COMPARISON OF MILK YIELD DATA FOR TEST DAY AND LACTATION TO DATE TOTALS WHEN RECORDS ARE MADE UNDER DHIA OR DHI-AP TESTING PLANS

By

RAYMOND BRYAN STOUT

Bachelor of Science
in Agriculture
Oklahoma State University
Stillwater, Oklahoma
1984

Submitted to the Faculty of the
Graduate College of the
Oklahoma State University
in partial fulfillment
of the requirements
for the Degree of
MASTER OF SCIENCE
December, 1989

COMPARISON OF MILK YIELD DATA FOR TEST DAY

AND LACTATION TO DATE TOTALS WHEN

RECORDS ARE MADE UNDER DHIA OR

DHI-AP TESTING PLANS

Thesis Approved:

James P. Key

Thesis Advisor

Robert Terry

Eddy Finley

Norman N. Durham

Dean of the Graduate College

ACKNOWLEDGMENTS

The author wishes to express his gratitude to Dr. James Key for all the cooperation, assistance, and encouragement while serving as his advisor. Appreciation is also extended to Dr. Robert Terry and Dr. Eddie Finley for their assistance and advice.

Eternal gratitude and appreciation is extended to the author's parents, Jack and Jodelle Stout for the love, guidance and assistance throughout. I will always be grateful to have a relationship with a man I can and always will call "Daddy." Without their support this paper would not be possible.

To my wife, Debi, to my children, Heather and BreAnna, I dedicate this book, who have sacrificed greatly and encouraged me in the completion of this study. Thank you for the unselfish commitment to allow me to pursue my education while your's is on hold.

TABLE OF CONTENTS

Chapter Page

I. INTRODUCTION 1

Rational. 2
Statement of Problem 5
Purpose of the Study 5
Objectives of the Study 6
Hypotheses 6
Assumptions 7
Scope of the Study 7
Types of Testing Plans 7
Definition of Terms 8

II. LITERATURE REVIEW 12

Introduction 12
History and Development 12
Use of DHI Records in the Industry. 14
Acceptence of Different Testin Plans. 16
How DHI-AP Testing Works. 18

III. DESIGN AND METHODOLOGY 27

Introduction. 27
Description of Test 27
DHIA Testing Plans Used 28
Statistical Analysis. 30

IV. PRESENTATION OF FINDINGS 31

Introduction. 31
Test Day and Lactation to Date Milk
Comparisons 32
Test Day Fat Percent. 38
Lactation To Date Fat Pounds. 40
Somatic Cell Results. 41
Protein Comparisons 42

V. SUMMARY, CONCLUSIONS AND RECOMMENDATIONS 44

Summary 44
Conclusions 45
Recommendations 47

SELECTED BIBLIOGRAPHY 48

LIST OF TABLES

Table Page

I. Sales Value of Holstein Cows For Selected Years .16

II. Herds and Cows on Various Testing Plans National DHIA 21

III. Herds and Cows Enrolled on Various Testing Plans Midstates DRPC. 22

IV. Comparison of Test Day Milk Weights and Milk Solk Per Cow Per Day 23

V. Factors For Estimating Daily Milk and Fat Yeild From a Single Milking 25

VI. Test Day Milk Weights and Correlations. 33

VII. Comparison of Rank Order of Cows Tested on DHI and DHI-AP Test Programs. 35

VIII. Rank Order of Cows Based on Complete Lactation Milk Pounds 37

IX. Test Day Fat Percentage, Means and Correlations For DHI and DHI-AP. 39

X. Lactaion to Date Fat Pounds, Means, and Correlations For DHI and DHI-AP 41

XI. Somatic Cell Raw Score and Linear Score of DHI and DHI-AP Test Plans 42

XII. Lactation to Date Pounds, Means and Correlations For DHI and DHI-AP 43

LIST OF FIGURES

Figure Page

I. Milk Cows Population by County 3

II. Dairy Herds and Herds on Test by County. 4

III. Pelissier's AM-PM Formulas 24

CHAPTER I

INTRODUCTION

The Dairy Herd Improvement (DHI) Records program is designed so that it will provide dairy producers complete and comprehensive milk production information on their cows. The information contained in DHI records includes milk yield and component data, feed consumption and cost data, female inventories, genetic evaluations and herdmate comparisons. Information is provided for each individual cow as well as group or herd totals where appropriate.

Being enrolled in the DHI record program is a voluntary decision of the dairy producer. Also, there are several different record plans from which a dairy producer may choose. Therefore, DHI record information must be provided at a cost that is both affordable and a worthwhile investment that fits his particular management scheme.

There is no doubt, that the records are worth their time and investment. National DHIA, Inc. studies reveal a 20 to 1 return on investment in DHI record information when it is used as intended in dairy herd management. As proof of their claims, they cite difference in production between herds on DHI and those not on DHI as 4600 lbs milk in 1986 (11). The difference is increasing each year. Information that has been added to DHI records in the last few years, the options within testing plans, as well as quality premiums being offered by milk plants for low somatic cell count milk, makes DHI records a much more economical by now than ever before.

Rational

Oklahoma has 104,000 dairy cows IN 1,055 dairies located in 77 counties (14). Approximately 300 of these dairymen are enrolled on the DHI records program. Calculations with these figures point out serious problems with administration and promotion of the DHIA program in Oklahoma. On the average, there are less than 1.5 dairy cows per square mile in Oklahoma or less than 14 herds per county. Figure 1 shows the milk cow population by county as compiled by the Oklahoma Department of Agriculture (14). Only 12 counties have sufficient dairy cow population to support a full employment supervisor if all herds were enrolled on the program. Figure 2 shows the number of herds in each county as well as number of herds on DHI (21). With 19 local Dairy Herd Improvement Associations operating with 22 supervisors, Oklahoma's supervisors average 120 miles per herd testing the standard DHI herds.

This lack of dairy farm concentration and miles between herds, coupled with the reluctance of Association boards of directors to furnish enough testing equipment for multiple supervisors covering a wider area are contributing factors to Oklahoma's low DHI participation.

