

Record keeping, Analysis, and Utilization of On-Farm Performance Data

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Preface

The article about On-Farm Performance Testing for Meat Goats in the August '09 issue of Goat Rancher described the theory and rationale for collection of performance data to enable owners to improve the productivity of their herds in the shortest possible time. This program identifies superior animals for retention as parents of succeeding generations; it is, in short, a process for making sustainable genetic improvement.

As Goat Rancher readers know, I have been a proponent of such programs for years. So also with my co-author in this article, Dr. Ken Andries, Animal Science Specialist at Kentucky State University, Frankfort. As an animal geneticist and goat extension specialist, Ken designed and has offered this program since 2006. To date, participation has been sporadic and limited, for whatever reasons.

My explanations for this poor showing are that some owners may feel that the results would not be worth the time, modest expense, and hassle of data collection and analysis. Others may feel that they lack the knowledge to properly evaluate the findings or to apply them advantageously. Still others may feel that they lack the necessary equipment and facilities for data collection. Some may be simply wary of documenting the actual levels of individual and herd performance, and some may be also wary of having the findings somehow made public. Not to worry: see below for details.

Introduction

It is the purpose of this article to describe the logistics (the how-to) of **collecting, analyzing, and utilizing** on-farm performance data. Put differently, how does one generate the performance figures, how does one evaluate the figures, and, most importantly, how does one put this

genetic selection program into action. If you are interested in discussing participation in this program, contact Dr. Andries at 502-597-5094 (office) or 502-682-0067 (cell) or 502-597-5933 (fax); he may also be reached at kenneth.andries@kysu.edu. (While I would also be pleased to talk with you, I am the cheerleader, not the coach, in this game; he acts, I applaud—him, and you).

In any case, if you decided to participate, Ken would enrol you and discuss initial actions on his and your part. First, he would need your contact information: phone, email or surface mail address as well as your location and size of herd (breeding age females). Secondly, he would need your estimated kidding schedule(s) so that he could get the forms to you in a timely manner (and, if you are a Kentucky resident, so he could schedule a visit or bring a scale for '90 day' weight-taking). Ken has Administrative approval to make this program available to non-Kentuckians and, currently, there is no cost to participating owners, anywhere, regardless of herd size.

Data Collection

As kidding time approaches, Ken will send you two forms. The first is a *code sheet*. As shown in the first attachment, it enables you to identify certain information about the does and their kids. The code categories for breed, livability, birth type, rearing type, and kidding ease are crucial for analysis of doe performance.

The second attachment is entitled *kidding data sheet* that enables you to provide certain information about each doe and her offspring. Some of this information uses the code designations, and the remaining information provides additional data points for individual kids in each litter.

When all the litters in a given 'kidding-group' of does have been weighed (at not less than 70 nor more 110 days postpartum, you return the kidding data sheet (or multiple sheets, depending on the number of kids weighed) to Ken, by email or post. A 'group of does' is defined as those kidding within a 60-day interval of each other. A producer may have 2 or more such group depending on his breeding/kidding

schedules. The rationale for this ‘evaluation-by-group’ is that the environment (climate and feeding program) changes over time; accordingly, it is not fair to compare litter performances from spring-kidding does to fall-kidding does to winter-kidding does.

Do note that, if it seems too inconvenient to get birth weights, you don’t have to provide Ken birth weights of individuals or litters in order for him to compare 90-day (adjusted) litter weaning weights. If you had weaning weights, he could compare does on the basis of the litter’s average daily gain (as adjusted) during the suckling period (final weight – birth weight = gain, divided by days = ADG). If you don’t have birth weights, he could compare weight per day of age (final weight/days on test) as adjusted. Attachment 2 does ask for birth weights, but that column can be ignored without ‘penalty’ if you elect not weigh kids at birth).

FYI: there is usually a small, but positive correlation between birth weight and 90-day weight (reflecting birth weight per se and the more aggressive suckling by larger, more vigorous kids). Should early culling decisions be required, this correlation could be used to do so. Birth weights are also useful in assessing possible impacts on kidding-ease scores and livability scores. Perhaps it may be useful to remember that final litter weight, not ADG, is the most useful selection criteria. If you want to furnish birth weights, Ken will do the computations.

