

Beef Cattle Management Update

**FACTORS AFFECTING PROFITABILITY OF
THE COW/CALF ENTERPRISE**

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Introduction

Economic and social pressures are constantly shaping decisions that beef cattle producers make. As production of a given livestock product increases, competition for a relatively constant number of consumers increases. Also, regardless of production conditions, consumers are increasingly concerned about how livestock producers care for their animals and the environment. The combined result from these pressures has led beef cattle producers to take into consideration economic and social conditions when making decisions to purchase inputs or market products from their farms in order to remain profitable. Whenever possible, lowering production costs should be one of the main focus of efforts to maintain or improve profitability. However, a set of production and financial records and a systematic approach to evaluating productivity must first be implemented to identify areas in need of improvement. This paper will focus on determining and analyzing production costs from a management point of view. In addition, it is the objective of this paper to provide a systematic method to evaluate cost-optimizing management strategies.

Components of Production Costs

The following discussion assumes that producers who are considering cost reduction strategies keep fairly complete production and financial records. Otherwise, implementation of these strategies is impossible. Costs of production are described for beef cow/calf enterprises in various regions of Minnesota (Table 1). All yearly costs incurred were added then divided by the number of brood cows. Thus, costs presented in Table 1 are on a per brood cow per year basis. Under direct costs, major costs can be broken down as feed and nonfeed costs. Nonfeed costs can be divided further as breeding costs (cost of keeping a bull, or of artificial insemination supplies and equipment), veterinary and medicine costs, livestock supplies (id tags, tattoo ink, etc.), fuel and oil, repairs, custom hire (usually feed procurement contracts), marketing costs and operating interest. For various Minnesota regions, feed and nonfeed total costs (direct costs) were from \$220.72 to \$334.85/cow/year. Overhead costs include: hired labor, real estate and personal property taxes, farm insurance, utilities, dues and professional fees, interest on capital invested, machinery and building depreciation and miscellaneous costs. For various Minnesota regions, overhead costs were from \$69.70 to \$123.18/brood cow/year (Table 1).

Table 1. Average costs of production for a cow/calf enterprise in various regions of Minnesota.

Cost of production	Expenses/brood cow, \$					
	NW ^a	C ^a	SC ^a	SW ^a	SE ^a	NE ^a and E ^a
<u>Direct costs:</u>						
Winter feed costs	205.68	217.52	184.20	159.45	241.48	240.65
Pasture	25.99	19.89	2.06	18.41	25.46	27.94
Total feed costs	231.67	237.41	186.26	177.86	266.94	268.59
Breeding fees	1.50	.88	3.69	2.59	3.92	2.27
Veterinary	21.73	18.84	11.99	13.61	13.49	13.87
Livestock supplies	6.87	4.57		10.50		5.98
Fuel & oil	5.96			9.34		6.90
Repairs	12.40			25.28		17.61
Custom hire	2.15	.85	6.71	3.38	3.83	.38
Hired labor	.41		.37	.28	.09	.00
Mach & bldg leases						.22
Livestock leases	3.90					1.65
Utilities	.22					.00
Marketing	4.65	4.57		.60		6.30
Operating interest	7.87		3.41	23.92		11.08
Miscellaneous	.10		8.29		8.12	
Total direct costs	299.43	267.12	220.72	267.36	296.39	334.85
<u>Overhead costs:</u>						
Hired labor	6.43	22.35	15.58	13.96	7.18	5.86
Mach & bldg leases	.54		26.40	.41	33.31	.58
Real estate & pers prop taxes	3.92			4.00		5.32
Farm insurance	4.06			6.12		7.95
Utilities	8.58	5.92	16.71	8.51	11.92	13.41
Dues & professional fees	.71			.20		.64
Interest	19.25	35.73	42.71	19.63	45.55	40.98
Mach & bldg depreciation	22.50	43.42	– 21.09	23.29	13.31	23.76
Miscellaneous	3.71	5.92	16.71	6.17	11.92	5.80
Total overhead costs	69.70	113.33	97.01	82.29	123.18	104.30
Total listed costs	369.13	380.45	317.73	349.65	419.57	439.15

^a NW=Northwest; C=Central; SC=South Central; SW=Southwest; SE=Southeast; NE=Northeast; E=East.