MILK COWS, OKLAHOMA, JANUARY 1, 1988

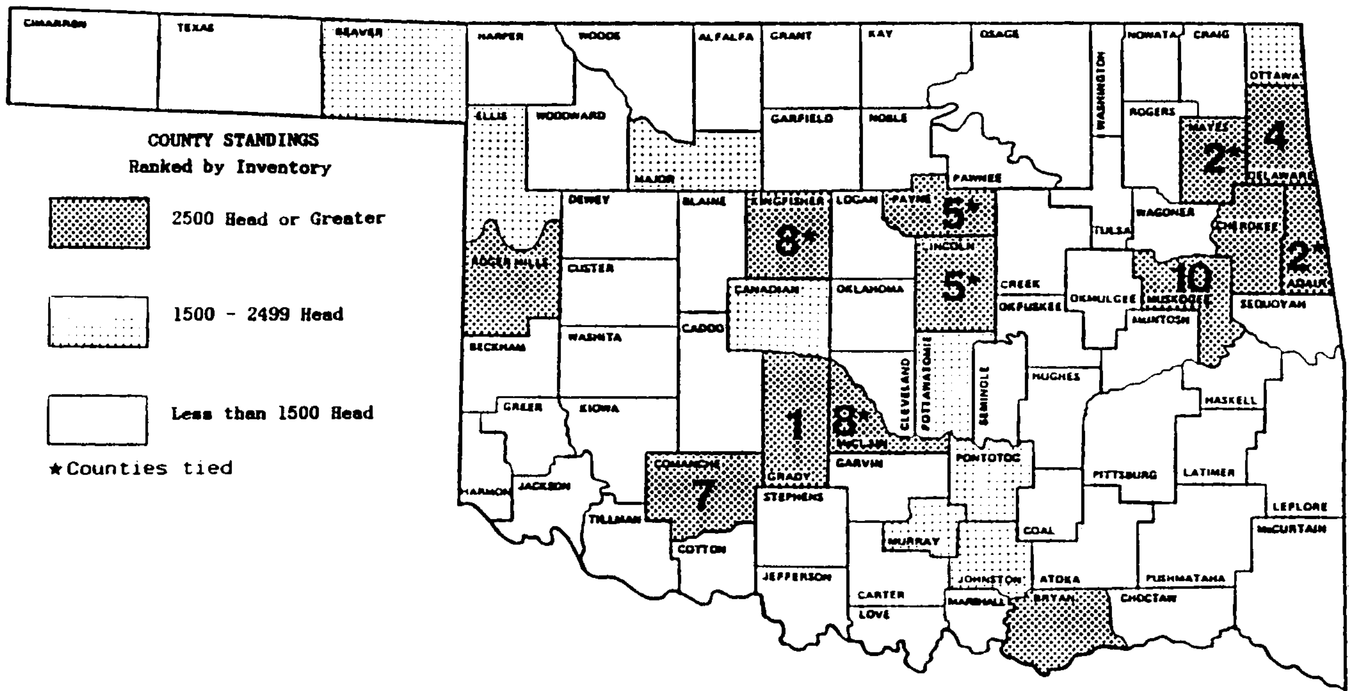

Figure 1. Milk Cow Population by County

Source: Oklahoma Ag. Statistics, (14)

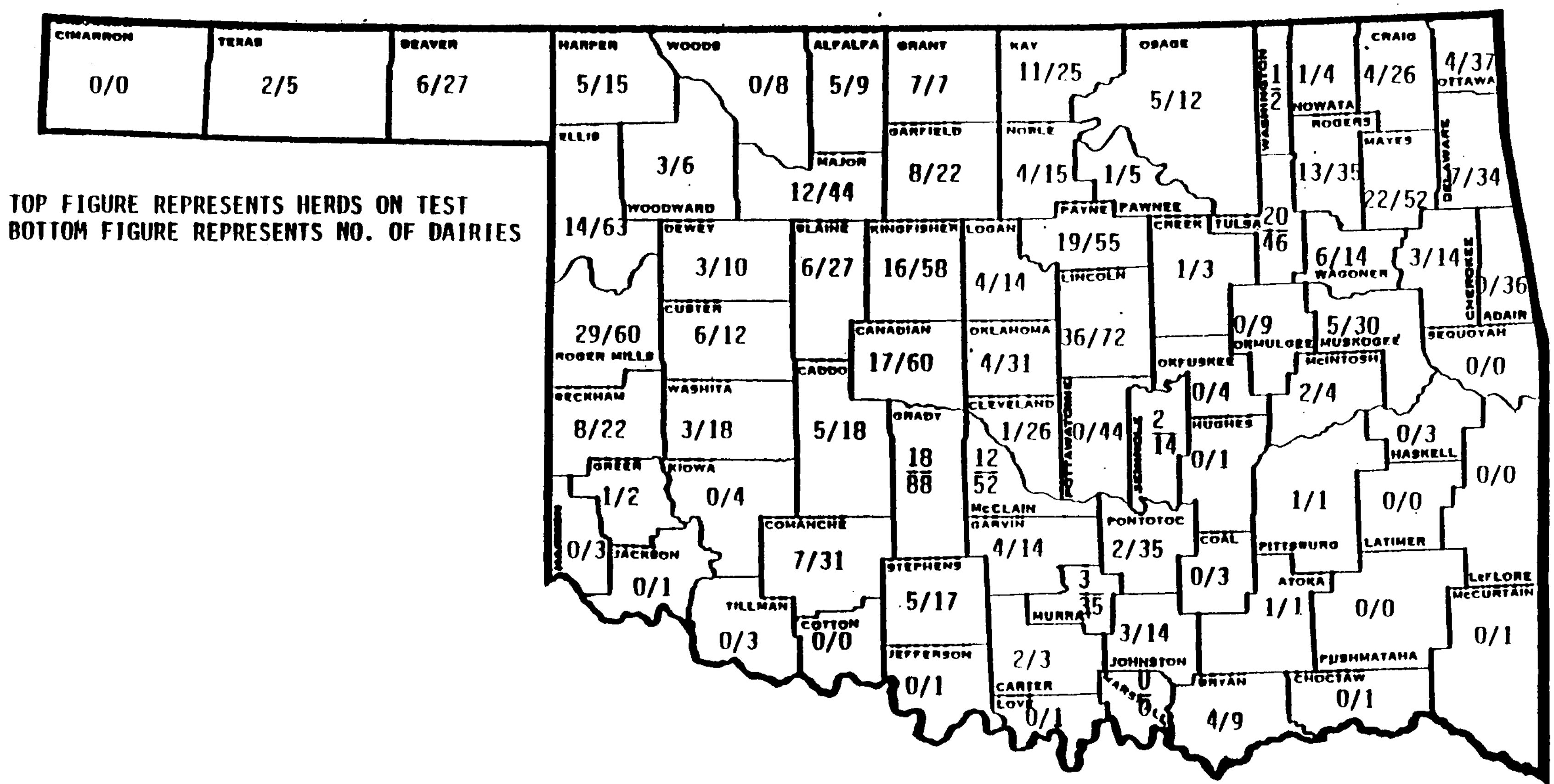

Figure 2: Dairy Herds and Herds on Test by County

Source: Animal Science Facts Oct. 88 (21)

DHI-AP testing plans have been developed that would reduce travel to one trip and time at each farm to one milking. However, Oklahoma dairymen have not accepted these plans. After six years of availability, the increase is still minimal with only six percent of Oklahoma's DHI herds adopting the DHI-AP testing plan.

Opposition to the DHI-AP testing plan stems from dairymen not believing that data collected at one milking could be factored to accurately represent a 24 hour period. Of those dairymen on DHI-AP plans, low fat percentage is of the most concern. When the DHIA test day fat percentage is different from the bulk tank test of the milk plant, dairymen tend to blame the DHIA program rather than the many management factors that contribute to fat test variation.

Statement of the Problem

The lack of education and understanding by dairymen and supervisors about the AM-PM correction factors and significant correlation of DHI-AP to DHI has led to low enrollment in DHI-AP testing programs in Oklahoma. Therefore information is needed showing the correlation of DHI-AP milk yield data to DHI milk yield data.

The Purpose of the Study

The purpose of this study was to demonstrate the correlation of milk yield data among DHI and DHI-AP testing plans. Also, to gather information to be used for educational material to use in training DHIA Supervisors and dairymen.

The Objectives of the Study

To accomplish the purpose of this study, the following objectives were met:

a. To determine the correlation of monthly and lactation-to-date production data of cows tested under DHI compared to the same cows tested under DHI-AP starting with an evening milking.

b. To determine the correlation of monthly and lactation-to-date production data of cows tested under DHI compared to the same cows tested under DHI-AP starting with a morning milking.

c. To determine the difference in the ranking of cows by production data collected under DHI and DHI-AP testing plans.

d. To gather current DHI information to incorporate into training packets for each of the "Official" DHI testing plans.

Hypotheses

The following hypotheses stated in the null form were tested:

1. There is no significant relationship between DHI milk yield data and milk yield data from DHI-AP starting with the evening milking.