Data Analysis

When Ken gets your data sheets back (as described above), he will transpose the raw figures to his computer program which will magically apply adjustment factors to the data to derive ‘adjusted 90-day litter weights’ for each doe. Essentially, you give him the weight of each litter (and associated info) and the program will do the rest. The properly adjusted litter weight at weaning for each doe will reflect: calculated 90-day weights, age of dam at parturition, number of kids born in the litter, number of kids weaned in each litter, and sex of kids in each litter.

Caveat: presently Ken does not have sufficient data in hand to calculate adjustment factors for pre-weaning management; however, such adjustments can be calculated once enough producers provide sufficient data for calculation. As of now, Ken can only separate those does whose kids are being creep-feed from those that are not; thus, a participant would get two Doe Summary Sheets for the same 60-day weaning age groups to reflect this management difference.

In any case, Ken would send you a **Doe Summary** sheet (see third attachment below; the data is from a long defunct enterprise) showing the adjusted litter weaning weights for comparing all does in the 'group' (in the next-to-the-last column entitled TOTAL ADJ WT). The last column in the Summary, entitled TADJWT RATIO, provides the crucial figures for analyzing the *relative standing* among the does. (*All your does* should be evaluated, or else you would be lying to yourself, and also your prospective customers; why bother at all?).

During analysis, the computer program first calculates the average adjusted litter weaning weight for the group and, secondly, compares each doe's record to this average, and assigns it a 'Ratio' figure. For example, if the group's *average* adjusted litter weaning weight figure were 100 lb, and doe A posted a 125 ratio, she was 25% above (better than) her group's average performance. If doe B posted an 80 ratio, she was 20% poorer than) the group-average performance.

As shown in the fourth attachment, Ken's computer program can also provide a Sire Summary if you have kids in given 60-day kidding group sired by two or more sires. Note that this Summary shows the number of kids weaned (having 90 day weights) from a given sire as compared to the number of his kids born—a most useful comparison indeed. One may calculate kid survival rates for each sire: number of kids weaned/number of kids born x 100. For example, Sire # 146 kid survival rate was 73 % (17/22 x 100) while Sire #859 rate was 94 (16/17 x 100); Sires 616 and 4006 posted rates in the mid-sixties and Sire 5052 posted a 100% rate, albeit on a smaller number of kids. (Caveat: the % kid crop *born* for each sire is not furnished in this analysis, but if producers knew the number of does exposed to each sire, then this figure could be calculated).

The crucial sire performance figures are the Average *adjusted* 90-Day Weights. The sires may be evaluated mathematically as shown below.

Rank	Sire	AAWW	Ratio
1.	616	34.58 lb	105.8
2.	859	33.82 lb	103.5
3.	4006	32.67 lb	100.0
4.	146	32.47 lb	99.4
5.	5052	<u>29.81 lb</u>	<u>91.2</u>
Average:		32.67 lb	100.0

As readers will perceive, this year's kid crops suggests that bucks 616 and 859 produced kids only 3.5 to 5.8% higher than the average weaning weight, respectively. With prior records for comparison, one could know if these 'findings' were consistent over 2-3 years. However, owners could also evaluate these sires by tabulating the performance Ratios of their daughters in this and prior years. Those sires having a majority of their daughters with 100-plus Ratios over the years would be the keepers (and sires of saleable young buck prospects, of course).

Utilizing Performance Data

If all your herd kidded within the requisite sixty-day interval and all does and kids were treated alike until weaning at about 90 days of age, you could use the Ratios shown to select keeper-does and to choose keeper kids from particular does. If you have two, or more, kidding periods, there is the problem of choosing between does with similar Ratios, but in different groups—a toughie only you can decide because only you know the seasonal situations, but look first at the group averages for guidance.

Caveat: the 'degree of selection pressure' you could apply across the entire herd would be dependent on your particular situation (herd size, expansion/contraction plans, cash-flow needs, prospective sales, expected feed supply, any resource limitations, etc.). For instance, if you were positioned to do so, you could immediately improve average herd performance appreciably by culling 'deeply', say, by selling all

does that had below 100 Ratio scores. Assuming no outside replacements, your herd would be smaller, but of higher genetic worth. If you could only cull the bottom fourth of the herd, the rate of genetic progress would be noticeably slowed.

