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## **FARM BUSINESS MANAGEMENT REPORTS**

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# **Using DHIA and Business Records to Identify an Economic Culling Point for the Dairy Herd**

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Using DHA and  
Business Records  
to Identify an  
Economic  
Culling Point  
for the  
Dairy Herd

THE USE OF DHIA AND BUSINESS RECORDS  
IN IDENTIFYING AN ECONOMIC CULLING  
POINT FOR THE DAIRY HERD

by

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INTRODUCTION

Upgrading herd productivity will often be the most attractive opportunity the dairyman has for improving business profits. This is particularly true for herds producing at average or below average levels. An obvious means of improving herd productivity and business performance is replacing low-producing, unprofitable cows with high-producing, profitable ones. Thus, identifying cows that should be culled because of unprofitable production is a major management problem confronting the dairyman.

In deciding whether to cull a particular cow, the dairyman may raise at least three questions: (1) Will this cow during her tenure in the herd produce at a profitable level?, (2) If it is likely that she will not be a profitable producer, when should she be culled?, and (3) Can the cow be replaced with one producing at a higher profit level? The objective of this publication is to present a procedure whereby dairymen can answer questions one and two within the context of their own herds. Specific objectives are to indicate how the dairyman can identify: (1) cows whose projected 305-day, mature equivalent, milk production is unprofitable and therefore, considered a potential cull, and (2) the level of daily milk production during the current lactation period at which culling is economically desirable. Worksheets based on information available from DHIA and business records are presented to facilitate making the necessary computations. Also, data from an example herd are used to illustrate relevant concepts and use of the worksheets.

IDENTIFICATION OF POTENTIAL CULLS DUE TO LOW MILK PRODUCTION

Dairymen in Washington, Oregon and Idaho belonging to the Dairy Herd Improvement Association (DHIA) receive a monthly report called the Barn Management Form. This report ranks each cow in the herd according to her test day production of 3.5 percent fat corrected milk. Several other types of key management information appear for each cow in the herd on the report, including days in milk, pounds of milk produced on test day, and the cow's production expressed as a percent of the herd's average milk production. A Barn Management Form for an example herd appears in the Appendix.

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The "percent of herd average" appearing in the last column of the Barn Management Form is highly useful in determining the optimal economic culling level. Thus, the exact meaning of this measure should be clearly understood. The percent of herd average is computed by dividing each cow's projected 305-day-2X-mature equivalent (ME)-3.5% fat corrected milk (FCM)<sup>1/</sup> by the herd's average 305-day-2X-ME-FCM production. Cows with more than 90 days of production during the current lactation have a sufficient basis to insure a valid indication of their percent of herd average production. It is generally recognized that the "percent of herd average" is the single best DHIA measure available for comparing the 305-day performance of all cows in the herd on an equivalent basis. Comparability is enhanced as production is adjusted for known sources of variation-the cow's age, season of calving, length of lactation and frequency milked.

It follows that the "percent of herd average" on the Barn Management Form offers the best criteria the dairyman has to evaluate the relative long-term productivity of each cow. However, the dairyman is still faced with the problem of using such a measure to determine the optimal economic culling point. Specifically, it is necessary to identify on an economic basis the percent of herd average below which serious thought should be given to removing cows from the herd.

As dairymen are well aware, numerous factors determine the optimal economic culling point. A listing of such factors would include, but certainly is not limited to: (1) productivity of the herd, (2) milk price, (3) feed costs, (4) non-feed costs, (5) cull cow prices, (6) cost of replacements, (7) productivity of replacements, and (8) utilization of facilities. The difficulty dairymen have in obtaining information specific to their herds on such a large number of variables, plus computational complexities, points to the need for a simplified approach.

Accordingly, it is suggested that dairymen base their primary culling criteria on the percent of the herd's average milk production at which total per-cow production costs equal total returns. Such a criteria assumes a cow unable to make money on a mature equivalent basis will not be profitable during her stay in the herd, however long that may be. Culling on a break-even basis overlooks the opportunity some dairymen may have to improve profits by replacing lower producing, but nevertheless profitable cows, with superior cows. However, it simplifies the replacement problem so that it is manageable by most dairymen. Moreover, while culling below break-even production levels does not necessarily maximize profits, it does insure that profits will increase (or losses decrease).

In order to compute the percent of herd average at which costs equal returns, good business records for the dairy enterprise are necessary. The type of information required is presented for the example herd in Tables 1 and 2. Annual per-cow costs for cows producing at the herd's average 305-day-2X-ME level must be estimated (Table 1). Thus, the feeding program and costs should support a cow producing at that level.

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<sup>1/</sup> The estimated 305-day-2X-ME is the 305-day record that a cow would be expected to make if she follows a standard lactation curve through to maturity.

Items included in the cost estimates are grouped into two major categories: (1) variable and (2) fixed costs. Variable costs are outlays varying with the number of cows supported by the fixed facilities (buildings and equipment). Such costs include feed, veterinary and medicine, breeding, bedding, utilities, fuel, repairs, supplies, labor, property taxes on cow, DHIA, replacement, interest on capital borrowed to finance replacement animals and other operating expenses, and milk hauling and marketing charges. The second type of costs, fixed costs, are incurred regardless of herd size. These costs are largely associated with the ownership of facilities (buildings, equipment and land in the farmstead) and include depreciation, property taxes, insurance, interest on borrowed capital, and various miscellaneous outlays (e.g., dues, telephone, legal, accounting, travel). Where buildings, equipment, and land are leased, rental costs should be substituted for ownership costs (e.g., property taxes, depreciation, insurance, and interest). As will be noted later, a distinction between variable and fixed costs is important in deciding when to cull.

