doing this follows Figure 11.

Step 3. Complete block 2. Assign normal dates to each grazing season. For each class of livestock, record the AUMs required for each season of grazing. Record the amount of hay and concentrates that will be required. Total across the page horizontally for each season of pasture and for hay and concentrates to obtain the total seasonal requirements.

Step 4. Show season of availability for each kind of forage in block 3. Compare with block 2 to roughly balance between seasonal availability and seasonal livestock requirements.

Trial-and-error adjustments in steps 2, 3 and 4 usually are needed. It is important to be conservative throughout. Use reasonable estimates of crop yields that can be obtained under practical levels of management. It is good planning to provide for a surplus of forage and feed in balancing blocks 2 and 3 by using fewer livestock than arithmetic shows can be supported. A reasonable surplus of forage on any ranch is good insurance. With experience, the amount of trial-and-error diminishes.

Step 5 is to develop the front side of the worksheet which summarizes the general grazing dates and kinds of forage used by the proposed herd of livestock yearlong. Estimated forage and feed production is balanced against livestock requirements in relation to length of time the livestock are on each kind of forage. This roughly tests the practicality of potential resource developments and land use adjustments.

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OR-RANGE-2 (Formerly OR-3)
3/71
(File Code RANGE -14)

SUMMARY OF RANCH OPERATIONS & LIVESTOCK FEED

S.C.D.	RANCH Sample				TECHNICIAN Anderson - Jernstedt			
	WEANERS 90%	YRLNGS. 0.6	2 YR. OLDS 1.0	COWS 12 1/2	EWES 0.2	LAMBS **	BUCKS 0.25	HORSES 1.25
Usual No. Calves	1.0	1.3	0.6	1.0	0.2	0.25	1.25	
An. Unit Equiv.	300	15	45	36			6	
Normal Number	300	20	27				8	
Animal Units								
Insert below usual dates of use and source of feed such as BLM or FS permit; deeded or leased range, dryland seeding, irrigated pasture, crop aftermath, feedlot								
REPLACE	BULLS	WEANERS	YRLNGS.	2 YR. OLDS	COWS	LAMBS	BUCKS	HORSES
YRLNG. HEIFERS								
SPRING:	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past. 85 Ac.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past. 85 Ac.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past. 25 Ac.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past.	4/1 - 5/15 Seeding + low range 5/15 - 6/15 irrig. past.
SUMMER:	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.	6/15 - 7/15 High range 7/15 - 9/30 Irrig. past.
FALL:	10/1 - 11/30 High range (no calves) 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture	10/1 - 11/30 High range 12/1 - 12/30 aftermath + pasture
WINTER:	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot	1/1 - 4/1 Feedlot
(Insert below usual amounts fed)								
Legume hay	450 T	22 T	68 T					
Native hay								
Grain hay								
Concentrates								

FIGURE 11: Summary of planned ranch operations showing seasonal balance between forage produced and livestock requirements yearlong.

Technical Note - Range No. 4 - Oregon

Determining Size of Herd

Example 1: Marketing weaner calves.

GRAZING SEASON		A.U.		Approx. %
<u>Herd</u>	<u>Number</u>	<u>Equiv.</u>	<u>A.U.s</u>	<u>Total A.U.s</u>
Cows	100	1.0	100	86.5%
Calves <u>1/</u>	90	-	-	-
Yrlng repl heifers <u>2/</u>	15	0.6	9	8.0%
Bulls	5	1.3	<u>6.5</u>	5.5%
			115.5	

1/ 90% calves weaned, 75 are marketed, 15 heifers are kept as replacements.2/ 12% replacement rate (cows usually culled at age 8-9 years) plus 3% for annual death loss.

WINTER FEEDING SEASON

Cows	85	1.0	85)
Repl cows	15	1.0	15) 86.5%
Yrlng repl heifers	15	0.6	9	8.0%
Bulls	5	1.3	<u>6.5</u>	5.5%
			115.5	

Example 2: Marketing long-yearlings or short two-year-olds in the fall.