1994 Minnesota Farm Business Management Programs

Feed costs. In a cow/calf enterprise, feed costs usually make up 60% of total costs. For various Minnesota regions (Table 1), feed costs were from \$177.86 to \$268.59 (from 66.5% to 90.1% of total direct costs or from 50.9% to 63.6% of total costs). Therefore, a small change in feeding programs can greatly affect production costs.

Producers are encouraged to evaluate their current feeding programs. Maximization of forage harvest by the animal is preferred over machine harvest of forages for hand-feeding. During winter, some forage harvesting and hand-feeding are necessary during the coldest, snowiest periods. These periods contribute the highest to feed expenses. For various Minnesota regions described in Table 1, winter feed costs were from \$159.45 to \$241.48/brood cow (from 88.8% to 98.9% of total feed costs).

Therefore, producers must hone their pasture management skills to rely on pastures for as long as possible. Strategies to achieve these skills are early spring and late winter grazing on stockpiled pasture, management intensive grazing or gleaning of crop fields. Research data demonstrate that when cows are in good condition in November, feed costs average between \$14 and \$84/cow/year below those of thin or average condition cows. When formulating winter diets, producers are strongly encouraged to evaluate forage nutrient content, to know nutrient requirements of their livestock and to supplement with protein, vitamins and minerals when necessary.

Implications of poor nutritional management are reduced fertility, low milk yield and lighter weaning weights. Table 2 demonstrates the relationship between weaning weight and weaning percentage (fertility) on effective weaning weight (weaning weight per cow exposed).

Table 2. Calculated effective weaning weights (weaning weight/cow exposed).

Calf crop, %	Average weaning weight of all calves, lb						
	400	450	500	550	600	650	700
	----- Effective weaning weight, lb -----						
70	280	315	350	385	420	455	490
75	300	338	375	413	450	488	525
80	320	360	400	440	480	520	560
85	340	383	425	468	510	553	595
90	360	405	450	495	540	585	630
95	380	428	475	523	570	618	665
100	400	450	500	550	600	650	700

Breeding costs. Genetic decisions impact nutrient requirements of livestock, growth potential and weaning weight. A discussion of how cow size impacts nutrient needs and costs is beyond the scope of this paper. Suffice it to say that for every 100 lb mature size increase over a standard 1200-lb cow, effective weaning weight must increase 5 lb to offset the additional expense incurred by increasing cow size (DiCostanzo and Meiske, 1994). Therefore, environmental effects on production ability must be considered. Once a decision is made relative to cow size, producers must strive to meet the nutrient requirements of their livestock to permit full expression of their growth potential (i.e., to obtain the weaning weight expected for a given genetic line). However, overfeeding of the brood cow does not increase production and impacts feed costs negatively.

Health maintenance costs. Health programming permits cow/calf producers to fully reap the benefits of their nutrition and genetics programs. Livestock diseases can be chronic or acute. Acute diseases (caused by bacteria, parasites or virus) can kill an animal or an entire herd in a rapid outbreak. Producers must work with their veterinarian to implement a bacterial, viral and parasite disease prevention program. Veterinary and medicine costs are small compared to the potential production losses that occur when disease outbreaks kill one or more animals.

Chronic diseases are caused by exposure to virus, bacteria, parasites or conditions that affect digestion or metabolism. Although chronic diseases may not kill animals readily, their impact is on reduced feed utilization, infertility and slow body weight gains.

A comparison of low and high cost beef producers in Iowa and Nebraska (Rasby, 1990; Strohbahn, 1990) demonstrated that veterinary medical costs were higher for high cost producers but weaning weights were lower for this group. Therefore, high cost producers were less profitable although they spent more in veterinary medical costs per cow per year. Because cost of prevention is lower than cost of treatment, and weaning weight per cow exposed was lower for the high veterinary medical cost group, it is safe to conclude that lack of prevention led to higher veterinary medical costs associated with morbidity and mortality.