Since the procedure used here is based on mature equivalent production levels, a longer-run view is taken, particularly for the younger cows in the herd. Therefore, input prices (e.g., feed and other supplies) should not necessarily be current prices. The appropriate planning horizon is two to four years and prices should reflect the dairyman's judgement of average price levels applying over that period. Also, inputs produced on the farm (e.g., feed, replacement animals) should be valued at market prices to insure that non-dairy enterprises do not influence the computation of break-even production levels.

The culling point, as defined here, is the production level at which the dairyman receives no return for his labor, management and equity capital resources. Consequently, costs for these inputs are not included in Table 1.<sup>2/</sup> Wages paid for hired labor and interest paid on borrowed capital should be included, however.

Annual gross receipts for the cow producing at the herd's 305-day-2X-ME average must also be estimated (Table 2). Receipts should include milk sales, calf sales, a credit for calves retained, cull cow sales, and a manure credit. As was the case with inputs, prices should reflect an average over the next two to four years, not necessarily current ones. Also, the milk price should be a blend price, or weighted average of the base and excess price, since a culling point is determined with reference to the entire herd. The price received for milk in excess of that supported by base will usually be the appropriate price in deciding when to cull a particular cow (more on this later).

Once the information in Tables 1 and 2 has been assembled, the break-even percent of herd average production can be computed. To facilitate that computation, Worksheet I was developed. The worksheet contains 15 steps, with each step indicating the type of information required and the necessary computation. Its use is illustrated for the example herd assumed in Tables 1 and 2.

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<sup>2/</sup> If the dairyman wishes to cull on the basis of a target return on his resources (e.g., \$5.00 per hour for labor and management, 8 percent return on equity capital investment), costs reflecting these returns should be added to those appearing in Table 1.

Table 1. Estimated annual costs for a dairy cow producing 15,400 pounds of milk, (305-day - 2X - ME), example herd.

Item	Dollars Per Cow	
	Example Herd	My Herd
<b>VARIABLE COSTS</b>		
Feed:		
Concentrate (4,858 lbs. @ \$120 per ton) . . . . .	\$ 291.48	
Alfalfa hay (3,729 lbs. @ \$75 per ton). . . . .	139.84	
Silage (9,451 lbs. @ \$20 per ton) . . . . .	94.51	
Pasture (173 days = 4,890 lbs. hay equiv. @ \$75 per ton)	183.38	
Dairy mineral (2:1 Ca-P, 139 lbs. @ \$16.75 per cwt. . .	23.28	
Total feed costs . . . . .	732.49	
Non-feed:		
Veterinary and medicine . . . . .	20.00	
Breeding fees . . . . .	17.60	
Bedding . . . . .	5.50	
Utilities & fuel. . . . .	17.63	
Repairs on buildings and equipment. . . . .	26.09	
Supplies (soap, inflations, brushes, etc.) . . . . .	10.00	
Hired labor (20 hrs. @ \$4.10 per hr.) . . . . .	82.00	
Property taxes on cow . . . . .	3.78	
Replacement heifer (33 1/3% x \$600) . . . . .	200.00	
Milk hauling & marketing. . . . .	59.75	
DHIA. . . . .	8.00	
Interest paid on cow loan . . . . .	44.58	
Interest paid on milk base loan . . . . .	20.25	
Interest paid on operating capital loan . . . . .	25.81	
Total non-feed variable costs. . . . .	540.99	
Total variable costs . . . . .	1,273.48	
<b>FIXED COSTS</b>		
Property taxes on buildings, equip. & land . . . . .	15.17	
Insurance (fire, wind, liability) . . . . .	12.00	
Depreciation on bldg. & equip. . . . .	90.51	
Interest paid on bldg., equip., & land loans . . . . .	41.81	
Miscellaneous (magazines, dues, telephone, travel, legal, acct., etc.) . . . . .	5.00	
Total fixed costs. . . . .	164.49	
TOTAL COSTS PER COW (Except operator labor, management, and equity capital) . . . . .	\$1,437.97	

SOURCE: 1976 Dairy Enterprise Budgets for a 120 Cow Western Washington Dairy Herd, E.M. 4039, April, 1976, Washington Cooperative Extension Service.

Table 2. Estimated annual gross receipts for a dairy cow producing 15,400 pounds of milk (305-day-2X-ME), example herd.

Item	Dollars Per Cow	
	Example Herd	My Herd
Milk sales (15,400 lbs. x 97% shipped @ \$9.50/cwt.).	<u>\$1,419.11</u>	_____
Calf sales (402-day calving interval, 12% mortality = .4 bull @ \$10 + .4 heifer @ \$50) . . . .	<u>24.00</u>	_____
Cull cow sales (33 1/3% culled or died - 2% death loss x 1,300 lbs. @ 21¢/lb.) . . . . .	<u>85.45</u>	_____
Manure credit (40 lbs. N @ 16.3¢, 70 lbs. P <sub>2</sub> O <sub>5</sub> @ 23.8¢, 140 lbs. K <sub>2</sub> O @ 11.4¢) . . . . .	<u>39.14</u>	_____
TOTAL RETURNS PER COW	<u>\$1,567.70</u>	_____

