



## ESTIMATED RELATIVE PRODUCING ABILITY

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One critical management decision made on dairy farms is to allow selected cows to freshen again and remain in the herd. Economic factors dictate these decisions, with value of milk produced being a determining factor. What tools are available in DHI records to assist in these decisions?

Our best culling guide is Estimated Relative Producing Ability, ERPA. ERPA is an estimate of subsequent lactation yield. ERPA is relative in that yield is expressed relative to herdmates - as a deviation from herdmate production.

In a nutshell, ERPA is our best prediction of a cow's future yield relative to other cows currently in the herd, with all yields standardized to a 305d-2X-ME basis.

### How is ERPA calculated?

ERPA is the average production of a cow, deviated from her herdmates, and weighted for the number of records involved in the average. Records in progress are extended and included in ERPA. The formula for ERPA is:

$$ERPA = R \text{ (Average deviation from herdmates)}$$

$$R \text{ is } \frac{0.5n}{1 + 0.5(n-1)} \text{ and } n \text{ is th number of records.}$$

n	R
1	0.50
2	0.67
3	0.75
4	0.80
10	0.91

As n increases, R increases.

As a cow has more and more records, we become more confident that her previous average deviation from herdmates will appear again in her next lactation.

Example: A cow has one record with 305d-2X-ME yield of 21,310 for milk and 812 for fat. Her herdmates averaged 16,750 milk and 572 fat. Her ERPA is

$$ERPA \text{ milk} = 0.5 (21,310 - 16,750) = +2,280$$

$$ERPA \text{ fat} = 0.5 (812 - 572) = +120$$

Had this cow averaged 21,310 for milk and 812 for fat for 3 lactations with the same average herdmate yield, her ERPA would have been:

$$ERPA \text{ milk} = 0.75 (21,310 - 16,750) = +3,420$$

$$ERPA \text{ fat} = 0.75 (812 - 572) = +180$$

0655  
0762  
70.404-083  
992  
1/11  
pec

We expect higher yield from the cow in her fourth lactation than we did in her second; not because she was older, but because she demonstrated superiority to herdmates across several lactations. ERPA's are adjusted for age, season of freshening, frequency of milking, length of record, and number of records.

How should ERPA's be used?

Use ERPA's to decide which cows to cull. Other factors such as reproductive status, ease of management, general health and vigor, and possible value of offspring enter the picture for culling decisions; but, for production, ERPA is the best predictor of future yield. You can remove the bottom 15-20% of your herd for ERPA without risking loss of an average producer, providing the cull candidates have been given the opportunity to produce through proper feeding and health care.

ERPA's can be compared to each other without confusion from number of records, age, length of lactation, season of freshening, or frequency of milking. Cow rankings based on ERPA's will identify cows with greatest and least probability of profitable production in succeeding lactations. Can you afford to maintain the bottom group of cows in your herd? The same feed and facility space could give you greater returns if made available to the better cows in your herd.

ERPA calculations make no adjustment for genetic merit of herdmates as is done for Cow Indexes. Therefore, ERPA's are useful only within the herd where they were calculated. Using ERPA for a cow in one herd to predict performance in another herd is risky unless genetic merit of the two herds is close to identical.

Who receives ERPA's?

ERPA's are mailed without additional charge to all dairymen on DHI test in April of each year on DHI Form 206. An additional list is available each November at a cost 3¢/cow on test for the test day proceeding the listing. Both mailings are from the DHI office at Virginia Tech, though ERPA's are calculated at DRPC in Raleigh, NC.

Some ERPA's always negative

If all cows with minus ERPA's are removed from a herd by culling, what will happen to ERPA's calculated in the future? Some of the new ERPA's will still be negative! Remember that ERPA's are deviations from herdmate average. No matter how high the herdmate average goes, some cows in the herd will always exceed it, and some cows will fall below it. You will always have some negative ERPA's in your herd.