A recent study (Wittum et al., 1993) indicated that costs of calf mortality related to reproductive tract (dystocia, stillbirth, premature birth/late abortion or birth defects) are \$177/calf. Costs associated with enteric or respiratory tract mortality, or sudden death (including clostridial diseases) averaged between \$215 and \$232/calf. Some of the reproductive conditions and probably all of the enteric or respiratory tract diseases are easily prevented with a thoroughly designed and conscientiously implemented health program.

Costs of death associated with miscellaneous causes (hypothermia, high-mountain disease, starvation, local infection, navel ill, septicemia, fracture, urolithiasis, unspecified trauma) averaged \$227/calf. Some of these costs and those of dystocia depend more on management (e.g., close observation of females at parturition) than on a health program but are equally expensive.

Effect of Management Strategies on Production Costs

Table 2 was generated using various weaning weights (a function of nutrition and genetics) and calf crop percentages (a function of nutrition, fertility and health programming) to incorporate effects of nutrition, genetics and health programming into productivity of cow/calf enterprises. At low weaning weights, high fertility is required to improve production per cow exposed. For example, if the average weaning weight in a herd is 500 lb but weaning percentage is 70, then effective weaning weight per cow exposed is only 350 lb. This same herd can improve productivity by increasing fertility or health maintenance leading to an increase in weaning percentage to 80%. At this weaning percentage and 500 lb average weaning weight per calf, effective weaning weight per cow exposed is 400 lb. This same herd could improve genetics or preweaning nutrition and health and achieve 600 lb weaning with 80% calf crop to increase effective weaning weight to 480 lb. From this table, it is derived that 100 lb weaning weight is equivalent to 20 units weaning percentage. This relationship is approximated as 5 lb weaning weight is equivalent to 1 unit weaning percentage. Although at heavier weights, 100 lb weaning

weight becomes equivalent to 15 percentage units of calf crop. Thus, a herd may achieve similar production per brood cow exposed by increasing weaning percentage by 20 units or weaning weight by 100 lb. In Table 2, a herd weaning an 80% calf crop at 500 lb and one weaning a 100% calf crop at 400 lb have the same production per brood cow exposed.

However, Table 2 does not take into consideration cost of keeping a cow. Table 3 was generated to include annual maintenance costs (feed, breeding, health costs plus other direct and indirect costs) and weaning percentages. At a given annual cow cost (e.g., \$350), cost per calf weaned decreases as percentage calf crop increases (from \$438/calf at 80% calf crop to \$350/calf at 100% calf crop). Obviously, as percentage calf crop increases, cost per calf weaned decreases because there are more calves over which to spread costs. Also, at any given percentage calf crop, the cost of each calf decreases as cost of keeping the cow decreases. For example, with a 90% calf crop, the cost of each calf decreases from \$389 when annual cow cost is \$350 to \$333 when annual cow cost is \$300.

Table 3. Influence of percentage calf crop on cost per calf weaned.

Calf crop, %	Annual cost of keeping a cow								
	200	250	300	350	400	450	500	550	600
	----- Cost per calf, \$/head -----								
60	333	417	500	583	667	750	833	917	1,000
70	286	357	429	500	571	643	714	786	857
80	250	313	375	438	500	563	625	688	750
90	222	278	333	389	444	500	556	611	667
100	200	250	300	350	400	450	500	550	600

Because cost per calf weaned for a 60% calf crop at \$200 annual cow cost (\$333) is the same as that for a 90% calf crop at \$300 annual cow cost, approximate equivalent values of \$100/year cow cost and 30 percentage units of calf crop result. Thus, each 10 percentage unit of calf crops is equivalent to \$33 cow cost per year. Also, cost per calf is the same whether annual maintenance cost per brood cow is \$300 and weaning percentage is 60, or annual maintenance cost per brood cow is \$350 and weaning percentage is 70. Therefore, 10 units weaning percentage are required to offset \$50 annual maintenance cost at intermediate cow costs. At yet higher annual cow cost values of \$400 and \$600, calf crop percentages of 60 and 90%, respectively, result in the same cost per calf weaned (\$667). In this case, a differential of 10 percentage units of calf crop is equivalent to \$66 annual cow cost. Thus, the relationship between annual cow cost and percentage calf crop is not constant or straight-line but curvilinear. This relationship is best approximated as: 1 percentage unit calf crop = \$3.00 to \$6.60 annual cow cost.