The worksheet initially requires that the dairyman estimate total annual gross receipts per cow (lines 1-4). Next, annual feed costs (line 5), non-feed variable costs (line 6), and total variable costs (line 7) are estimated. Fixed costs must also be estimated (line 8). Total per-cow costs equal the sum of variable and fixed costs and that estimate appears on line 9. Subtraction of total costs from total receipts (line 4) gives the dairyman an estimate of per-cow annual returns. (line 10). These are returns to the dairyman's labor, management and equity capital, providing costs for these resources were not included on line 9. Lines 11-14 ask the dairyman to estimate the reduction in returns resulting from a five-percent decrease in milk production. That estimate (line 14) is obtained by subtracting reduced feed costs (line 13) from the reduction in milk sales (line 12).<sup>3/</sup>

The final step in the worksheet divides the returns per cow producing at the herd's average production level (line 10) by the reduction in per-cow returns per five-percent decrease in milk production (line 14). The result of that division, when multiplied by five, gives the percent decrease from the herd's average 305-day-2X-ME milk production necessary to equate costs and returns. Subtraction of that percent from 100 percent gives the herd's break-even percentile (line 15).

Those cows whose percent of herd average, as listed on the Barn Management Form, falls below the break-even percentile (line 15 of worksheet) should be considered candidates for culling. Of course, dairymen may want to take other factors into account when deciding if a particular cow is to be culled.

<sup>3/</sup> If feed is not adjusted according to production, line 13 should be left blank.

WORKSHEET I: IDENTIFICATION OF HERD'S  
BREAK-EVEN PERCENT OF HERD AVERAGE MILK PRODUCTION

1.	Enter herd's average 305-day, M.E., 3.5% fat corrected milk production . . . . .	<u>154.0</u> cwt.
2.	Multiply line 1 times % of milk shipped times milk price per cwt. ( <u>154.0</u> line 1 x <u>.97</u> x <u>\$9.50</u> milk price) . . . . .	\$ <u>1,419.11</u>
3.	Enter other receipts per cow per year (calf, cull cow, manure credit) . . . . .	\$ <u>148.59</u>
4.	Enter total gross receipts per cow per year (line 2 plus line 3) . . . . .	\$ <u>1,567.70</u>
5.	Enter total annual feed costs per cow producing at 305-day, M.E., herd average. . . . .	\$ <u>732.49</u>
6.	Enter annual non-feed variable costs per cow <sup>1/</sup> . . . . .	\$ <u>540.99</u>
7.	Enter total variable costs per cow (line 5 plus line 6) . . . . .	\$ <u>1,273.48</u>
8.	Enter total annual fixed costs per cow <sup>2/</sup> . . . . .	\$ <u>164.49</u>
9.	Enter total annual variable and fixed costs per cow producing at 305-day, M.E., herd average (line 7 plus line 8) . . . . .	\$ <u>1,437.97</u>
10.	Enter annual returns to operator labor, management, and equity capital investment in buildings, equipment, and land per cow producing at 305-day, M.E., herd average (line 4 - line 9). \$	<u>129.73</u>
11.	Enter 5% of herd's average 305-day, M.E., milk production (line 1 times .05). . . . .	<u>7.7</u> cwt.
12.	Multiply line 11 times % of milk shipped times milk price per cwt. ( <u>7.7</u> line 11 x <u>.97</u> x <u>\$9.50</u> milk price). . . . .	\$ <u>70.96</u>
13.	Enter reduction in annual feed costs for cow producing at 95% rather than 100% of herd's average 305-day, M.E., milk production. . . . .	\$ <u>20.58</u>
14.	Enter reduced per-cow income per 5% reduction in production from herd's average 305-day, M.E., milk production (line 12 minus line 13) . . . . .	\$ <u>50.38</u>
15.	HERD BREAK-EVEN PERCENTILE EQUALS 100 MINUS (LINE 10 ÷ LINE 14 x 5) <sup>3/</sup> . . . . .	<u>87</u> %

<sup>1/</sup> Includes vet.-med., breeding, bedding, utilities and fuel, repairs, supplies, hired labor, property taxes and insurance on cow, hauling and marketing, annual cow replacement cost, DHIA, and interest on cow, milk base, feed, and other operating capital loans.

<sup>2/</sup> Includes (1) property taxes and insurance on buildings, equipment and land allocable to dairy enterprise, (2) depreciation on buildings and equipment, (3) interest paid on money borrowed to finance buildings, equipment, and land allocable to dairy enterprise, and (4) miscellaneous expenses (magazines, dues, telephone, legal, accountant, etc.).

<sup>3/</sup> When line 10 is a negative number, the breakeven percentile is 100 plus (line 10 ÷ line 14 x 5).



Such factors might include (1) availability, cost and productivity of a replacement (2) temporary sickness, disease or injury that has depressed production during current lactation, (3) need to maintain milk base, or (4) possibility of the cow dropping a potentially high-producing heifer calf.

An examination of the Barn Management Form for the example herd (see Appendix) indicates that 15 of the herd's 97 cows (milking and dry) fall below the computed break-even percentile (87%). Cows projected to lose money on a projected 305-day-2X-ME basis are ranked 42, 48, 50, 57, 58, 61, 62, 64, 70, 71, 72, 74, 78, 85 and 94. All of these cows have at least 90 days in milk and therefore, should have had adequate milking time during the current lactation to accurately predict their M.E. productivity.

Before making cull decisions, dairymen will want to vary key business factors for which there is considerable uncertainty to determine the impact such variation has on the break-even percentile. Thus, several worksheets should be filled out with different assumptions for such variables as (1) milk price, (2) feed costs, (3) replacement cost, and (4) cull cow prices. The impact of different milk and hay prices on the example herd break-even percentile is noted in Table 3. Also, dairymen should re-compute the break-even percentile whenever there is a significant adjustment in herd productivity (305-day-2X-ME) and/or feeding program, feed prices, milk price, etc.