ERPA and Cow Indexes

These two values are designed for different purposes. ERPA predicts yield, while Cow Index predicts the genetic contribution to production that a cow transmits to her offspring. The two numbers can be quite different. CI's will usually be lower than ERPA's, but don't be surprised if an individual cow ranks higher or lower in the herd on CI than she does on ERPA. For example, Cow #32 on the attached DHI Form 206 is probably better genetically than her production indicates. We would expect her daughter's ERPA to exceed her own. There will be instances where you will want to keep a cow for the milk she puts in the bulk tank, but you may not want to raise her heifer calf as a replacement animal. Keep in mind that the sires of calves are important too. If you cull calves, do so on the basis of pedigree index ( $1/2$  sire PD +  $1/2$  dam Cow Index).

DHI Form 206

A sample of DHI Form 206 is included in this Guideline to familiarize you with its contents. Form 206 includes cow identification, most recent lactation credits, most current USDA Cow Index, a summary of all lactation credits for each cow, the average of herdmates across all records of the cow, and the ERPA values themselves. The column labeled \$\$ Value is the product value of ERPA estimates for milk and fat. The latest milk prices and fat differentials reported for each herd are used to calculate \$\$ Value. ERPA lists are in ERPA order for milk. Thus, the bottom of the list contains the "cull candidates" in a herd. For the Henry Smith herd, cows 61, 27, and 467 could be removed from the herd with risk of losing an average producer.

Cow Indexes and ERPA's can be compared using DHI Form 206. In the Henry Smith herd, cow 457 is second in the herd for ERPA for milk. However, her Cow Index for milk (+600), places her 7th in the herd. Cow 499 is 6th for milk on ERPA and 14th for Cow Index Milk. Remember that ERPA evaluates producing ability and Cow Index evaluates transmitting ability. These two "abilities" are not one and the same. Cows do not always produce well because of genetics.

The bottom section of DHI Form 206 contains valuable information about the impact of involuntary culling (cows that cull themselves) on genetic and producing ability of a herd. State averages can be used for comparison. Henry Smith culls fewer cows for low production than his state average, 10 versus 14%. These culls, however, were lower than state average for ERPA milk, -1141 versus -860. Henry Smith has a problem with involuntary culling, the "left herd-all other reasons" section. He lost 20% of his herd for such reasons compared to state average of 9%. More importantly, Henry's involuntary culls were better cattle than state average, +200 versus +24 for ERPA milk, +150 versus +4 for Cow Index milk. If Henry could reduce his involuntary culls, he could remove more of his poor producers. Instead of culling the bottom 3 cows on Form 206, perhaps he could remove the bottom 6 or 7.

The more often dairymen can cull cows by choice instead of necessity, the more profitable their herd becomes. DHI Form 206 and ERPA's can help dairymen make intelligent culling decisions.

DHI-206 Estimated Relative Producing Ability List (ERPA)

DAIRY HERD IMPROVEMENT RECORDS  
DHI-206 1-81

TYPE OF RECORD		DATE OF TEST	
DHI A			
ST	CD	HERD	MO DAY YR
64	43	0108	04 16 81

NAME AND ADDRESS  
HENRY SMITH  
SMITH DAIRY FARM  
RFD 3  
AUBURN ALA 36830

ESTIMATED RELATIVE PRODUCING ABILITY LIST (ERPA)  
COWS ARE LISTED IN ORDER BY ERPA FOR MILK

THIS REPORT LISTS ALL COWS IN THE HERD WITH AT LEAST ONE CALVING DATE PRIOR TO 11-01-80 PLUS ALL COWS THAT HAVE LEFT THE HERD SINCE 04-16-80