The effects of weaning weight and weaning percentage on breakeven price per lb weaned calf are summarized in Tables 4, 5 and 6 for annual maintenance cost per brood cow of \$250, \$350 and \$450, respectively. Within each table, increasing weaning weight (as a result of improved genetics, nutrition or health programming) and weaning percentage (as a result of improved

nutrition and health programming) reduces breakeven price per lb weaned calf (i.e., permits maximum net return). In Table 4, breakeven prices are the same at weaning weights of 400 lb and weaning percentage of 90 or at weaning weights of 450 lb and weaning percentage of 80. At heavier weights, breakeven prices are the same when weaning weight and weaning percentage are 600 and 70, respectively, or when weaning weight and percentage are 700 and 60, respectively. Therefore, the effect of weaning weight and percentage on breakeven price is not linear. This effect is approximated at light weights by the relationship of 100 lb weaning to 20 weaning percentage units, and at heavy weights by the relationship of 100 lb weaning to 10 weaning percentage units. These relationships hold true, within weight limits described, when annual maintenance cost per cow increases.

Tables 7, 8 and 9 present breakeven percentage calf crops when annual cow costs are \$250, \$350 and \$450, respectively, for different average weaning weights and selling prices. Breakeven percentage calf crop was calculated as annual cow cost divided by cost per calf. Cost per calf depends on annual cow cost and percentage calf crop as shown in Table 3. At some low price situations with low weaning weights, hypothetical calf crop percentages of more than 100% are needed to cover cow costs. However, similar breakeven percentage calf crops are required when weaning weight increases 50 lb and selling price declines \$5/cwt. For example, when selling price in Table 8 decreases from \$100 to \$80/cwt with an 88% calf crop, weaning weight must increase from 400 to 500 lb to offset the price decline. Also, with an annual calf cost of \$450 and a 92% calf crop (Table 9), as price declines from \$75 to \$70/cwt, weaning weight must increase from 650 to 700 lb to balance the price decline. Thus, an equivalent value relationship of 100 lb weaning weight to each \$10/cwt selling price differential becomes apparent; or, each 50 lb weaning weight per calf is equivalent to a differential of \$5/cwt in selling price.

It is also apparent from Tables 7, 8 and 9 that when selling prices of calves are high relative to cow costs, even producers who have poor calf crop percentages (poor fertility or health programs) can show a profit. On the other hand, as selling price relative to cow costs becomes narrow, only producers who wean high percentage calf crops can remain profitable.

Table 4. Necessary selling price when annual cow cost is \$250.

Calf crop, %	Cost per calf, \$	Average weaning weight per calf, lb						
		400	450	500	550	600	650	700
----- Necessary calf selling price, \$/100 lb -----								
100	250.00	62.50	55.56	50.00	45.45	41.67	38.46	35.71
90	277.78	69.44	61.73	55.56	50.51	46.30	42.74	39.68
80	312.50	78.13	69.44	62.50	56.82	52.08	48.08	44.64
70	357.14	89.29	79.37	71.43	64.94	59.52	54.95	51.02
60	416.67	104.17	92.59	83.33	75.76	69.44	64.10	59.52

Table 5. Necessary selling price when annual cow cost is \$350.

Calf crop, %	Cost per calf, \$	Average weaning weight per calf, lb						
		400	450	500	550	600	650	700
----- Necessary calf selling price, \$/100 lb -----								
100	350.00	87.50	77.78	70.00	63.64	58.33	53.85	50.00
90	388.89	97.22	86.42	77.78	70.71	64.81	59.83	55.56
80	437.50	109.38	97.22	87.50	79.55	72.92	67.31	62.50
70	500.00	125.00	111.11	100.00	90.91	83.33	76.92	71.43
60	583.33	145.83	129.63	116.67	106.06	97.22	89.74	83.33

Table 6. Necessary selling price when annual cow cost is \$450.