Table 3. The impact of alternative hay and milk prices on the breakeven percent of herd average production, example herd, with 305-day-2X-ME average milk production of 15,400 pounds.

Hay Price (\$/Ton)	Milk Price (\$/cwt.)		
	9.00	9.50	10.00
70	92	85	79
80	96	89	83
90	101	94	87
100	106	98	91

\*/ Based on information appearing in example analysis, Worksheet I.

DECIDING WHEN TO CULL

Once the cows to be culled have been identified, dairymen must determine the most profitable point within the current lactation period to sell the cows. Under most business circumstances, it will not pay to keep a cow for her entire lactation. As a cow approaches the end of her lactation and daily milk production drops, a point is usually reached where the added milk sales from continuing to milk the cow no longer cover the added costs. If the cow is kept beyond this point, she loses money. Thus, profitable culling requires that dairymen identify the particular point in the lactation at which milk sales fall below the relevant costs. The specific costs determining the most profitable culling point depends upon whether a replacement or excess facility capacity is available.

REPLACEMENT NOT AVAILABLE OR ABLE TO SUPPORT ADDITIONAL COWS WITH EXISTING FACILITIES

When replacements are either not available or existing facilities (e.g., barn space) will accommodate additional cows without removing cows from the current herd, a cow should not be culled as long as her milk sales cover variable costs. In this case, variable costs are defined as the added costs incurred by continuing to milk the cow. Fixed costs (i.e., depreciation, interest, property taxes, and insurance on buildings and equipment) are not a relevant factor in the decision, since they are experienced whether the cow is culled or not. Thus, even if a cow is not generating enough daily milk sales to cover full (fixed and variable) costs, the dairyman should continue to milk her, provided she more than covers variable costs.

Culling a cow when there is no replacement immediately available implies a daily loss equaling her fixed costs. By continuing to milk a cow more than covering variable costs, at least a part of the fixed costs are recovered. When variable costs are not covered, losses can be restricted to the fixed costs by culling the cow. The example below illustrates these concepts.

	<u>Case I</u> <u>(Variable Costs Covered)</u>	<u>Case II</u> <u>(Variable Costs Not Covered)</u>
Daily milk receipts	\$4.25	\$3.25
Daily variable costs	4.00	3.50
Daily fixed costs	<u>.50</u>	<u>.50</u>
Daily total costs	\$4.50	\$4.00
Loss if culled	\$ .50 (fixed cost)	\$ .50 (fixed cost)
Loss if not culled	\$ .25 (\$4.50-\$4.25)	\$ .75 (\$4.00-\$3.25)

In Case I (where variable costs are covered), losses are minimized by not culling, even though milk sales are less than total costs. However, when production falls to the point where variable costs are not covered (Case II), losses are minimized by selling the cow.

Thus, a profitable culling policy would be to cull when daily milk production falls to the point where the value of that production equals daily variable costs. Worksheet II, Part I, was designed to help dairymen identify that daily production level. To use the Worksheet, first estimate the daily feed costs (lines 1-3) for cows fed at lower production levels. The price paid for feed currently fed should be used in estimating feed costs. Lower producing cows in the example herd are fed 37 pounds of hay at \$85.00 per ton and 10 pounds grain at \$130 per ton, thus daily feed costs are \$2.22.

Next, daily non-feed variable costs must be determined (line 4). To identify these costs, the dairyman should ask the question: What daily costs will be eliminated if the cow is culled? While the answer to that question will vary depending upon the situation at hand, the following costs (as estimated for the example herd) would typically be eliminated:

<u>Item</u>	<u>Cost Per Cow Per Year</u>	
	<u>Example Herd<sup>4/</sup></u>	<u>My Herd</u>
Veterinary - medicine	\$ 20.00	_____
Bedding	5.50	_____
Utilities and fuel	17.63	_____
Repairs (bldg. & equip.)	26.09	_____
Supplies	10.00	_____
Milk hauling and marketing	59.75	_____
Interest on above and feed costs	24.70	_____
Interest on the cow's cull value (1,300 lbs. @ 21¢ x 10%)	<u>27.30</u>	_____
TOTAL PER YEAR	\$190.97	_____
TOTAL PER DAY (\$190.97 ÷ 365)	<u>.52</u>	_____

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<sup>4/</sup> Taken from Table 1.

WORKSHEET II: COMPUTATION OF WHEN TO CULL WITHIN A LACTATION

I. REPLACEMENT NOT AVAILABLE OR ABLE TO SUPPORT ADDITIONAL COWS WITH EXISTING FACILITIES.

1. Enter daily hay costs per cow (37 lbs. @ <u>4 1/4</u> ¢ per lb.)...	\$ <u>1.57</u>
2. Enter daily silage costs per cow (___ lbs. @ ___¢ per lb.).....	\$ _____
3. Enter daily grain costs (10 lbs. @ <u>6 1/2</u> ¢ per lb.).....	\$ <u>.65</u>
4. Enter daily non-feed costs per cow that would be eliminated if cow is culled*/.....	\$ <u>.52</u>
5. Total daily variable costs per cow (add lines 1-4)....	\$ <u>2.74</u>
6. BREAK-EVEN DAILY PRODUCTION EQUALS LINE 5 ÷ PRICE OF MILK PER LB. ( <u>2.74</u> LINE 5 ÷ <u>8 1/4</u> MILK PRICE).....	<u>33 lbs.</u>