There are additional considerations. The average commercial herd typically replaces about 20% of its does every year. A few die, some are not decent producers, some leave for health reasons, some for old age, whatever. To maintain herd size (without outside purchases), one must save at least 25% replacement doelings.

If a 100 head doe herd is reproducing at the rate of 175% kid crop weaned (good), among the 175 kids born, there will be 80 or so doelings surviving from which to choose the 25 replacement doelings. These replacements should come from does scoring in the top half (Ratio of over 100) of all does or, better yet, the top third, but *only* if the individual doelings *warrant* saving. (There can be issues of poor conformation, bad mouths, and unacceptable rates of daily gain when a given doeling has really sterling litter mates from a top litter).

And then there is the matter of saving buck kids. All else being equal (ADG pre-weaning, conformation, etc.), they should come from the top 5% or so of the does on test. They should be retained for further evaluation, post-weaning, before the *final* selection is made (and he should be re-evaluated after his first kids are weaned).

On-farm performance test programs are particularly good venues for comparing multiple herds sires, but only if the objects of their affection are ‘randomly’ chosen and treated equally during the test period. Otherwise, the comparison will be compromised. Putting buck A on your top does and buck B on your bottom does is unfair—worse still, it is inaccurate.

And then there is the too typical farm situation where the ‘top’ buck is untested but is really horny and very pretty and cost a lot of money and stood real high in the Ring and/or has mighty ancestors, however defined (but also not performance tested). A scale under his progeny and another scale under his daughter’s progeny can be an enlightening,

sometimes sobering, experience indeed; if so, I can recommend a really good sausage recipe.

Commentary

Sustained participation in this performance-based program would allow you to cull-or-keep with more accuracy and confidence than your current procedure likely permits. You may have a keen eye for phenotypic evaluation of does and a good eye for estimating weaning weights of kids. However, if you *document* doe and kid performance via scale weights, you don't have to *guess* at their performance; you *know* their performance—and so would a prospective buyer who could peruse the Doe Summary and Sire Summary furnished by Dr. Andries (who doesn't have a dog in your hunt).

When deciding among keeper does from these records, the choice between does with very close Ratios can be dicey. One way to solve such a dilemma, would be to calculate an 'efficiency rating' (ER) of the individual does by dividing her adjusted litter weaning weight by her body weight at weaning time. Litter weight per pound of doe is the ultimate evaluation for keepers. For example, if doe A produced 120 lb litter weight and weighed 130 lb at weaning; her ER would be .92 (120/130). If Doe B also produced 120 lb litter weight, but weighed 110 lb at weaning; her ER rating would be 1.09. Mathematically speaking, doe B would be about 18% better (more efficient) than doe A ($1.09 - .92 = .17/.92 \times 100 = 18.4$).

Such efficiency ratings could of course be determined on *all* your does and then ranked from high to low. Such rankings could be more useful to you (and prospective customers) than the Ratio figures shown in the Doe Summary. Doubtless Ken's computer program could be modified to derive such efficiency figures and their rankings; he just needs participants to start furnishing doe weights. Personally, I would prefer using ER rankings over Ratio rankings. (If I were pressed for time, I would opt for doe weights-at-weaning over obtaining birth weights of kids).

To pose a further dilemma for your consideration/education, suppose doe A above had an obviously superior phenotype (larger/day of age and better conformation... prettier, so to speak) than did doe B. The same litter weight from a prettier doe (perhaps with a ribbon or two to 'prove' it). What to do? If you were not flogging 4-H kids at premium prices, offer doe A with a pseudo show of reluctance (but try for a premium on 'potential'). In any case, try not to smile as you load her and retain doe B for herd improvement.

A concluding word about confidentiality of this performance evaluation program is in order. Only you and Ken would know the Ratios (or efficiency rankings) of your herd. Ken won't tell, so any leaks would be on you. Also, remember, these tests are only useful in your site-specific herd. You cannot *logically* compare your herd to another producer's herd.

However, Ken *could* do an annual 'participant comparison' and publish it as being from producers A, B, C, etc. so that all could know the *relative* performance of their herds but *without* knowing who had what breed or who did forage-only feeding or who did creep-feeding, etc. For example, Ken could report that herd A had a herd of X does with an *average* total adjusted weaning weight of, say, 70 lb with a range of, say, 45 to 100 lb, while herd B had a herd of Y does averaging, say, 90lb with a range of, say, 55 to 115 lb.