Calf crop, %	Cost per calf, \$	Average weaning weight per calf, lb						
		400	450	500	550	600	650	700
----- Necessary calf selling price, \$/100 lb -----								
100	450.00	112.50	100.00	90.00	81.82	75.00	69.23	64.29
90	500.00	125.00	111.11	100.00	90.91	83.33	76.92	71.43
80	562.50	140.63	125.00	112.50	102.27	93.75	86.54	80.36
70	642.86	160.71	142.86	128.57	116.88	107.14	98.90	91.84
60	750.00	187.50	166.67	150.00	136.36	125.00	115.38	107.14

Table 7. Necessary calf crop percentages to breakeven when annual cow cost is \$250.

Selling price of calves, \$/100 lb	Average weaning weight per calf, lb						
	400	450	500	550	600	650	700
----- Necessary calf crop, % -----							
50	125	111	100	91	83	77	71
55	114	101	91	83	76	70	65
60	104	93	83	76	69	64	60
65	96	85	77	70	64	59	55
70	89	79	71	65	60	55	51
75	83	74	67	61	56	51	48
80	78	69	63	57	52	48	45
85	74	65	59	53	49	45	42
90	69	62	56	51	46	43	40
95	66	58	53	48	44	40	38
100	63	56	50	45	42	38	36

Table 8. Necessary calf crop percentages to breakeven when annual cow cost is \$350.

Selling price of calves, \$/100 lb	Average weaning weight per calf, lb						
	400	450	500	550	600	650	700
	----- Necessary calf crop, % -----						
50	175	156	140	127	117	108	100
55	159	141	127	116	106	98	91
60	146	130	117	106	97	90	83
65	135	120	108	98	90	83	77
70	125	111	100	91	83	77	71
75	117	104	93	85	78	72	67
80	109	97	88	80	73	67	63
85	103	92	82	75	69	63	59
90	97	86	78	71	65	60	56
95	92	82	74	67	61	57	53
100	88	78	70	64	58	54	50

Table 9. Necessary calf crop percentages to breakeven when annual cow cost is \$450.

Selling price of calves, \$/100 lb	Average weaning weight per calf, lb						
	400	450	500	550	600	650	700
	----- Necessary calf crop, % -----						
50	225	200	180	164	150	138	129
55	205	182	164	149	136	126	117
60	188	167	150	136	125	115	107
65	173	154	138	126	115	107	99
70	161	143	129	117	107	99	92
75	150	133	120	109	100	92	86
80	141	125	113	102	94	87	80
85	132	118	106	96	88	81	76
90	125	111	100	91	83	77	71
95	118	105	95	86	79	73	68
100	113	100	90	82	75	69	64

Equivalent Values of Percentage Calf Crop and Annual Cow Cost

Percentage calf crops (for calves weighing 450, 500 or 650 lb) needed to break even when annual cow costs are \$250, \$350 or \$450 and with calf prices ranging from \$60 to \$90/cwt were calculated and are summarized in Table 10. From these, the increase in percentage calf crop

needed to cover a \$100 increase in annual cow cost was determined at each selling price (from Tables 7, 8 and 9). With heavier calves or with higher prices, smaller increases in percentage calf crops are needed to compensate for increases in annual cow costs. However, an average in calf crop of about 25 percentage units is needed to cover a \$100 increase in annual cow cost (it varies from a 17-percentage unit increase for 650-lb calves selling at \$90/cwt to a 37-percentage unit increase for 450-lb calves selling at \$60/cwt). Thus, each 10-percentage unit calf crop increase has the value of decreasing annual cow costs about \$40/year (ranges from \$27.02 to \$58.82/year; averages near \$40/year).

Table 10. Calf crop percentages needed to breakeven when annual cow cost is \$250, \$350 or \$450; weaning weights are 450, 550 and 650 lb; selling price per 100 lb ranges from \$60 to \$90/cwt.