2. There in no significant relationship between DHI milk yield data and milk yield data from DHI-AP starting with the morning milking.

Assumptions

The major assumption of this study was that when milk weights, samples for component testing and milking time intervals were collected and recorded according to the rules outlined for each testing plan, the differences in production yield data would be within the tolerance levels of .95 to 1.05% of DHI established by the National Dairy Herd Improvement Association Policy Board.

Scope of the Study

The scope of this study was limited to 51 Holstein cows from the OSU dairy herd calving within 75 days prior to October 20, 1988. Cattle were maintained in a similar production group through out the course of a lactation.

Types of Testing Plans Used in the Study

The National Dairy Herd Improvement Association Policy Board has established guidelines and approved the following DHI testing plans used in this study:

Official DHI. The standard plan of the DHI records program. An unbiased Supervisor weighs, samples, records the milk production from each cow for the consecutive milkings representing a 24 hour period each month.

DHI-AP. Weighing and sampling of each individual cow one milking each month, alternating between AM and PM.

Definitions of Terms

DHIA Supervisor. The person employed by the local association to perform the duties necessary to test the member's herds. The term "supervisor" and "tester" are synonymous for Oklahoma dairymen.

Test Day data. All of the necessary information recorded on the barn sheet. Milk weights, milk sample for component analysis, time intervals, and feed weights should represent a twenty-four hour period. Dates for breeding, calving, dry, left herd, etc. should reflect herd changes for the period between current and previous test.

Lactation to date. The cumulate information on days in milk, milk, fat, protein, and income over feed cost since last calving date or since entering the herd.

Income over feed cost. The value of the milk produced over the amount required to pay for feed cost (figured test day and lactation-to-date).

Persistency. A percentage figure which tells how well the cow is maintaining her production level compared to a normal lactation curve equated for age, breed, and season of calving.

<u>305-2X-M.E.</u> A record standardized for length of lactation to 305 days, to twice-a-day milking, and to an average age of calving appropriate for that breed, season, and area of United States.

<u>Difference from herdmates.</u> A comparison of the current 305-2X-M.E. record with the average of cows within the same herd that are of the same breed and calved during the same season.

<u>Predicted difference (PD).</u> The measure of the genetic transmitting ability of the sire for milk, fat, protein, cheese yield, dollars and type.

<u>NCDHIP.</u> National Cooperative Dairy Herd Improvement Program.

<u>Estimated Producing Ability (EPA).</u> The best estimate of a cow's ability to produce under the conditions of her previous environment, based only on her own past performance.

<u>Estimated Average Transmitting Ability (EATA).</u> The best estimate of a cow's ability to transmit to her offspring based on the genetic evaluation of her paternal sisters, dam,

maternal sisters, and daughters in addition to her own production.

Pedigree Estimate of Breeding Value (PEBV). The best estimate of a heifers future genetic producing ability based on her sire's PD and her dam's EATA.

DHIA milk testing laboratory. A laboratory under the direction of state and national DHIA Quality Certification Service guidelines.

Shook factors. Correction factors developed by Dr. George Shook used to correct lactation to date totals for milk, fat, and protein at the beginning and end of lactation.

AM-PM factors. Factors used to convert production data for milk, fat, and protein at one milking to a twenty-four hour total based on the time between milkings.

Official DHIR. Dairy Herd Improvement Registry. A program for registered cattle only. All requirement of Official DHI are met plus any additional standards set by the respective breed association.

DHI-APCS. The same as Official DHI except milk is sampled only one milking -- always sampling the second milking with the first milking alternating between AM and PM each month. Supervisor records start and stop time of each milking so computer can determine intervals between milking for adjusting milk component yield.

<u>UNOFFICIAL DHI.</u> The testing programs that do not meet the requirements or rules of the official testing plans. Usually the only difference is that herd owners do the work of the supervisor or that intervals between tests or tests per year do not meet the guidelines of National DHIA Quality Certification Service.

<u>SOMATIC CELL LINEAR SCORE</u>. Logarithmic value for scoring somatic cell counts of raw milk from 1 to 10 so that the percent change between any two numbers is equal and has the same affect in loss of milk production.

CHAPTER II

LITERATURE REVIEW

Introduction

The literature in this paper can be divided into three main categories: history and development of the DHI record programs, use of DHI records in herd management, and acceptance of various DHI testing plans by producers.

Background information in these areas is needed to understand the overall scope of the DHI program.

History and Development

A Jersey cow named Flora 13 produced 232 kg of churned butter in 1854. This was the earliest record of production in the United States. A Holstein cow named Dowager produced 5,764 kg of milk for 365 days ending on March 15, 1871 (23). A cow's production was measured only in product yield prior to 1890 as there was no method other than scales to measure value or content.

In 1890 the Babcock test for milk fat was developed. This simple and quick test provided a means to determine the milk fat percentage of each cow's milk using only a small sample. In

September 1905, six Michigan dairymen discussed starting a "Cow Testing" program and by January, 1906, an association of 31 herds with 239 cows began operation. There were 40 states with Cow Testing associations by 1920 and all 48 states had associations by 1929 (23).

The Smith-Lever Act established the Cooperative Extension Service in 1914 and county, state, and federal extension workers assumed leadership in the dairy cow testing programs.

In 1924 the American Dairy Science Association (ADSA) was developed and an uniform set of rules and guidelines were adopted to help in operation of the cow testing associations. By 1927, the committee proposed "Dairy Herd Improvement Association" (DHIA) and "DHIA Supervisor" as the new name for the association and its employees. Extension and the testing committee later termed the "Dairy Records Committee" guided the program for over 40 years.

April 1965, the USDA announced the establishment of the National Dairy Herd Improvement Coordinating Group and National Dairy Herd Improvement Association (NDHIA). With the organization of National DHIA, rapid developments in computer and electronic milk testing technology, improvements in DHI occurred at a more rapid pace. Many committees and regulations have been established to guide and enhance the program. Quality Certification Service (QCS), a program designed to improve the training of field personnel, maintain equipment calibration, and check laboratory accuracy was developed in 1980.

NDHIA has become instrumental in giving guidance and direction for management and policy decisions. Their offerings of planning and educational meetings, or seminars for state presidents, state managers, and laboratory personnel are in keeping with the responsibility of promotion, business, financial and routine management functions (23).

With the introduction of computerized records in the 1950s, electronic milk component analysis of the 1970s, and optional testing plans, along with NDHIA guidance, enrollment in DHI has more than doubled in the U.S. from 1965 with 18.9 percent of the cows on the program, to 1985 with 42.4 percent (13).

Use of DHI Records in the Dairy Industry

Management decisions are required each time a cow is milked, fed or bred. It takes good records to decide what direction needs to be taken to make the correct profitable decision. DHI Records provide that information to the dairy producer to help aid in these everyday decisions that determine the overall profitability of the dairy herd.

In very simplified terms, DHI Records can be used to "feed-weed-breed". First, one feeds the animal enough to obtain a response, followed by culling of the inferior producers, and breeding the remainder to animals of superior genetic background (1).

DHI Records are used many different ways depending on the individual producer. A study designed to determine how farmers use their dairy records was conducted using 1178 Ohio dairy farmers on DHIA for five or more years. Monthly progress reports were the most important reason reported in this study for participating in the testing program. Records were important for use in sales and advertising for purebred cattle owners. When records were used for feeding decisions, dairy farmers also reported higher herd averages for milk and fat, lower services per conception, more percent days in milk, and lower age of cows at last calving (19).