GRAZING SEASON		A.U.		Approx. %
<u>Herd</u>	<u>Number</u>	<u>Equiv.</u>	<u>A.U.s</u>	<u>Total A.U.s</u>
Cows	100	1.0	100	62.5%
Calves	90	-	-	-
Yrlng repl heifers	15	0.6	9	5.5%
Yrlngs to be marketed	75	0.6	45	28.0%
Bulls	5	1.3	<u>6.5</u>	4.0%
			160.5	

WINTER FEEDING SEASON - The above percentage relationship also applies in winter.

Similar guidelines can be developed for other types of livestock operations. Using 100 breeding females as a base makes percentage determinations easier.

How to Use: Figure 11 shows a potential of 3,530 AUMs forage with a grazing season of 9 months for a total theoretical stocking rate of about 390 Animal Units. In a cow-weaner calf operation about 86.5% of the forage is required by the cows. Therefore, about 340 cows could be in the herd. Using 12% replacement rate and 3% death loss, about 15 replacement heifers per 100 cows will be required for a total of about 50 heifers in the herd. If one bull is required for each 20 cows, about 17 bulls would be required in the herd.

A shortage of forage in one season often becomes the controlling factor in herd size. To determine which season is limiting the size of the cow herd for a balanced yearlong operation, use Step 4 in Figure 11.

When planning the herd size based on estimated production of planned land use adjustments, resource developments and management, it is always best to err on the conservative side. Do not be overly optimistic because it is usual to encounter unforeseen set-backs under normal operating conditions.

Technical Note - Range No. 4 - Oregon

Per-Acre Approach

The per-acre approach to analyzing cost-benefits for land use adjustment and resource development is illustrated in Table 1. In the sample ranching operation illustrated, two land use adjustments were feasible and necessary: the conversion of 100 acres low-elevation rangeland to irrigated land and of 450 acres low-elevation rangeland to a range seeding. These adjustments are shown by comparing block 3 on the reverse sides of Figures 10 and 11.

Crop values and generalized annual costs of these land use adjustments and resource development are shown in Table 3.

Using the per-acre approach, the two land use conversions and resource development appears to be a questionable venture with \$7,485 predicted increased value annually to the ranch at a predicted annual cost of \$7,525.

Technical Note - Range No. 4 - Oregon

TABLE 1: Summary of the per-acre approach to analyzing cost-benefits for land use adjustments and resource development.

	450 Acres Range Seeding		100 Acres Irrigated Pasture, Hay, Crops	
	<u>Initial</u>	<u>Planned</u>	<u>Initial</u>	<u>Planned</u>
Production $\frac{1}{/}$	45 AUMs	300 AUMs	Production, 85 acres pasture.....	10 AUMs
Crop value.....	\$135	\$900	15 acres hay.....	60 tons
Increased annual value.....		\$765	3 acres crops.....	30 AUMs
Generalized annual costs $\frac{1}{/}$		\$1,355		$\frac{1}{/}$
			Crop value, pasture.....	\$5,100
			hay & pasture.....	1,650
			crops.....	$\frac{1}{/}$
			Increased annual value.....	\$6,720 plus
			Generalized annual costs.....	\$5,170
			Total annual increased value, range seeding.....	\$ 765
			pasture, hay, crops.....	\$6,720.....
				\$7,485
			Total annual costs of installation, range seeding.....	\$1,355
			pasture, hay, crops.....	\$5,170
			Annual cost of additional range management required.....	\$1,000.....
				\$7,525

Technical Note - Range No. 4 - Oregon

Multiple-effect Approach

The multiple-effect approach to analyzing cost-benefits for land use adjustment and resource development is illustrated in Table 2. In this approach the benefits are measured by the gains made on the marketable product which, in the case of the example illustrated by Figures 10 and 11, is weaner calves and the cows that raise them.

In the sample ranching operation illustrated, the initial situation of ranch income from sale of calves is compared with three alternative changes that might be achieved through planned land use adjustments, resource development, and resource management. Annual cost of installation is compared with annual increased income for the total-package achievement (all three changes) to emphasize how the multiple-effect approach brings out actual benefits more realistically than does the per-acre approach. Crop values and annual costs of these land use adjustments and resource developments are shown in Table 3.

Using the multiple-effect approach, the two land use conversions and resource development appears to be a sound venture with \$13,160 predicted increased value annually to the ranch at a predicted annual cost of \$7,525.