II. REPLACEMENT AVAILABLE AND FACILITIES FULLY UTILIZED.

1. Enter daily hay costs per cow (37 lbs. @ <u>4 1/4</u> ¢ per lb.)	\$ <u>1.57</u>
2. Enter daily silage costs per cow (___ lbs. @ ___¢ per lb.).....	\$ _____
3. Enter daily grain costs per cow (10 lbs. @ <u>6 1/2</u> ¢ per lb.).....	\$ <u>.65</u>
4. Enter daily non-feed variable costs per cow (line 6, Worksheet I ÷ 365).....	\$ <u>1.48</u>
5. Enter daily fixed costs per cow (line 8, Worksheet I ÷ 365).....	\$ <u>.45</u>
6. Total daily costs per cow (add lines 1-5).....	\$ <u>4.15</u>
7. Enter daily receipts per cow from cull cow, calf and manure (line 3, Worksheet I ÷ 365).....	\$ <u>.41</u>
8. Net daily costs per cow (line 6 minus line 7).....	\$ <u>3.74</u>
9. BREAK-EVEN DAILY PRODUCTION EQUALS LINE 8 ÷ PRICE OF MILK PER LB. (\$___ NET COST ÷ ___¢ MILK PRICE).....	<u>45 lbs.</u>

\*/ Will usually include veterinary-medicine, bedding, utilities and fuel, repairs, supplies, milk hauling and marketing, interest on the preceding and feed costs, and interest on the cow's cull value. May also include breeding fee, property taxes on the cow, DHIA, and labor.

Other costs that may be eliminated are breeding fees, property taxes on cow, DHIA, and labor. If culling a cow releases labor that can be used in an alternative productive use, the value of the labor in that use, whether it is hired or operator labor, should be charged against the cow. Also, when the billing policy is such that property taxes and DHIA fees must be paid if the cow is retained, these outlays should be included as a variable cost.

Total daily variable costs (line 5) divided by the price of milk per pound gives the level of daily milk production at which the value of daily milk sales equals daily variable costs (line 6). The milk price should reflect the price received for milk not supported by base, assuming the dairyman is producing excess milk. However, if all of the daily production is base milk, the base price should be used.<sup>5/</sup>

Assuming replacement cows are not available or excess facility capacity, the culling point for the example herd is 33 pounds (Worksheet II, Part I, Line 6). Thus, profit maximization suggests that of the 15 cows identified as unprofitable on a mature equivalent basis (Worksheet I), only those currently producing less than 33 pounds per day should be immediately culled. The Barn Management Form (Appendix) indicates that the cows ranked 70, 71, 72, 74, 78, 85, and 94 are below 33 pounds. However, cows 85 and 94 are currently dry and due to calve in 12 and 62 days, respectively, so the example dairyman may wish to keep these two cows long enough to profit from high post-calving production. The cows ranked 70, 71, 72, 74, and 78 should be considered strong candidates for immediate culling as they are clearly costing the dairyman more to keep than they are returning.

#### REPLACEMENTS AVAILABLE AND FACILITIES FULLY UTILIZED

If replacement animals are immediately available and facilities are fully utilized, culling should occur when the cow fails to cover total variable and fixed costs. The continued operation of the business is dependent upon the realization of a profit from the herd over the long-run. If an individual cow is to make a contribution to that profit, she must generate income sufficient to cover not only her variable costs, but her share of the fixed costs as well. Thus, the dairyman cannot afford to continue milking a cow producing at less than break-even levels, particularly when replacements with a better profit potential are available.

Part II of Worksheet II provides a procedure whereby the dairyman can compute the daily pounds of milk production required to cover the full costs of daily production. Feed costs are the same as noted for Part I of the worksheet. Annual non-feed variable and fixed costs were estimated on Worksheet I (lines 6 and 8, respectively) and can be used for this worksheet, once they have been converted to a daily figure. Since the intent is to determine the level of milk production at which total receipts equal total costs, income from sources other than milk (i.e., cull cow, calf, manure) should be recognized. This income was estimated on an annual basis on Worksheet I (line 3) and needs only to be converted to a daily basis to be used here.

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<sup>5/</sup> It will be necessary to recompute the culling point whenever there is a significant change in the feeding program, feed prices, or milk price.

The break-even level of daily milk production is computed by dividing total daily costs (line 6), reduced by non-milk receipts (line 7), by the price per pound of milk. Like Part I of the Worksheet, the milk price should be the excess price if the dairyman is producing above available base.

The analysis for the example herd indicates that cows producing below 45 pounds per day should be considered strong candidates for immediate culling. This assumes good replacement animals are available and complete utilization of facilities. An examination of the herd's Barn Management Form (Appendix) will indicate that of the 13 cows below the break-even 87 percentile and not dry, the nine cows ranked 57, 58, 61, 62, 64, 70, 71, 72, and 78 are below 45 pounds of daily production and therefore, eligible for culling. However, if for example, only five replacements are available, the dairyman should cull the five lowest ranking cows (i.e., those ranked 64, 70, 71, 72, and 78) and keep the remaining four, provided they are more than covering their variable costs. Since the analysis in Part I of the worksheet indicated these four cows were covering their variable costs, they should remain in the herd until their production drops below the 33-pound break-even level.