Several studies have compared production of DHI tested herds to the non-DHI herds. Pelissier (18) showed an average production of DHI cows to be 1872 kg/lactation higher than non-DHI cows. Miller et al. (10) sampled 87 Holstein herds not on DHI and found that tested herds had 772 kg higher milk yields than cows in untested herds.

The difference in dollar value between DHI cows to non-DHI cows is proven every time there is a sale. The more information a buyer has on a cow the more he is willing to pay. Olson (15) compared the differences paid for Holstein cows with and without DHI records as listed in Table I.

TABLE I

SALES VALUE OF HOLSTEIN COWS
FOR SELECTED YEARS

Added sales value of:	1976	1978	1980
DHI record cows vs cows without records or records on the dam	$469	534	$925
DHI record cows vs cows with only DHI records on the dam	150	96	177
Heifers from DHI record dams vs heifers from dams with no records	361	479	533

Source: Olson p.974 (15)

Acceptance of Different Testing Plans

Dairymen have a choice between "Official" and "Unofficial" testing programs. Differences between the programs involve the way information is collected, public use of records, publication of records, and the rules that govern the program.

Records labeled with DHI or DHIR imply that all the national DHI rules have been followed. Individual cow production, herd averages, sire and cow indexes may be published under these record plans. The governing rules set minimum standards to be followed throughout the United

States to insure all official records will be uniform and accurate. Data collected for all DHI and DHIR records are by trained DHI supervisors. A DHI supervisor weighs and samples the milk and collects the required management information on his/her monthly farm visits. The rules define such things as how the record is to be calculated, frequency of tests, use of approved weighing and sampling devices, which cows are to be tested, and how to handle special situations.

The DHIR record program is designed for the breeder with registered cattle. This program is administered at the farm level the same as DHI but the dairyman must pay their breed association a separate fee to participate in this program and follow the additional guidelines set by the respective breed association.

Unofficial plans are designed for management purposes only. The rules are less ridged, making the dairyman responsible for the accuracy of information. When these records are published they must be marked "unofficial". Owner-Sampler records are the most common type of unofficial records. The herd owner pays for and receives the same information as an official herd but uses his own labor to collect weights, samples, etc., and does not have the high expense of the supervisor coming to the farm every month.

The programs listed above can be administered in several different ways. The old standard for DHI testing was for the supervisor the make a monthly visit to the farm and collect milk weights and samples at two consecutive milkings for calculation of the cows daily production. With the growing cost of labor and travel, programs were developed to save both the dairyman and supervisor time and money. Labor saving programs are labeled DHI-AP programs. The supervisor is only required to collect a milk weight and sample for one milking each month, but alternates the collection from AM to PM each month. These programs provide several advantages to both the supervisor and the dairy farmer.

How DHI-AP Testing Works

DHI-AP involves monitoring one milking per sample period on the farm. Alternatively, it is an AM milking one month followed by a PM milking the next month. The program is recognized as "Official" nationally if dairyman have a device which automatically records milking times of five or more previous milkings. The electronic recorder is hooked to the vacuum pump to determine milking times by recording the time the pump is running (18). In most states, records made without the use of a time monitor are used in state recognition programs. All records supervised by these programs can also be used for USDA sire and cow evaluations.

The DHI-AP records programs have several advantages:

* DHI-AP testing is a new DHI service that complements the traditional testing services that are available.
* It provides dairymen with a new supervised service at about 70 to 80 percent of the cost of traditional services.

* The program uses the same supervisor, equipment and follows the same rules.

* DHI-AP testing eliminates the inconvenience of the second sample in herds where the supervisor may slow down the milking process.

* DHI-AP testing provides a better work week for the supervisor where more herds can be tested in a given amount of time.

* With energy cost increasing each year, DHI-AP monthly testing provides a needed service at one-half the energy costs.

DHI-AP testing also has some disadvantages:

* Some dairymen claim there is a greater chance of rule violations.

* The expense of purchasing and installing the electronic timing device.

* Maintenance and upkeep of the timing device.

* Some dairymen feel they loose accuracy with alternate sampling programs vs. traditional programs.

Alternate sampling programs have not been very popular in Oklahoma because of the lack of knowledge of the dairymen and some supervisors on how the programs work. Some early adopted DHI-AP programs were administered incorrectly at the local association level and dairymen were disappointed in the results which led to changing back to traditional programs or dropping production testing altogether (6).

Many states have substantial numbers of herds and cows on DHI-AP testing programs. Listed in Tables II and III are cow and herd numbers enrolled on various testing plans of National

DHIA and of the Midstates DRPC region (13).

Several studies have been conducted to determine the accuracy of alternate sampling plans. One study showed DHI-AP milk weights and lactation information was within 2.2 percent of daily milk weights where standard DHI had a 2.0 percent error (6). A 1980 study of milk shipped on test day compared to milk collected on test day showed that owner-sampler to be the most accurate and DHI-AP to be more accurate than DHIR as far as measuring milk sold per cow. Table IV indicates the results (6).

TABLE II

HERDS AND COWS ON VARIOUS TESTING PLANS
NATIONAL DHIA

Record Programs	Herds	Cows	Percent	Average Herd Size
DHI	22231	1845114	41.1	83
DHIR	5803	490799	10.9	85
DHI-MO	122	29227	0.7	240
DHI-OS	11920	565906	12.0	47
DHI-OS-MO	338	46669	1.0	138
COM	140	44574	1.0	318
COM-MO	1	547	0.0	547
SS	63	7003	0.2	111
SS-MO	121	23578	0.5	195
BASIC	866	40564	0.9	47
Totals	41605	3093981	68.9	74
DHI-AP Testing Plans				
DHI-AP-T	3723	377400	8.4	101
DHI-APCS	2495	322976	7.2	129
DHIR-AP-T	247	25213	0.6	102
DHIR-APCS	280	41196	0.9	147
DHI-AP	4966	308712	6.9	62
MO-AP	34	8084	0.2	238
DHI-OS-AP	3890	198048	4.4	51
OTHER-AP	539	87798	5.7	1371
Totals	16174	1369427	34.3	85
Total Cows on DHI		4463408		

Source: NDHIA Fact Sheet, K-1, 1985, (13)

TABLE III

HERDS AND COWS ENROLLED ON VARIOUS TESTING PLANS
MID-STATES DRPC

Records Plan	Herds	Cows	Percent	Average Herd Size
DHI	2270	137013	30.13	60
DHIR	858	48643	10.70	57
DHI-OS	778	39544	8.70	51
DHI-OS-MO	59	4339	0.95	74
Totals	3965	229539	50.48	58
AM-PM Testing Plans				
DHI-APT	1337	94773	20.84	71
DHI-APCS	309	24921	5.48	81
DHIR-APT	103	7226	1.59	70
DHIR-APCS	42	3136	0.69	75
DHI-AP	894	51524	11.33	58
DHI-OS-AP	801	43630	9.59	54
Totals	3486	225210	49.52	65
Total Cows ON DHI			454749	

Source: NDHIA Fact Sheet K-1, 1985, (13)

TABLE IV

COMPARISON OF TEST-DAY MILK WEIGHTS
AND MILK SOLD PER COW PER DAY

Type of test	No. of herds tests	cows per herd	Avg. Diff. of milk reported minus milk sold
DHI AM-PM	10,227	60.2	1.09 +/-.03
DHI	29,232	65.6	.89 +/-.01
DHIR	2,638	62.1	1.25 +/-.05
OS	5,239	45.4	.70 +/-.03

Source: Everett, p. 333, (6)

Pelissier (18) conducted a study involving four DHIA herds milked at 12-hour intervals. PM and AM milk yields were weighed monthly from four DHIA herds which milked at 12-hour intervals. Fat tests were determined for PM milk, AM milk and composite sample of AM and PM milk. Test day data were calculated by these three methods listed in Figure 1. The three systems of calculating test day data were highly correlated. The correlation of daily milk weight by doubling the PM was .976 to the composite system. Correlation of using the AM daily milk weight was .980 to the composite system (18).