Technical Note - Range No. 4 - Oregon

TABLE 2: Summary of the multiple-effect approach to analyzing cost-benefits for land use adjustments and resource development.

	Per Cow Net Income From Sale of Calves		
	Initial Situation	#1 plus #2	plus #3
Present net income per cow from sale of calves.....\$	5.00	5.00	5.00
(80% calf crop; 400# weaners; \$75 cow cost; 25¢/lb value)			
Change #1: Increase % calves weaned from 80% to 90%.....\$	10.00	10.00	10.00
(90% calf crop; 400# weaners; \$75 cow cost; 25¢/lb value)			
Change #2: Increase weaning weights from 400 to 500 lbs.....\$	23.00	23.00	23.00
(90% calf crop; 500# weaners; \$75 cow cost; 25¢/lb value)			
Change #3: Increase cow numbers from 200 to 300 head.....\$	9.20		9.20
(reduces annual cost per cow to \$65.80, which is profit)			
1 Annual net income per cow from sale of calves.....\$	5.00	15.00	38.00
2 Annual net income from sale of calves for entire ranch.....\$1,000.00	3,000.00	7,600.00	14,160.00
Increased net income from sale of calves.....\$	2,000.00	6,600.00	13,160.00
Total annual increased income (total program).....\$			13,160.00
Total annual cost of installation (total program) 1/.....\$			7,525.00
Net annual increased income from sale of calves.....\$			6,635.00

1/ See Table 3.

Technical Note - Range No. 4 - Oregon

TABLE 3: Generalized annual costs of planned land use adjustments, resource development and management used for analyzing cost-benefits.

Range Seeding:	Establishment, \$10/acre; 20 yrs & 8%; (\$4500 X .102).....	\$ 459
	Fences, 3½ miles, \$800/mile; 20 yr & 8% (\$2800 X .102).....	286
	Stockwater, \$5000, 20 yr & 8% (\$5000 X .102).....	510
	Management, 5 man days @ \$20.....	<u>100</u>
		\$1,355
Irrigated Pasture, Hay and Cropland		
	Establishment, \$20/acre; 8 yrs & 8% (\$2000 X .174).....	\$ 348
	Fences, 1½ miles, \$800/mile; 20 yrs & 8% (\$1200 X .102).....	122
	Irrigation water, \$10/acre.....	1,000
	Labor, ½ man year @ \$6000.....	3,000
	Fertilizer @ \$7/acre.....	<u>700</u>
		\$5,170
Range Management, additional labor for grazing system, 2 man mos @ \$500.....		\$1,000
Total Annual Cost.....		<u>\$7,525</u>

Since this illustration is merely an example, no attempt was made to list all the costs. However, the costs that are shown are generous so that total costs would be realistic. When working with actual ranching situations, additional costs such as increases in taxes, insurance, hauling crops and animals, maintenance, repairs, depreciation, and so on can be added to the compilation, if this seems desirable. In most cases, however, a broad approach as illustrated is sufficient for decision-making.

Crop Values Used

Range, 10 acres/AUM @ \$3/AUM
 Range seeding, 1½ acres/AUM @ \$3/AUM
 Irrigated improved pasture, 12 AUMs/acre @ \$5/AUM
 Irrigated hay, 5 tons/acre @ \$25/ton plus 2 AUMs/acre @ \$5/AUM
 Irrigated cropland for cleanup in rotation, no value assigned because this depends upon the kind of crop raised and the way it is marketed. Since this value is not included, it provides a margin on the conservative side.

Technical Note - Range No. 4 - Oregon

Changes in Management

Figure 12 illustrates how to graphically present broad changes in management that are needed along with resource development and land use adjustments. This information is taken from the front sides of Tables 10 and 11. It is intended to emphasize changes in management that are needed to achieve the full potential provided by land use adjustments and resource development.

It is important to note that this illustration is not a grazing system. Individual or groups of pastures are not represented. For example, a grazing system graphically presented in this manner would show how grazing was to be rotated seasonally among each of several pastures of spring range, irrigated pasture, summer range, and so on. A separate grazing system for each of several years is commonly prepared to show the sequence of use within each pasture over a period of years -- the length of the rotation.