Ken could also institute a Breed Code for Sire-of-Kid. This would allow participants to compare crossbred kids within their herd. To accurately evaluate sires of different breeds, each would have to be bred to dams of just one breed. For example, a Boer or Savannah buck on Kiko or Spanish does.

If enough participants did evaluations of purebreds and crossbreds over time and place, the accumulated data could be used to identify *apparently* superior breeds and crosses. I use 'apparently' because the multiple comparisons would not be in made in the same environments across the country. But do remember that the long-running DHIA program comparisons as between Holstein, Jersey, Guernsey, Ayrshire,

and Brown Swiss dairy cattle that led to a near monopoly of Holsteins did not have the same environments either.

Conclusion

Human nature being what it is, I would rather expect that those owners with the best does (highest litter weights and/or efficiencies) would not be above using the 'participant reports' and, more importantly, their own Herd Summaries to 'educate' would-be buyers. Indeed, using such data for merchandizing purposes would, in my opinion, be second only to achieving the 'genetic improvement objective' of participation in the on-farm performance evaluation program.

My feeling is: if you have it, flaunt it; if not, buy a better buck (with some sort of performance data other than standing first in the Jones County or State Show or having a pedigree indicating ancient lineages to South Africa, New Zealand or the TX Hill Country).

In short, we urge you to enrol, to help yourself, to be thoughtfully persuasive in pursuit of self-interest, and to let others know of your efforts. After all, putting lesser players in your review mirror is a so satisfying thing.

BREED CODES

BIRTH TYPE CODES

BREED	COD E		SINGLE	SN
ALPINE	AP		TWIN	TN
ANGORA	AG		TRIPLET	TR
BOER	BR		QUAD	QU
KIKO	KK		OTHER	OT
KINDER	KR		IF KID IS RESULT OF EMBRYO TRANSFER	
LAMANCHA	LM		PLACE AN "E" IN FRONT OF BIRTH CODE	
NIGERIAN DROWF	ND			
NUBIAN	NB		REARING CODES	
OBERHASLI	OB		Born Raised	
PYGMY	PY		Single Single	1
SAVANNA	SV		Single Twin	2
SPANISH	SP		Twin Single	3
TENNESSEE FAINTING	TM		Twin Twin	4
TOGGENBURG	TO		Triplet Single	5
CROSS BRED	XX		Triplet Twin	6
			Triplet Triplet	7
PREWEANING MANAGEMENT			For more than Triplet use Triplet code	
NO CREEP	1		If Fostered, put foster dam ID in comment	
CREEP GRAZED	2			
CREEP FEED	3		KIDDING EASE SCORE	
			NO ASSISTANCE	1
POST WEANING MANAGEMENT			SLIGHT ASSISTANCE	2
FED AS MARKET KID	4		HARD PULL	3
FED AS REPLACEMENT	5		CAESAREAN SECTION	4
PRODUCTION TEST	6		ABNORMAL PRESENTATION	5
FORAGE ONLY	7			
FORAGE /SUPPLEMENT	8		PURCHASE CODES	
			PRIVATE TREATY	PT

CULL REASON CODES			SPECIAL BREEDING SALE	BS
DIED	1		PRODUCTION SALE	PS
AGE	2		SALE BARN	SB
OPEN/FAILED TO KID	3		OTHER	O
LOST KID EARLY	4			
BAD UDDER	5			
FOOT PROBLEMS	6		SALE CODES	
CL	7		PRIVATE - BREEDING	PB
SINGLE BIRTH	8		PRIVATE - MEAT	PM
POOR PERFORMANCE	9		SPECIAL BREEDING SALE	BS
DISPOSITION	10		SPECIAL MEAT SALE	MS
OTHER	11		SALE BARN	SB
			OTHER	O
LIVABILITY CODE			SEX CODE	
BORN ALIVE AND WEANED	1		DOE	D
DIED AT BIRTH/ STILLBORN	2		BUCK	B
DIED WITHIN 72 HRS	3		WEATHER	W
DIED AFTER 72 HRS	4			
DIED AFTER 2 WKS	5			
ABORTED	6			