Test day milk

PM data	=	PM milk x 2
AM data	=	AM milk x 2
Composite data	=	PM + AM milk

Test day fat

PM milk x 2 x fat percentage
AM milk x 2 x fat percentage
PM + AM milk x fat percentage of composite sample

Figure 3. Pelissier's AM-PM formulas

Source: Pelissier, p. 622, (18)

This high correlation serves as an endorsement for DHI-AP testing. However this study did show that with higher daily production there was more variation in the adjusted milk weights. Pelissier (18) stated that for good management, test day information has to be accurate. As test day variations for milk go beyond 4 pounds per cow or .16 pounds of fat, the value of data for management purposes declines rapidly.

Somatic cell count (SCC) is a variable dairymen need to understand if they are going to use AM-PM testing. Cow's SCC will vary according to the bacterial challenge and conditions of the cow's environment, age of the cow, and stage of lactation (4). An uninfected cow's SCC will be below 50,000, but it will vary from 10,000 to 50,000. An infected cow's SCC will usually be above 200,000 and vary as much as 500,000. Clean healthy cows will increase scc with age and also with declining milk yield during the lactation. When an infection occurs, the cow will flood the quarter with white blood cells (somatic cells) to battle the bacteria. In any of the DHI testing plans, there is no attempt to factor SCC as it needs to be a measure of a cows status at the time of sampling. SCC of individual cows may make a substancial change from one milking to the next according to the cow's ability to combat injury, infection, or trauma.

Listed in Table V are the DHI-AP factors that have been developed through USDA research studies to help accurately calculate daily milk and fat yields (24).

TABLE V

FACTORS FOR ESTEMATING DAILY MILK AND FAT YIELDS FROM A SINGLE MILKING

Milking Interval Hrs.		Milk Yield		Fat Yield	
Daytime	Nighttime	PM	AM	PM	AM
9.0	15.0	2.58	1.63	2.19	1.84
9.5	14.5	2.49	1.67	2.17	1.85
10.0	14.0	2.40	1.72	2.16	1.86
10.5	13.5	2.31	1.77	2.14	1.88
11.0	13.0	2.21	1.82	2.10	1.91
11.5	12.5	2.12	1.89	2.05	1.95
12.0	12.0	2.03	1.97	2.00	2.00
12.5	11.5	1.94	2.06	1.94	2.06
13.0	11.0	1.86	2.17	1.89	2.13

Source: Wiggans, p. 28, (26)

These factors, when added to the computer programing of the various DRPCs, have been developed for every 15 minutes of the milking interval. When the supervisor indicates start and stop times of the previous milking on the barn sheet along with the start and stop time of the sampled milking, the computer uses the correct factor to determine the cows 24-hour milk total.

The AM-PM factors have been approved by National DHI and USDA, however, several researchers are working to find improvements in the component adjustments. The findings in the research reported in this paper will not change any of the factors already established. But with the advantages of AM-PM for the supervisor and certain dairymen, we felt it important to perform a study on a local basis so Oklahoma dairy producers would be able to see that this type program is a viable alternative to the old standard DHI program.

CHAPTER III

DESIGN AND METHODOLOGY

Introduction

This study was undertaken to determine the correlation of milk yield data and management factors of cows tested under the various "Official" DHIA testing plans available to Oklahoma dairymen. This chapter is divided into three sections that explain the test groups, the testing plans, and the analysis used in meeting the purpose and objectives of the study.

Description of Test

Fifty cows in the Holstein herd of Oklahoma State University were selected to make up the test herd. Every cow that freshened after September 1, 1988 was selected. Cows were only selected on date of freshening, therefore, a general cross section of age, lactation number, and production levels were represented. Each cow was concurrently tested on all three plans and therefore they served as their own control.

The cows were concurrently tested using three DHI testing approaches as follows:

Test	DHI Plan	Test Designated as
Control	DHIA	DHI or Composite
Test 1	DHIA-AP PM Beginning	Test 1
Test 2	DHIA-AP AM Beginning	Test 2

Two tests were used on the DHI-AP plan to determine if there is a difference between starting the plan with the PM milking or the AM milking.

Management of the 50 cows was identical to that of the total OSU herd as no cows were separated from the standard groupings used by OSU. Cows were fed a Total Mixed Ration (TMR) containing Alfalfa hay, sorghum silage, grain, and protein supplement in varying amounts to meet their nutritional needs.

DHIA Testing Plans Used

Control. The testing plan listed as DHI was used as the control. This plan is the standard for the dairy industry and has been used consistently since the beginning of DHIA records. Milk weights for two consecutive milking were recorded. A representative 1 oz milk sample was collected in plastic bags labeled with barn name from each cow at the first milking. A representative 1 oz sample was collected in the same bag at the second milking. Milk was preserved with Potassium Dicromate added to the sample at time of first milking. All management data needed to complete the barn sheets were taken from the herd records maintained at the OSU dairy barn and was the same for each group.

Test 1. This test was enrolled on the DHI-AP program, beginning with the PM milking of the control test. Samples were drawn for both tests at the same time. Milk weights, milk samples, and milking time intervals were collected in accordance with the guidelines of DHI-AP testing. A 2 oz sample was collected into plastic bags and labeled for each cow. Potassium Dicromate was added as a preservative. The previous milking starting time and stop time was recorded to determine which AM-PM factors would be use in the calculations. Management data as recorded for the Control Group was included to complete the barn sheets. Each test interval throughout the lactation, sample milkings alternated PM to AM as required by the DHI rules.

Test 2. This test on DHI-AP beginning with the AM milking of the control test, was handled in the same manner as Test 1 with the exception of starting the first interval with the AM milking. The previous night's milking time and stop time was recorded to determine the appropriate DHI-AP factors to be used. With each successive test interval the sampling milking alternated AM to PM as required. Management data that matched the Control test was added to complete the barn sheet.

For test 1 and 2 the AM-PM factors approved by the Mid-States processing center were used to determine 24 hour milk yield, fat percentage and protein percentage.

All milk samples were tested in the Oklahoma DHIA Milk Testing Laboratory, 105 Poultry Building, Oklahoma State University. Testing procedures established for DHIA Labs by the NDHIA Quality Certification Service were followed. Fat and protein analysis was by an Infra-red Multispec II instrument. Somatic Cell counts were run on a Coulter straight rack system.

Statistical Analysis

The data collected in this study were compiled and tabulated in a manner designed to disclose findings related to the purpose and objectives of the study.

The SAS Program (Statistical-Analysis-System) was used to compute the statistical analysis. Means and correlations were computed on all data for test day and lactation to date data such as milk, fat, protein and somatic cell counts.

CHAPTER IV

PRESENTATION OF RESULTS

Introduction

The cows used in this study were 59 Holstein cows of the OSU herd that calved prior to the October 20, 1988 test day. National DHIA rules allows the first test period calculations to credit as much as 75 days back to a fresh date. In order to assure all cows would be credited with a complete lactation, cows selected were less than 75 days into lactation. All cows were in the high producing group, averaging over 80 lbs per day and managed in the same way as to milking time, feeding, housing, etc. Fifty-nine cows were started on the research project. Cows were dropped from the experimental group as they were sold for low production, breeding problems or moved into another management group of the University herd. Fifty-one cows completed the project and are summerized in these results.