Appendix  
BARN MANAGEMENT FORM

Example Herd			Test Period is 12-07-76 to 1-24-77											
Cow Rank	Barn Name	Index No.	T-Day Milk Lbs.	T-Day Milk Value	Lbs. Dif. From Last T-Day Lbs.	T-Day % Fat	M T	Grain Guide Lbs.	Days in Milk	Days to Next Calving	Date Due	Age Last Calving Yrs. Mos.	% Herd Avg.	
1	85	85	90.0	8.76	+ 0.0	4.1		32	31			3 10		
2	51	51	92.5	8.78	+ 0.0	3.8		31	35			4 10		
3	84	84	103.5	9.24	+ 0.0	3.1		31	35			3 10		
4	3	3	84.0	8.37	+ 0.0	4.4		31	37			5 11		
5	69	69	96.0	8.80	+10.0	3.4		30	62	B		4 0	117	
6	38	38	93.5	8.65	+ 0.0	3.5		30	27			5 3		
7	30	30	86.0	8.23	+ 0.0	3.9		29	46	B		4 10		
8	39	39	86.0	8.16	+ 0.0	3.8		29	28			5 2		
9	78	78	86.5	8.00	+14.0	3.5		28	58	B		3 11	107	
10	104	104	82.0	7.78	- 0.5	3.8		28	95	262	10 13	3 0	114	
11	70	70	90.0	8.11	+ 0.0	3.2		28	36			4 1		
12	76	76	77.5	7.54	+ 5.5	4.1		27	62	B		4 0	107	
13	42	42	68.0	7.05	- 0.5	4.9		27	62	B		4 11	100	
14	77	77	86.0	7.75	+18.5	3.2		26	59	B		4 0	99	
15	47	47	79.0	7.43	+27.5	3.7		26	394	B		4 0	107	
16	512	512	77.5	7.29	- 3.0	3.7		26	79	270	10 21	7 4	95	
17	689	689	69.5	6.82	- 3.0	4.2		25	140	B		6 0	100	
18	201	201	72.5	6.94	+ 0.0	3.9		25	37			2 1		
19	79	79	80.0	7.21	+11.0	3.2		25	66	B		4 1	95	
20	71	71	82.0	7.13	+ 0.0	2.8		24	48	B		4 1	89	
21	138	138	71.5	6.67	+ 0.0	3.6		23	37			2 5		
22	110	110	65.0	6.38	-10.5	4.2		23	116	267	10 18	2 10	142	
23	135	135	74.0	6.73	+ 0.0	3.3		23	43	B		2 5	113	
24	23	23	70.0	6.53	- 2.5	3.6		23	80	279	10 30	5 5	91	
25	147	147	69.5	6.43	+ 0.0	3.5		22	42	B		2 2	112	
26	143	143	64.0	6.18	+ 0.0	4.0		22	43	B		2 3	110	
27	62	62	64.0	6.07	- 5.0	3.8		22	92	273	10 24	4 3	95	
28	20	20	66.0	6.16	- 6.5	3.6		22	164	226	10 17	5 3	106	
29	701	701	62.5	5.98	+ 0.0	3.9		21	17			6 0		
30	72	72	58.0	5.78	- 5.0	4.4		22	96	248	9 30	3 11	89	
31	35	35	69.5	6.26	- 8.5	3.2		21	84	262	10 13	5 2	98	
32	146	146	65.5	6.06	+ 0.0	3.5		21	33			2 2		
33	15	15	62.0	5.88	- 5.5	3.8		21	250	160	7 3	5 1	117	
34	90	90	57.0	5.64	-14.5	4.3		21	122	239	9 21	3 3	108	
35	211	211	63.5	5.87	+ 0.0	3.5		20	31			2 0		
36	207	207	58.5	5.65	+ 0.0	4.0		20	37			2 0		
37	202	202	57.0	5.55	+ 0.0	4.1		20	23			2 1		

Cows are ranked in descending sequence of test day production of 3.5% fat corrected milk