KIDDING DATA SHEET

KI D	D A M	SI R E	AG E OF	BR EE D	BIRT H	LIV	KI D	BIR TH	BIR TH	90 d	RE AR	9 0 d	A D G	ADJ 90 d	RE AR		
ID	ID	ID	DA M	CO DE	DATE	S E X	CO DE	EA SE	TY PE	WT	DAT E	TY PE	W T	90 d	WT	CO DE	COMME NTS
72 01	60 27	14 6	1	BR- X	11/29/ 2007	M	1	1	TW	7.6 9	3/5/2 008	4	3 7	0. 30	34.8 8		
72 02	60 27	14 6	1	BR- X	11/29/ 2007	M	1	1	TW	6.7 5	3/5/2 008	4	3 2	0. 26	30.1 8		
72 03	62	85 9		BR- X	12/3/2 007	F	1	1	TW	7.3 1	3/5/2 008	4	3 9	0. 34	37.9 8		
72 04	62	85 9		BR- X	12/3/2 007	M	1	1	TW	9.6 9	3/5/2 008	4	5 7	0. 51	55.4 7		
72 05	60 32	85 9	1	BR- X	12/3/2 007	F	1	1	TW	6.8 8	3/5/2 008	3	3 0	0. 25	29.2 5		
72 06	60 32	85 9	1	BR- X	12/3/2 007	F	4	1	TW	5.1 3							DIED 12/9
72 07	40	14 6		BR- X	12/4/2 007	F	3	1	TW	7.0 6							DIED 12/6
72 08	40	14 6		BR- X	12/4/2 007	F	1	1	TW	7.0 6	3/5/2 008	3	3 7	0. 33	36.3 5		
72 09	6	61 6		BR- X	12/5/2 007	F	1	1	TW	8.3 1	3/5/2 008	4	4 5	0. 40	44.6 0		
72 10	6	61 6		BR- X	12/5/2 007	F	1	1	TW	9.0 6	3/5/2 008	4	4 8	0. 43	47.5 7		
72 11	82	85 9	3	BR- X	12/5/2 007	M	1	1	TW	9.0 6	3/5/2 008	4	4 2	0. 36	41.6 4		
72 12	82	85 9	3	BR- X	12/5/2 007	M	1	1	TW	9.3 8	3/5/2 008	4	4 5	0. 39	44.6 1		
72 13	60 81	61 6	1	BR- X	12/6/2 007	M	1	1	S	7.0 6	3/5/2 008	1	4 4	0. 41	44.0 0		
72 14	60 31	85 9	1	BR- X	12/6/2 007	F	1	1	TW	6.1 3	3/5/2 008	4	3 0	0. 27	30.0 0		
72 15	60 31	85 9	1	BR- X	12/6/2 007	F	1	1	TW	7.0 0	3/5/2 008	4	3 2	0. 28	32.0 0		
72 16	35	61 6		BR- X	12/6/2 007	F	1	1	TW	8.3 1	3/5/2 008	4	2 9	0. 23	29.0 0		

72	61	BR-	12/6/2						7.1	3/5/2		3	0.	33.0	
17	35	X	007	F	1	1	TW		3	008	4	3	29	0	
72	60	BR-	12/8/2						7.5	3/5/2		3	0.	34.6	
18	52	X	007	M	1	1	TW		6	008	4	4	30	0	
72	60	BR-	12/8/2						8.3	3/5/2		2	0.	25.3	
19	52	X	007	F	1	1	TW		1	008	4	5	19	8	
72	61	BR-	12/8/2						13.	3/5/2		6	0.	63.1	
20	21	X	007	M	1	1	S		00	008	1	2	56	1	
72	14	BR-	12/7/2						8.1	3/5/2		2	0.	27.2	
21	19	X	007	M	1	1	TW		3	008	4	7	21	1	
72	14	BR-	12/7/2						7.1	3/5/2		1	0.	18.1	
22	19	X	007	F	1	1	TW		3	008	4	8	12	2	
72	61	BR-	12/8/2						11.	3/5/2		4	0.	44.7	
23	29	X	007	M	1	1	TW		31	008	3	4	37	4	
72	61	BR-	12/8/2						9.0						Died
24	29	X	007	F	5	1	TW		6						1/25
72	14	BR-	12/8/2						9.0						BORN
25	76	X	007	M	2	5	TW		0						DEAD
72	14	BR-	12/8/2						9.5	3/5/2		3	0.	34.5	
26	76	X	007	F	1	1	TW		0	008	3	4	28	6	
72	85	BR-	12/8/2						10.	3/5/2		4	0.	46.8	
27	26	X	007	M	1	1	TW		00	008	3	6	41	2	