Weaning wt/calf, lb	Selling price/ 100 lb, \$	Cow costs per year, \$/cow			
		250	350	450	
450					
	60	93	(37)*	130	167
	65	85	(35)	120	154
	70	79	(32)	111	143
	75	74	(30)	104	(29) 133
	80	69	(28)	97	(28) 125
	85	65		92	(26) 118
	90	62		86	(25) 111
550					
	60	76	(30)	106	136
	65	70	(28)	98	126
	70	65	(26)	91	117
	75	61	(24)	85	109
	80	57	(23)	80	(22) 102
	85	53		75	(21) 96
	90	51		71	(20) 91
650					
	60	64	(26)	90	115
	65	59	(24)	83	107
	70	55	(22)	77	99
	75	51	(21)	72	(20) 92
	80	48		67	(20) 87
	85	45		63	(18) 81
	90	43		60	(17) 77

* Values in parentheses are percentage unit calf crop differentials (increases required) between c

If a 25 percentage unit increase in calf crop is about equivalent to a \$100 increase in annual cow cost, then 10 percentage units of calf crop equals \$40 annual cow cost. Because 1 percentage unit of calf crop is equivalent to 5 lb weaning weight, 10 percentage units of calf crop is equal in value to 50 lb weaning weight or \$40 annual cow cost. The 50-lb increment in weaning weight

was calculated earlier to be equivalent in value to \$5/cwt in the selling price of calves. Thus, the table of equivalent values becomes:

Percentage units of calf crop	Weaning weight of calves, lb	Annual cow cost, \$	Calf price/ cwt, \$
10	50	40	5
1	5	4	.5

These calculations show that each 1 percentage unit improvement in calf crop that can be obtained (by good management at calving time or by good breeding management, etc.) has the same value as improving average weaning weight by 5 lb. Also, each percentage unit improvement in calf crop has about the same value as reducing annual cow costs by \$4 or as increasing the calf selling price per hundredweight by \$0.5. If proper sire selection allows one to improve weaning weight and other management items remain at the same level, an improvement in weaning weight of 15 lb has the same value as improving calf crop by 3 percentage units or as decreasing annual cow costs by \$12 or as selling the calves for \$1.50 more per hundredweight.

Fortunately, improving status in one profit determinant area is not antagonistic to another. Thus, if one simultaneously increases weaning weight by 25 lb and calf crop percentage by 5%, the combination of these two increases has the same benefit as reducing annual costs by \$40/cow or as increasing the selling price by \$5/cwt. An increase in cow costs of \$40/year can be compensated for by any combination of increasing calf crop percentage, weaning weight or selling price that has the summed equivalent value of \$40 cow cost per year.

Evaluation of Management Strategies

From the previous discussion, it is evident that many management factors affect costs of production in cow/calf enterprises. The bottom line, however, is the total amount of pounds weaned per brood cow. This figure usually represents the only source of income to offset annual maintenance cost of brood cows in cow/calf production enterprises. Some factors affecting weaning weight per brood cow were discussed. Figure 1 (adapted from Taylor, 1994) attempts to represent the interrelationships among these factors. Thus, when weaning weight per brood cow is low, a producer can use this figure to evaluate the interrelationships among management strategies that resulted in low weaning weight and plan appropriate strategies to improve.

On the left hand side of Figure 1, are factors associated with fertility (and health). On the right hand side of Figure 1 are factors associated with growth (genetics and health). Thus, weaning percentage or weaning weight per calf, respectively, would be the starting points.

If weaning percentage is low, it could be due to cows that failed to wean calves because they remained open (a fertility problem caused by either disease, male or female reproductive problems, poor nutrition or, where applicable, poor AI technique). Another reason for low weaning percentage could be that they conceived but lost calves in utero at or after birth (usually a health problem). On the other hand, if weaning weight is low, it could be due to age of calf when weaned (extended breeding season) or low daily gain from birth resulting from poor growth

(poor genetics or health of offspring or low dam's milk yield). Low dam's milk yield is also a result of poor genetics, nutrition or health. Health problems in calves are often times associated with low weaning percentage. Thus, based on production records, a producer can follow this diagram to pinpoint the exact cause of the problem and implement a plan to solve it before it impacts profitability further.

Producers are encouraged to utilize their records and relationships among equivalent values in conjunction with this figure to define economic viability of problem solving strategies. For instance, records from a producer may indicate low weaning weights per cow exposed. A look at weaning weight of the calves indicates that preweaning growth, nutrition and health were possibly adequate (weaning weights were over 500 lb). Records on weaning percentage reveal that some mature cows failed to conceive. Therefore, the producer focuses on why they failed to conceive. An evaluation of the body condition and nutritional management of the mature cows indicates that precalving nutrition could have been better. Therefore, the producer focuses on improving precalving nutrition of the mature cows. Using the relationships described above, the producer knows that for weaning percentage to improve 10 units, he/she can spend less than \$40 more per cow per year on improving precalving nutrition and reduce breakeven price, provided weaning weights are unaffected.