S E R I E S N O.	REGISTRATION OR EARTAG NUMBER	COW INDEX NUMBER	BRAIN NAME	LAST LACTATION				C A R	USDA COW INDEX		NO. OF LACTATIONS	AVERAGE OF ALL 305 DAY M.E. RECORDS		AVERAGE OF ALL HERDMATE RECORDS		ESTIMATED RELATIVE PRODUCING ABILITY					
				DATE FRESH		AGE	M.E. PRODUCTION		MILK	FAT		MILK	FAT	MILK	FAT	MILK	FAT	MILK	FAT	\$\$ VALUE	
				MO	YR		MILK														FAT
H	64WAG2478	0498	498	8	80	44	20790	899	+1040	+55	2	20404	805	15489	573	3293	155	+489			
H	64WAF3736	0457	457	3	80	55	17140	592	+600	+24	3	19620	726	16282	602	2504	93	+330			
H	7281802	0439	439	6	80	64	19740	658	+1004	+23	4	17743	621	15401	570	1874	41	+198			
H	64WAF4203	0002	2	8	80	41	20230	661	+945	+5	2	18235	602	15502	574	1831	19	+157			
H	64WAC8754	0371	371	4	80	80	18420	643	+780	+42	5	17378	626	15591	577	1483	41	+171			
H	64WAF6378	0499	499	9	80	49	15505	559	+60	+2	3	16896	591	15241	564	1241	20	+119			
H	64WAD3785	0450	450	7	80	60	17180	623	+835	+35	4	16004	608	14881	551	898	46	+140			
H	64WAG2853	0016	16	8	80	38	15420	544	+680	+5	2	16655	583	15532	575	752	5	+60			
H	64WAC8146	0008	8	3	80	83	16040	564	+514	-10	5	16320	555	15485	573	643	-15	+18			
H	64WAF4688	0480	480	11	78	44	17720	590	-505	-8	2	16740	569	15781	584	643	-10	+27			
H	64WAD7863	0476	476	8	80	54	16250	689	+410	+34	3	15920	610	15201	562	539	36	+98			
H	64WAF6481	0504	504	4	80	27	17620	561	+420	-15	1	17620	561	16598	614	511	-27	-11			
H	64WAC2631	0427	427	2	80	63	17140	634	+340	+20	4	16680	632	16110	601	456	25	+74			
H	64WAG6344	0005	5	2	80	34	16420	621	+75	+5	2	16680	634	16520	611	107	15	+33			
H	64WAI3596	0046	46	3	80	28	16300	580	-100	-9	1	16300	580	16621	615	-161	-18	-42			
H	64WAG6345	0032	32	1	80	27	15983	592	+450	+10	1	15983	592	16644	616	-330	-12	-43			
H	64WAF6623	0034	34	7	80	26	13204	487	-943	-20	1	13204	487	15545	575	-1171	-44	-155			
H	64WAG6482	0003	3	9	80	39	13890	505	-1009	-10	2	13660	557	15543	575	-1262	-12	-107			
H	64WAF2122	0061	61	8	80	28	12482	453	-1300	-60	1	12482	453	15574	576	-1546	-62	-211			
H	64WAG1355	0027	27	10	80	38	14505	525	-1354	-35	2	12985	519	15556	576	-1723	-38	-182			
H	64WAF4602	0467	467	2	80	1	13140	503	-1021	-42	3	11421	423	16196	599	-3581	-132	-470			

TOTALS AND AVERAGES	NUMBER OF LACTATIONS	305-DAY M.E. LACTATION AVERAGE		LEFT HERD — LOW PRODUCTION							LEFT HERD — ALL OTHER REASONS						
		MILK	FAT	NUMBER		AVERAGE ERPA			AV. USDA COW INDEX		NUMBER		AVERAGE ERPA			AV. USDA COW INDEX	
				%	%	MILK	FAT	\$\$ VALUE	MILK	FAT	NUMBER	%	MILK	FAT	\$\$ VALUE	MILK	FAT
HERD	86	15696	578	9	10	-1141	-35	-138	-362	-10	17	20	+200	+6	+24	+150	+3
STATE	109	12012	427	15	14	-860	-32	-113	-202	-8	10	9	+24	+1	+3	+4	+1