Doe Summary

D A M	AG E	KIDDI NG	NU M	BIR TH	WEA N	WE AN	NU M	AG E AT	AD J	AGE OF	SEX ADJ	TOT AL	TAD J WT	COMME NT S
ID	OF DA M	DATE	BO RN	WT	DAT E	WT	WE AN	WE AN	90 D WT	DAM ADJ		AD J WT	RATI O	
185	3	11/12/2006	2	16.0	3/1/2007	101.9	2.0	109	87.0	87.0	83.0	97.9	133.4	
177	2	11/15/2006	1	3.0										
118	6	11/14/2006	2	21.0	3/1/2007	103.5	2.0	107	90.4	90.4	90.4	106.7	145.4	
199	3	11/14/2006	2	14.0	3/1/2007	95.4	2.0	107	82.5	82.5	75.0	88.5	120.6	
200	4	11/14/2006	2	15.0	3/1/2007	64.8	2.0	107	57.8	57.8	52.5	62.0	84.5	
201	4	11/14/2006	2	17.0	3/1/2007	103.6	2.0	107	89.8	89.8	89.8	106.1	144.6	
202	4	11/14/2006	2	15.5	3/1/2007	78.9	2.0	117	64.3	64.3	58.5	69.0	94.0	
204	3	11/16/2006	2	16.0	3/1/2007	58.8	2.0	105	52.7	52.7	52.7	62.1	84.6	
285	3	11/18/2006	2	16.0	3/1/2007	76.4	1.0	103	36.4	36.4	36.4	39.1	53.3	1 bottle fed
301	3	11/21/2006	1	10.0	3/1/2007	41.8	1.0	100	38.6	38.6	35.1	35.1	47.8	
335	2	11/10/2006	2	14.0	3/1/2007	88.5	2.0	111	74.4	79.6	76.4	90.3	123.0	
485	2	11/11/2006	2	12.0	3/1/2007	55.5	1.0	110	46.5	49.8	45.3	47.1	64.2	
889	4	11/13/2006	2	20.0	3/1/2007	113.1	2.0	108	97.6	97.6	93.5	110.4	150.4	
910	6	11/19/2006	3	24.0	3/1/2007	85.6	2.0	102	77.4	77.4	77.4	95.2	129.7	1 kid died 1/31
915	3	11/16/2006	2	19.0	3/1/2007	95.2	2.0	105	84.3	84.3	84.3	99.5	135.6	
918	2	11/19/2006	1	10.0	3/1/2007	47.6	1.0	102	43.2	43.2	43.2	43.2	58.9	
920	3	11/12/2006	2	17.0	3/1/2007	104.0	2.0	109	88.8	88.8	80.8	95.4	130.0	

92 2	3	11/13/ 2006	2	14. 0	3/1/2 007	39. 7	1.0	108	34.1	34.1	34.1	35.4	48.2	1 kid died w/72 hrs
95 7	3	11/15/ 2006	3	24. 0	3/1/2 007	135 .3	3.0	106	118. 5	118. 5	107. 8	136. 9	186. 5	
95 8	2	11/17/ 2006	1	10. 0	3/1/2 007	46. 9	1.0	104	41.9	44.8	40.8	40.8	55.6	
96 7	2	11/17/ 2006	1	9.0	3/1/2 007	41. 8	1.0	104	37.4	40.0	36.4	36.4	49.6	
99 6	5	11/11/ 2006	2	19. 0	3/1/2 007	110 .7	2.0	110	94.0	94.0	89.0	105. 0	143. 1	

Sire Summary

Sire	Number	Birth	AVERAGE	Number	Average	90D	Average
ID	Born	Date	BWT	90 D	90D Wt	ADG	Adjusted 90D Wt
146	22	3/22/2007	6.82	17.00	33.53	0.28	32.47
616	36	3/23/2007	7.59	24.00	34.79	0.29	34.58
859	17	3/22/2007	7.44	16.00	34.63	0.29	33.82
4006	34	3/22/2007	7.24	22.00	33.71	0.28	32.67
5052	12	4/27/2007	7.07	12.00	21.75	0.25	29.81