Milk weights, milk samples, and management data were collected in the manner prescribed by DHI and DHI-AP testing programs and recorded on the barn sheets for each plan. Records were processed by the Mid-States Dairy Records Processing Center (DRPC), Ames, Iowa.
Test 1 and Test 2 were calculated using the AM-PM correction factors in effect at the time of each test date.

The Control test was processed according to all regulations of DHI testing plan of National DHIA.

Milk samples were analyzed in the Oklahoma DHIA laboratory on the OSU campus for fat and protein percentage and somatic cell counts.

Test Day and Lactation to Date Milk Comparisons

After each test day, means and correlations were calculated using the SAS computer program. Data collected each month was analyzed to determine if there was a time during each cow's lactation that may seem to be more effected by correction factors used in the AM-PM program. Listed in Table VI are the means and correlations for test day milk weights for all test periods. The r values of test day milk weights ranged from .93 to .99 indicating that there was a significant correlation between test day milk weights of cows tested on each of the DHI plans. The high correlation values indicated that as DHI milk weights change up or down the AM-PM weights will vary in the same direction.

TABLE VI

TEST DAY MILK WEIGHTS AND CORRELATIONS

Test Inter-val	DHI Mean Wt	Test 1 Mean Wt	Test 2 Mean Wt	r Test 1	r Test 2	Test 1 AS % of DHI	Test 2 AS % of DHI
Int. 1	79.8	82.3	76.5	.96	.94	1.03	.96
Int. 2	75.4	78.1	73.0	.94	.94	1.03	.97
Int. 3	72.8	79.2	69.1	.98	.96	1.09	.95
Int. 4	63.5	60.3	66.7	.97	.97	0.95	1.05
Int. 5	58.6	61.8	56.5	.94	.93	1.06	.97
Int. 6	55.5	56.3	53.6	.97	.97	1.01	.97
Int. 7	44.7	42.9	46.4	.98	.98	0.96	1.04
Int. 8	39.2	38.4	39.5	.99	.99	0.98	1.01
Int. 9	37.1	33.3	37.8	.98	.98	0.90	1.02

all r values show significant relationship ($p<.01$)

Prior research indicate early lactation cows when increasing or at peak milk production, are most suseptable to stress and management changes and may have more fluctuation in daily milk weights. The r values of this study were also lower for the test intervals when a higher percentage of the cows were in early lactation. As days in lactation progressed the correlation of DHI to DHI-AP approached 1.0. Correlations of Test 1 and Test 2 with Control for intervals 6-9 calculated at identical r's ranging form .97 to .99.

Table VI also lists the percent Test 1 and Test 2 varies from Control. When the National DHIA Policy Board accepted the DHI-AP plans, they established the guideline that yield data for DHI-AP must be within 5% of DHI data. In this study three test intervals of Test 1 were outside the .95 to 1.05 range. However, the average for nine intervals of the lactation was 1.001. Test 2 had no intervals out of the .95 to 1.05 range with a nine interval average of .993.

Several reasons for variation in daily milk production are inconsistent feeding, different employee's technique of milking the cows, milking order of cow coming through the milk line, injuries or sickness and weather conditions. Cows are much more sensitive to management changes early in lactation because of the higher production. Despite the large variation from Control for Test 1 to Test 2 milk weights on certain cows, the DHI system still ranked the cows in these three tests in a very similar order as illustrated in Table VII.

The 51 cows listed in Table VII are divided into High, Medium, and Low production groups based on test day milk weight of test interval 3 and ranked 1 to 17 in each group. The table is printed in rank order of the Control test. Interval 3 was selected because all cows were in milk on this test day and early enough in lactation for production to be at a high level. Test 1 and Test 2 were very similar in ranking to the Control test with only five cows in each test not ranking within the same High, Medium, or Low third.

TABLE VII

COMPARISON OF RANK ORDER OF COWS TESTED ON DHI AND DHI-AP TEST PROGRAMS BY TEST DAY MILK WEIGHT

BARN NAME	DHI DAILY MILK DHI	RANK ON DHI	TEST 1 DAILY MILK PM	RANK ON PM	TEST 2 DAILY MILK AM	RANK ON AM
617	130.7	H1	154.9	PH1	111.0	AH2
298	120.8	H2	128.4	PH2	117.6	AH1
746	105.6	H3	118.9	PH3	96.0	AH5
382	103.0	H4	104.3	PH5	105.5	AH3
737	100.6	H5	105.3	PH4	99.5	AH4
738	94.2	H6	100.7	PH7	91.9	AH8
861	92.3	H7	92.6	PH9	95.4	AH6
360	90.5	H8	101.7	PH6	82.5	AH13
770	89.4	H9	86.9	PH17	95.2	AH7
571	89.0	H10	91.8	PH10	89.5	AH9
869	88.4	H11	91.2	PH11	88.9	AH10
410	85.2	H12	88.2	PH14	85.4	AH12
520	84.0	H14	85.1	PM4	86.0	AH11
303	84.0	H13	89.8	PH13	81.3	AH14
704	83.0	H15	99.5	PH8	69.4	AM7
503	82.3	H16	89.8	PH12	77.8	AM1
687	81.5	H17	85.3	PM3	80.6	AH15
885	80.7	M1	84.7	PM7	79.6	AH17
376	79.5	M2	85.1	PM6	76.7	AM2
848	79.2	M3	85.1	PM5	76.1	AM3
736	77.3	M4	87.1	PH16	70.2	AM6
698	75.4	M5	86.7	PM1	66.7	AM10
867	75.1	M6	85.7	PM2	67.1	AM9
934	75.0	M7	73.2	PM14	79.6	AH16
556	72.7	M8	84.7	PM8	63.2	AM12
498	69.7	M9	82.5	PM9	59.3	AM14
819	69.5	M10	76.2	PM12	65.3	AM11
802	69.4	M11	69.6	PL1	71.8	AM5
638	69.0	M12	87.6	PH15	52.7	AL7
788	68.9	M13	78.7	PM11	61.6	AM13
727	68.8	M14	81.9	PM10	58.1	AM17
817	68.6	M15	66.7	PL3	73.1	AM4
884	67.4	M16	69.6	PL2	67.7	AM8
546	64.1	M17	74.8	PM13	55.6	AL1
900	61.9	L1	71.0	PM15	55.0	AL3
766	61.4	L2	69.6	PM17	55.4	AL2
955	60.8	L3	65.1	PL4	58.7	AM16
966	60.1	L4	63.3	PL5	59.1	AM15
686	60.0	L5	69.8	PM16	52.3	AL8
340	57.9	L6	63.1	PL6	54.8	AL4
951	56.8	L7	60.9	PL8	54.8	AL5
928	54.9	L8	58.4	PL9	53.4	AL6
868	53.8	L9	61.9	PL7	47.8	AL11
942	50.8	L10	56.2	PL11	47.2	AL13
971	50.6	L11	53.2	PL15	49.9	AL9
839	49.7	L12	54.2	PL13	46.4	AL14
958	49.5	L13	53.2	PL14	47.6	AL12
941	48.8	L14	51.4	PL16	48.0	AL10
845	48.0	L15	54.6	PL12	43.1	AL15
840	44.9	L16	58.0	PL10	33.2	AL17
946	37.7	L17	38.2	PL17	38.6	AL16

H = DHI High Milk Cows   PH = PM High Milk Cows   AH = AM High Milk Cows
M = DHI Medium Milk Cows   PM = PM Medium Milk Cows   AM = AM Med. Milk Cows
L = DHI Low Milk Cows   PL = PM Low Milk Cows   AL = AM Low Milk Cows

When cows were sorted by lactation to date milk, there appeared to be even less change from production groups as listed in Table VIII. Only three cows of Test 2 and two cows of Test 1 ranked in different High, Medium, or Low thirds when DHI is compared to DHI-AP testing plans of this study.