## BARN MANAGEMENT FORM

Example Herd			Test Period is 12-07-76 to 1-24-77											
Cow Rank	Barn Name	Index No.	T-Day Milk Lbs.	T-Day Milk Value	Lbs. Dif. From Last T-Day Lbs.	T-Day % Fat	M T	Grain Guide Lbs.	Days in Milk	Days to Next Calving	Date Due	Age Last Calving Yrs. Mos.	% Herd Avg.	
38	45	45	54.5	5.43	- 6.0	4.4		20	211	178	7 21	4 5	112	
39	385	385	60.0	5.65	- 2.0	3.7		20	267	249	10 1	7 9	113	
40	203	203	56.0	5.45	+ 0.0	4.1		20	28			2 1		
41	139	139	65.5	5.85	+ 2.0	3.1		20	95	251	10 3	2 3	106	
42	60	60	57.5	5.50	+ 0.5	3.9		20	96	278	10 29	3 10	74	
43	106	106	52.0	5.18	-14.0	4.4		19	93	262	10 13	2 11	105	
44	150	150	62.0	5.59	- 5.0	3.2		19	80	B		2 0	107	
45	210	210	56.0	5.27	+ 0.0	3.7		19	49	B		2 0	96	
46	67	67	56.5	5.18	-20.0	3.4		18	155	249	10 1	4 0	119	
47	102	102	56.5	5.14	- 7.5	3.3		18	118	276	10 27	2 11	98	
48	98	98	51.5	4.89	- 3.0	3.8		17	121	233	9 15	3 1	80	
49	213	213	51.0	4.84	+ 0.0	3.8		17	27			2 0		
50	144	144	47.5	4.58	+ 8.0	4.0		17	155	259	10 10	2 0	85	
51	122	122	45.0	4.41	- 3.0	4.2		16	173	B		8 7	94	
52	52	52	47.5	4.51	- 2.0	3.8		16	293	75	4 10	4 1	112	
53	0122	121	48.0	4.52	+ 0.0	3.7		16	142	198	8 10	2 7	89	
54	129	129	43.5	4.30	+ 0.5	4.3		16	266	100	5 5	1 11	118	
55	136	136	48.0	4.48	+ 4.0	3.6		16	239	114	5 18	1 11	98	
56	149	149	35.0	3.71	+ 0.0	5.2		15	8			2 3		
57	61	61	41.5	3.97	- 3.0	3.9		14	160	210	8 22	4 1	84	
58	26	26	39.5	3.84	- 3.0	4.1		14	177	179	7 22	5 0	80	
59	75	75	47.0	4.12	- 9.0	2.9		14	231	161	7 4	3 6	93	
60	89	89	41.5	3.84	- 7.0	3.5		13	158	233	9 15	3 2	93	
61	691	691	41.0	3.79	- 5.0	3.5		13	176	B		6 2	67	
62	134	134	39.0	3.70	+ 2.5	3.8		13	159	221	9 3	2 2	78	
63	83	83	29.5	3.25	- 1.0	5.7		14	357	122	5 26	3 0	135	
64	64	64	38.0	3.61	- 2.5	3.8		13	168	208	8 20	4 0	84	
65	56	56	32.0	3.34	-13.0	5.0		13	211	198	8 10	4 0	101	
66	112	112	31.5	3.32	+ 2.5	5.1		13	374	72	4 7	2 1	108	
67	724	724	29.5	2.99	-17.5	4.6		11	311	102	5 7	5 2	104	
68	115	115	29.0	2.96	- 0.5	4.7		11	263	93	4 28	2 4	89	
69	125	125	28.0	2.70	- 5.0	4.0		10	252	118	5 22	2 1	88	
70	11	11	29.0	2.73	-14.5	3.7		10	172	198	8 10	5 5	69	
71	131	131	25.0	2.51	-12.0	4.5		9	184	148	6 21	2 2	80	
72	59	59	26.0	2.51	- 9.0	4.0		9	223	216	8 28	3 11	75	
73	679	679	29.5	2.59	-19.0	2.9		9	293	156	6 29	6 1	101	
74	58	58	25.5	2.40	- 7.0	3.7		8	225	198	8 10	3 11	86	

Cows are ranked in descending sequence of test day production of 3.5% fat corrected milk.



## BARN MANAGEMENT FORM

Example Herd			Test Period is 12-07-76 to 1-24-77											
Cow Rank	Barn Name	Index No.	T-Day Milk Lbs.	T-Day Milk Value	Lbs. Dif. From Last T-Day Lbs.	T-Day % Fat	M T	Grain Guide Lbs.	Days in Milk	Days to Next Calving	Date Due	Age Yrs.	Last Calving mos.	% Herd Avg.
75	127	127	16.0	1.70	- 6.5	5.2		7	309	72	4 7	1	10	96
76	80	80	18.5	1.79	- 7.5	4.0		6	293	96	5 1	3	3	98
77	19	19	13.0	1.24	- 2.0	3.9		4	295	94	4 29	4	11	90
78	5	5	9.0	0.83	- 7.5	3.5		4	274	80	4 15	5	3	86
79	784	784	0.0*	0.00	+ 0.0	0.0		4	372		1 20	2	11	112
80	81	81	0.0*	0.00	+ 0.0	0.0		4	301		1 20	2	11	116
81	105	105	0.0*	0.00	+ 0.0	0.0		4	317		1 25	2	2	119
82	4	4	0.0*	0.00	+ 0.0	0.0		4	300	3	1 29	5	0	109
83	118	118	0.0*	0.00	+ 0.0	0.0		4	307	9	2 5	2	0	98
84	36	36	0.0*	0.00	+ 0.0	0.0		4	309	9	2 5	4	5	120
85	114	114	0.0*	0.00	+ 0.0	0.0		4	295	12	2 8	2	2	83
86	111	111	0.0*	0.00	+ 0.0	0.0		4	310	12	2 8	2	2	103
87	91	91	0.0*	0.00	+ 0.0	0.0		4	333	12	2 8	2	6	96
88	119	119	0.0*	0.00	+ 0.0	0.0		4	321	17	2 13	2	0	117
89	123	123	0.0*	0.00	+ 0.0	0.0		4	307	19	2 15	1	11	107
90	50	50	0.0*	0.00	+ 0.0	0.0		4	317	21	2 17	4	1	98
91	28	28	0.0*	0.00	+ 0.0	0.0		4	321	22	2 18	4	0	121
92	82	82	0.0*	0.00	+ 0.0	0.0		4	337	44	3 9	3	0	123
93	88	88	0.0*	0.00	+ 0.0	0.0		4	290	52	3 17	2	11	89
94	723	723	0.0*	0.00	+ 0.0	0.0		4	287	62	3 27	5	3	83
95	44	44	0.0*	0.00	+ 0.0	0.0		4	298	71	4 6	4	2	88
96	93	93	0.0*	0.00	+ 0.0	0.0		4	289	79	4 14	2	9	89
97	117	117	0.0*	0.00	+ 0.0	0.0		4	304	96	5 1	2	1	91

Cows are ranked in descending sequence of test day production of 3.5% fat corrected milk.