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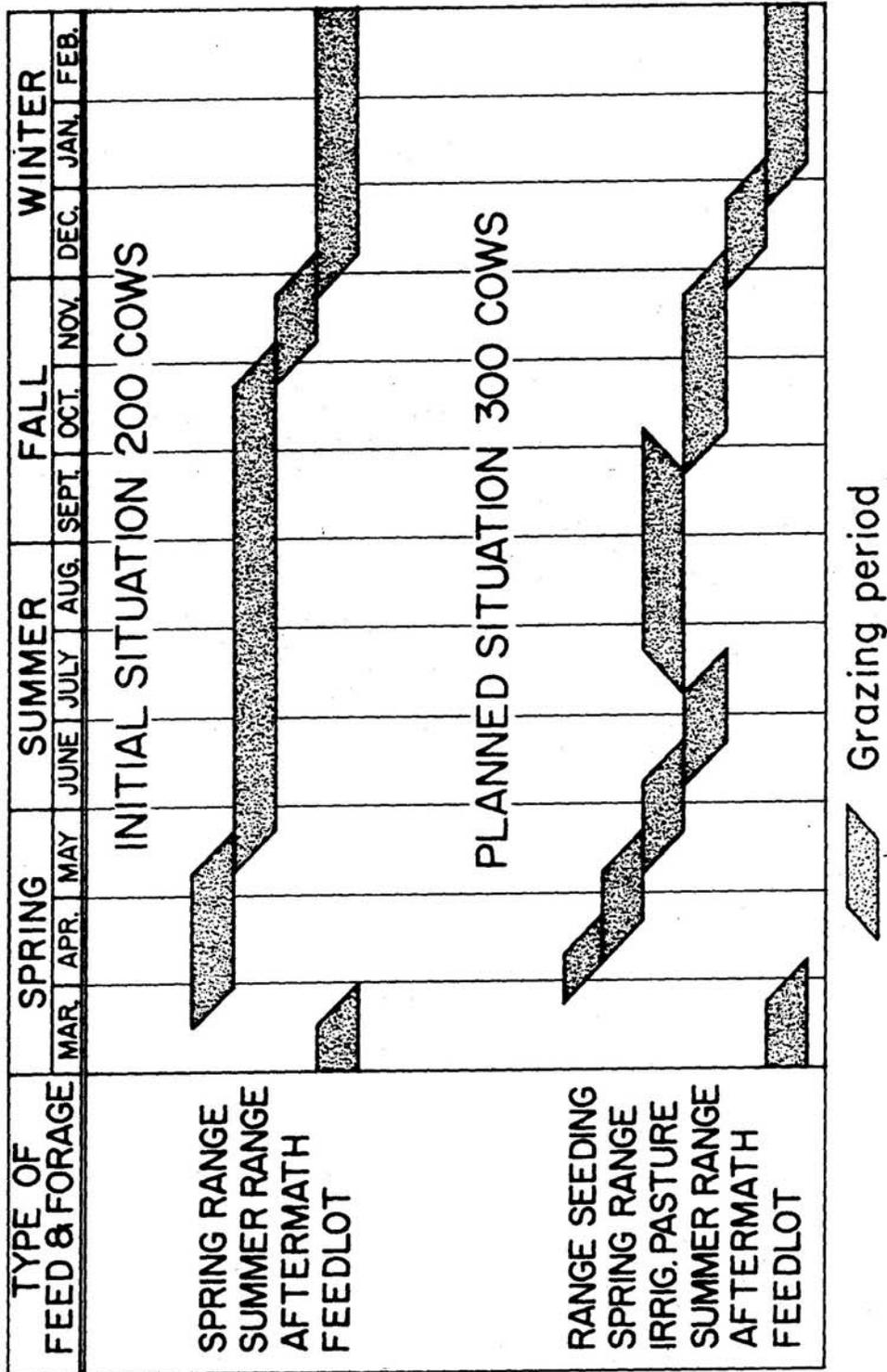


FIGURE 12: Changes in land use and resource management (cow herd) associated with development of irrigated pasture and managing the total resource for optimum forage quality, timeliness of availability, and production.