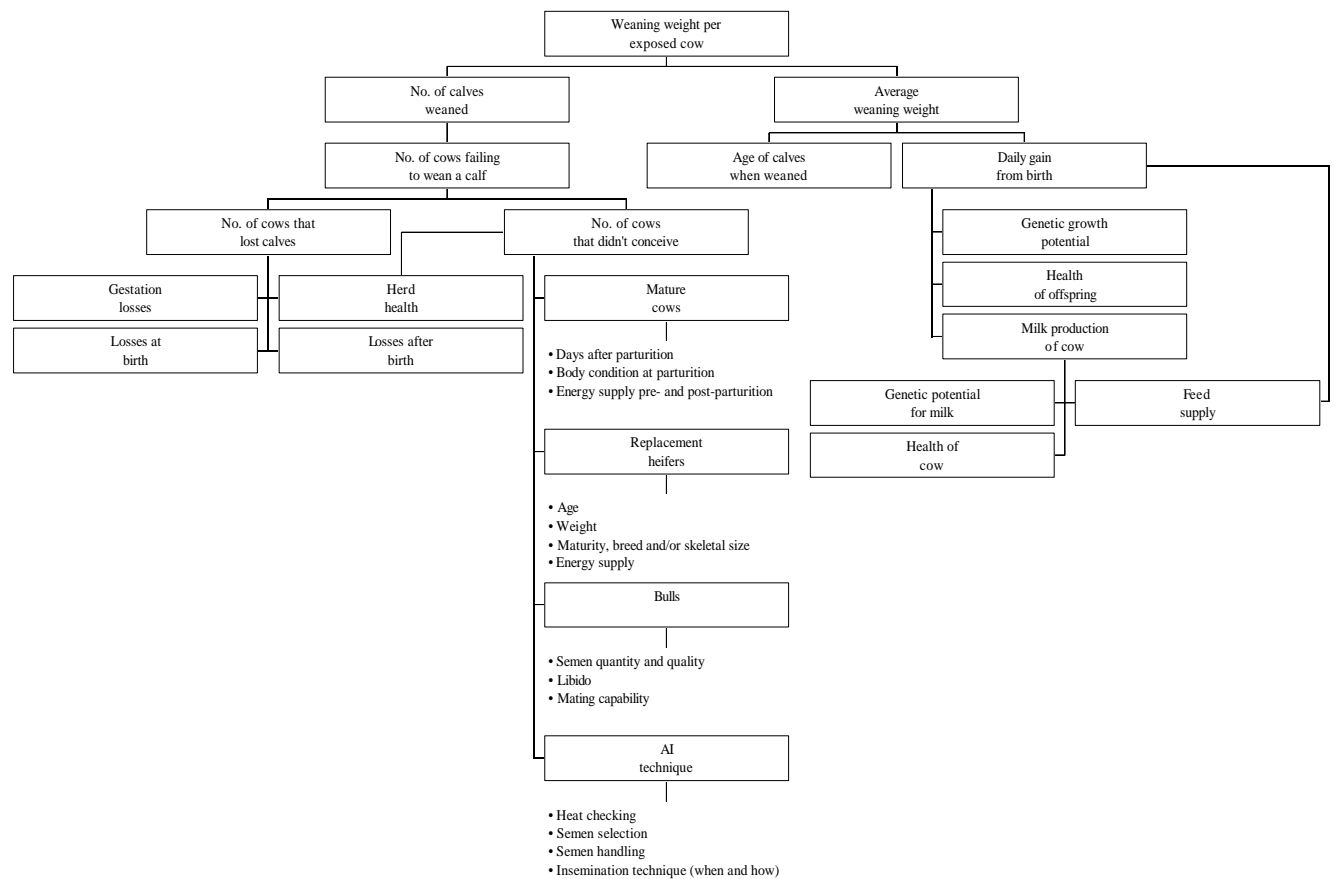


Figure 1. Factors affecting weaning weight per brood cow (adapted from Taylor, 1994).

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