Lactation to date milk pounds are calculated by projecting the previous test day milk weight for a cow forward half of the test period and projecting the current test day milk weight backward for the other half of the test period. This test interval formula protects the cow from being charged with an abnormally low test day milk weight or preventing her from being credited for a higher than normal milk weight for more days than the lactation record deserves. This is illustrated in Figure 4.

LTDM	LTDF	Previous Test Day wt. %	Days in Current Test Interval	Test Day wt. %
4000	160	50 @ 3.7	30	40 @ 4.0

50 lbs x 15 days = 750 lbs	750 lbs x 3.7% = 28 lbs fat
40 lbs x 15 days = 600 lbs	600 lbs x 4.0% = 24 lbs fat
1350	52
+4000	+160
5350 LTD Milk	212 LTD Fat

Figure 4. Calculations for LTD Milk and Fat

TABLE VIII

RANK ORDER OF COWS BASED ON COMPLETE LACTATION MILK POUNDS

COW NAME	DAYS IN MILK	DHI MILK POUNDS	RANK ON DHI	TEST 2 MILK POUNDS	RANK ON AM	TEST 1 MILK POUNDS	RANK ON PM
617	291	31590	H1	29660	AH1	33520	PH1
746	292	24870	H2	24790	AH3	24820	PH4
861	308	24550	H3	22500	AH9	26420	PH2
704	298	24540	H4	22900	AH8	26110	PH3
382	284	24250	H5	24560	AH4	23960	PH7
869	352	23670	H6	23220	AH5	21880	PH10
410	317	23660	H7	25100	AH2	21530	PH14
770	299	23610	H8	23160	AH6	23970	PH5
885	300	23490	H9	22950	AH7	23970	PH6
298	257	22740	H10	22470	AH10	23030	PH8
303	306	22260	H11	21640	AH11	22770	PH9
687	318	21530	H12	20990	AH13	21800	PH13
819	333	21420	H13	20850	AH15	21850	PH11
698	342	21400	H14	21380	AH12	20440	PM2
848	344	21240	H15	20740	AH16	20810	PH16
738	312	21140	H16	20320	AH17	21850	PH12
817	277	20790	H17	20130	AM1	21440	PH15
934	310	20670	M1	20870	AH14	20130	PM4
951	353	20070	M2	19610	AM3	18710	PM12
546	302	19820	M3	19080	AM4	20480	PM1
360	296	19700	M4	19840	AM2	19490	PM8
955	342	19270	M5	18990	AM6	17800	PM16
556	285	19250	M6	18340	AM11	20180	PM3
736	315	19150	M7	18730	AM9	18780	PM11
737	267	19070	M8	18410	AM10	19810	PM6
520	323	19050	M9	17180	AM16	20510	PH17
884	336	19000	M10	18870	AM7	19100	PM9
638	292	18880	M11	17870	AM12	19830	PM5
727	298	18690	M12	17690	AM14	19620	PM7
802	312	18380	M13	18860	AM8	18120	PM14
966	333	18340	M14	19040	AM5	18200	PM13
900	304	18320	M15	17730	AM13	18870	PM10
503	280	17570	M16	17470	AM15	17680	PM17
766	301	17300	M17	16550	AL1	17910	PM15
340	301	17180	L1	16800	AM17	17420	PL1
928	323	16220	L2	15060	AL5	16580	PL3
867	286	16190	L3	16080	AL2	16200	PL4
571	198	15780	L4	15150	AL4	16610	PL2
788	269	14820	L5	14680	AL6	15000	PL6
868	303	14640	L6	15280	AL3	15630	PL5
971	291	14140	L7	14400	AL7	13850	PL11
376	194	14070	L8	14190	AL8	13920	PL10
686	292	13960	L9	13660	AL9	14160	PL8
840	307	13800	L10	13170	AL12	14210	PL7
942	295	13700	L11	13470	AL11	13960	PL9
845	320	13690	L12	13610	AL10	13720	PL12
941	301	13160	L13	13000	AL13	13300	PL13
946	327	11360	L14	10920	AL15	11790	PL15
498	165	11350	L15	11000	AL14	11810	PL14
958	221	10520	L16	10390	AL16	10690	PL16
839	180	8190	L17	8370	AL17	7940	PL17

High DHI Milk Cows PH = PM High Milk Cows AH = AM High Milk Cows
Medium DHI Milk Cows PM = PM Medium Milk Cows AM = AM Med. Milk Cows
Low DHI Milk Cows PL = PM Low Milk Cows AL = AM Low Milk Cows

As cows progressed into their lactation, LTDM correlations showed a more significant relationship. As was indicated earlier, as a cow continues into lactation, her production decreases making less variation in daily production thus allowing LTDM to move closer together between each testing plan. The larger variation in early lactation indicates that it is important to test with any DHI program on a regular schedule to get a more accurate record. Sixty percent of the cows were more than 30 days into lactation on the first test, ranging from 42 to 65 days. In a normal testing situation this hopefully would not occur.

Test Day Fat Percentage

Test day fat percentages were evaluated in the same maner as milk weights. The average fat percntages for test day and correlations are presented in tavle IX. The weighted means of test interval fat percentages of the 51 cows of Test 1 and Test 2 matched the Control in only four intervals. Test 1 was equal to Control on interval 6, varied .1 on two intervals, .2 on three intervals and had one interval each at .3, and .6 difference.

Test 2 cows had three intervals with the fat percntage equal to Control. Test 2 also had the most single variation with interval 3 averaging 4.5% fat, .8 more than the 3.7% of the Control. Test 2 also had three intervals with .2 difference and one with .3. The average fat percentage for the eight test intervals was 3.76, 3.65 and 3.79 for the Control, Test 1 and Test 2 respectivly.

Examination of individual fat tests of the same cow between herds indicate a wide range of variation. Correlation values listed in Table IX range from .43 to .95. Test 1 and Test 2 as a percent of DHI values range from .85 to 1.22 which is also more than the acceptable variation by National DHIA standards.

TABLE IX

TEST DAY FAT PERCENTAGE MEANS AND CORRELATION FOR DHI AND DHI-AP HERDS

Test Interval	DHI Mean Fat	Test 1 Mean Fat	Test 2 Mean Fat	r Test 1	r Test 2	Test 1 AS % of DHI	Test 2 AS % of DHI
Int. 1	3.9	3.8	3.9	.68	.95	.97	1.00
Int. 2	4.1	3.5	3.8	.77	.70	.85	.93
Int. 3	3.7	3.6	4.5	.65	.88	.97	1.22
Int. 4	3.8	4.0	3.8	.87	.43	1.05	1.00
Int. 5	3.6	3.8	3.4	.76	.77	1.06	.94
Int. 6	3.5	3.5	3.5	.75	.62	1.00	1.00
Int. 7	3.7	3.9	3.5	.78	.72	1.05	.95
Int. 8	3.8	3.5	3.9	.94	.90	.92	1.03

all r values indicate a Significant Relationship ($p<.01$)

Lactation to Date Fat Pounds

Correlations for LTDF were much more closely related than test day percentages. Comparisons of DHI to Test 2 and DHI to Test 1 ranged from a r value of .90 to .95.