WORKSHEET I: IDENTIFICATION OF HERD'S  
BREAK-EVEN PERCENT OF HERD AVERAGE MILK PRODUCTION

- 
- |     |  |      |
|-----|--|------|
| 1.  | Enter herd's average 305-day, M.E., 3.5% fat corrected milk production . . . . .   | cwt. |
| 2.  | Multiply line 1 times % of milk shipped times milk price per cwt. (____ line 1 x ____ x ____ milk price) . . . . .   | \$   |
| 3.  | Enter other receipts per cow per year (calf, cull cow, manure credit). . . . .   | \$   |
| 4.  | Enter total gross receipts per cow per year (line 2 plus line 3). . . . .  | \$   |
| 5.  | Enter total annual feed costs per cow producing at 305-day, M.E., herd average . . . . .   | \$   |
| 6.  | Enter annual non-feed variable costs per cow <sup>1/</sup> . . . . .   | \$   |
| 7.  | Enter total variable costs per cow (line 5 plus line 6). . . . .   | \$   |
| 8.  | Enter total annual fixed costs per cow <sup>2/</sup> . . . . .   | \$   |
| 9.  | Enter total annual variable and fixed costs per cow producing at 305-day, M.E., herd average (line 7 plus line 8). . . . .   | \$   |
| 10. | Enter annual returns to operator labor, management, and equity capital investment in buildings, equipment, and land per cow producing at 305-day, M.E., herd average (line 4 minus line 9)\$ | \$   |
| 11. | Enter 5% of herd's average 305-day, M.E., milk production (line 1 times .05) . . . . .   | cwt. |
| 12. | Multiply line 11 times % of milk shipped times milk price per cwt. (____ line 11 x ____ x ____ milk price) . . . . .   | \$   |
| 13. | Enter reduction in annual feed costs for cow producing at 95% rather than 100% of herd's average 305-day, M.E., milk production . . . . .  | \$   |
| 14. | Enter reduced per-cow income per 5% reduction in production from herd's average 305-day, M.E., milk production (line 12 minus line 13). . . . .  | \$   |
| 15. | HERD BREAK-EVEN PERCENTILE EQUALS 100 MINUS (LINE 10 ÷ LINE 14 x 5) <sup>3/</sup> . . . . .  | %    |
- 

- 1/ Includes vet.-med., breeding, bedding, utilities and fuel, repairs, supplies, hired labor, property taxes and insurance on cow, hauling and marketing, annual cow replacement cost, DHIA, and interest on cow, milk base, feed, and other operating capital loans.
- 2/ Includes (1) property taxes and insurance on buildings, equipment and land allocable to dairy enterprise, (2) depreciation on buildings and equipment, (3) interest paid on money borrowed to finance buildings, equipment, and land allocable to dairy enterprise, and (4) miscellaneous expenses (magazines, dues, telephone, legal, accountant, etc.).
- 3/ When line 10 is a negative number, the break-even percentile is 100 plus (line 10 ÷ line 14 x 5).

WORKSHEET II: COMPUTATION OF WHEN TO CULL WITHIN A LACTATION

I. REPLACEMENT NOT AVAILABLE OR ABLE TO SUPPORT ADDITIONAL COWS WITH EXISTING FACILITIES.

1. Enter daily hay costs per cow ( \_\_\_ lbs. @ \_\_\_ ¢ per lb.) . . \$ \_\_\_\_\_
2. Enter daily silage costs per cow ( \_\_\_ lbs. @ \_\_\_ ¢ per lb.) \$ \_\_\_\_\_
3. Enter daily grain costs ( \_\_\_ lbs. @ \_\_\_ ¢ per lb.) . . . . \$ \_\_\_\_\_
4. Enter daily non-feed costs per cow that would be eliminated if cow is culled . . . . . \$ \_\_\_\_\_
5. Total daily variable costs per cow (add lines 1-4) . . . . \$ \_\_\_\_\_
6. BREAK-EVEN DAILY PRODUCTION EQUALS LINE 5 ÷ PRICE OF MILK PER LB. ( \_\_\_\_\_ LINE 5 ÷ \_\_\_\_\_ MILK PRICE) . . . . . lbs.

II. REPLACEMENT AVAILABLE AND FACILITIES FULLY UTILIZED.

1. Enter daily hay costs per cow ( \_\_\_ lbs. @ \_\_\_ ¢ per lb.) . \$ \_\_\_\_\_
2. Enter daily silage costs per cow ( \_\_\_ lbs. @ \_\_\_ ¢ per lb.) \$ \_\_\_\_\_
3. Enter daily grain costs per cow ( \_\_\_ lbs. @ \_\_\_ ¢ per lb.) . \$ \_\_\_\_\_
4. Enter daily non-feed variable costs per cow (line 6, Worksheet I ÷ 365) . . . . . \$ \_\_\_\_\_
5. Enter daily fixed costs per cow (line 8, Worksheet I ÷ 365) . . . . . \$ \_\_\_\_\_
6. Total daily costs per cow (add lines 1-5) . . . . . \$ \_\_\_\_\_
7. Enter daily receipts per cow from cull cow, calf and manure (line 3, Worksheet I ÷ 365) . . . . . \$ \_\_\_\_\_
8. Net daily costs per cow (line 6 minus line 7) . . . . . \$ \_\_\_\_\_
9. BREAK-EVEN DAILY PRODUCTION EQUALS LINE 8 ÷ PRICE OF MILK PER LB. ( \_\_\_\_\_ NET COST ÷ \_\_\_\_\_ ¢ MILK PRICE) . . . . . lbs.

\*/ Will usually include veterinary-medicine, bedding, utilities and fuel, repairs, supplies, milk hauling and marketing, interest on the preceding and feed costs, and interest on the cow's cull value. May also include breeding fee, property taxes on the cow, DHIA, and labor.