The total pounds of fat credited for a cow's record is greatly dependant on the total pounds of milk the cow is producing. Lactation to date fat pounds is figured in the same way as LTDM as shown in Figure 4. By having very close correlations for LTDM between testing groups this caused the LTDF to stay relatively close between groups despite the wide variation in test day percentages. This data in Table X does indicate that if fat percentage or total lbs is important in a dairymans management needs or goals, then an alternative DHI testing plan may be required.

TABLE X

LACTATION TO DATE FAT POUNDS MEANS AND CORRELATIONS FOR DHI AND DHI-AP

Test Inter-val	DHI Mean Lbs	Test 1 Mean Lbs	Test 2 Mean Lbs	r Test 1	r Test 2	Test 2 AS % of DHI	Test 2 AS % of DHI
Int. 1	98	102	94	.92	.95	1.04	.96
Int. 2	241	244	233	.90	.91	1.01	.97
Int. 3	333	337	329	.91	.92	1.01	.99
Int. 4	434	421	426	.91	.92	.97	.98
Int. 5	478	481	475	.91	.91	1.01	.99
Int. 6	570	583	559	.92	.92	1.02	.98
Int. 7	633	650	617	.93	.93	1.02	.97
Int. 8	701	704	693	.93	.95	1.00	.99

all r values indicate a Significant Relationship ($p<.01$)

Somatic Cell Count Results

Somatic cell data collected in this study indicates that somatic cell counts do vary on a milking to milking basis. Somatic cell counts for each cow provides an evaluation as to the udder condition of the cow and response she was giving at the time of test. The data listed below gives the raw scores and linear score averages for each test period. The data received from any of the three testing plans would allow a dairyman to evaluate his cows and herd to make any management decisions needed. No correlation values were calculated as a condition causing an increase in SCC can be sudden and a low

SCC on one milking would have no relationship to the SCC of the same cow the following milking.

TABLE XI

SOMATIC CELL RAW SCORE AND LINEAR SCORE OF HERDS ON DHI AND DHI-AP TEST PLANS

	RAW SCORE*			LINEAR SCORES		
Test Interval	DHI	Test 1	Test 2	DHI	Test 1	Test 2
Int. 1	183	167	144	3.4	3.3	3.2
Int. 2	175	189	184	3.4	3.4	3.5
Int. 3	149	155	141	3.2	3.2	3.3
Int. 4	158	163	136	3.3	3.3	3.0
Int. 5	241	381	213	3.3	3.1	3.6
Int. 6	269	272	286	4.0	4.1	4.1
Int. 7	189	209	202	3.9	3.9	3.9

*Raw score is expressed in 1000 cell units
As an example: 50, would = 50,000 somatic cell

Protein Comparisons

Protein composition is one of the least variable components analyzed by DHIA. Most cows regardless of the type of testing program, have very little change in protein tests from night to morning or day to day. This allows for means and correlation values to be near 1.0 for the complete research project. Each month the r values were at least .97 comparing Test 2 or Test 1 to DHI. The lactation to date means and correlations are listed in Table XII.

TABLE XII

LACTATION TO DATE POUNDS, MEANS AND CORRELATIONS FOR DHI AND DHI-AP HERDS

Test Inter-val	DHI Mean Lbs	Test 1 Mean Lbs	Test 2 Mean Lbs	r Test 1	r Test 2	Test 1 AS % of DHI	Test 2 AS % of DHI
Int. 1	86	88	82	.98	.97	1.02	.95
Int. 2	206	208	195	.97	.97	1.01	.95
Int. 3	284	290	274	.97	.97	1.02	.96
Int. 4	362	371	350	.97	.91	1.03	.97
Int. 5	409	415	398	.98	.98	1.02	.97
Int. 6	501	513	484	.98	.98	1.02	.97
Int. 7	548	560	532	.98	.98	1.02	.97
Int. 8	607	614	593	.98	.97	1.01	.98
Int. 9	658	658	643	.98	.97	1.00	.98

All r Values Indicate Significant Relationship (p<.o1)

CHAPTER V

SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

Summary

The purpose of this study was to demonstrate the correlation of milk yield data among DHI and DHI-AP testing plans. The various comparisons consisted of test day milk weights, test day fat and protein percent, test day somatic cell counts, lactation to date milk, fat and protein pounds. Cows from the Oklahoma State University Holstein herd were entered into DHI and DHI-AP record plans. Each cow served as her own control during this project as she was concurrently enrolled on three DHIA test plans. Test one was a DHI-AP record plan collecting a sample, milk weight and herd data starting with an evening test. Test two was the same type of DHI-AP record plan, only starting with a morning test. The Control was started on a DHI record plan consisting of two consecutive milk weights and samples. This plan is considered to be the most accurate DHIA record plan, and thus the standard of comparison.

The statistical information obtained in this study will be used to promote all aspects of DHI in Oklahoma. These data provide an opportunity to use local information to promote the various DHI-AP records plans. A greater acceptance of DHI-AP plans will benefit all supervisors in Oklahoma by allowing more herds to be tested in the same time thus increasing income and still give dairymen accurate management information for the least cost. With furthur development, training packets with these information can become an important tool for education and promotion for Oklahoma DHIA.

Conclusions

DHI-AP test results seem to be extremely sensitive to management conditions of the cow herd. With any DHIA testing plan, milk weights are only collected once a month. A cow can be off in daily production on test day and this will affect her overall production for that lactation. DHI-AP is much more sensitive to this because of only collecting one milk weight. It was apparent at times during this study that certain cows were not performing to their potential. The changing in help and handling of cattle from day to day seemed to have an affect on many cows when samples for this study were being collected.

Test day fat percentage is the most highly variable component in DHI. It also is one of the least important components when it comes to day to day management of a cow herd. Most dairymen will not cull a cow for low fat percent if she is producing enough pounds of milk. Total pounds of milk has more affect on the bottom line in profitablility than a small change in fat percent. To make the most profit, dairymen need to concentrate on maximum milk production before they worry about fat percentage. The results of this study indicated that DHI-AP testing can be a viable alternative for producers and supervisors. Listed below are some final advantages and conclusions regarding AHI-AP testing:

1. Time savings for dairyman.
2. Less cost and hassle to dairy producer.
3. Enhances supervisor schedule to allow for more herds being tested in a shorter period of time.
4. Saves on energy costs and travel.
5. Allows for better use of DHIA equipment.
6. DHI-AP meets the standards for accuracy set by National DHIA.

Recommendations

After evaluation of this research, the author has these recommendations:

1. DHI-AP testing should be used by any herd as long as individual test day fat components are not an important part to their management scheme.
2. DHI-AP testing should be used to allow better use of Oklahoma DHIA equipment and supervisor resources.
3. More research needs to be done to determine the correct AM-PM factors for fat.
4. Educational programs for dairymen and supervisors on the benefits of DHI-AP should be developed.
5. Because extreme variations in early lactation can occur it is important to test on a regular interval.

SELECTED BIBLIOGRAPHY

(1) Albright, J. L. and W. M. Dillon "Dairy Herd Management Research in a Changing World" Journal of Dairy Science, Vol. 52, No. 6 (June, 1969), pp.808-809.

(2) Andrew, Lee J. and J. Wardrop "Predicting Daily Milk Yield, Fat Percent, and Protein Percent from Morning or Afternoon Tests" Journal of Dairy Science, Vol. 67, No. 2, (February, 1984) pp. 351-360.

(3) Benson, R. H. National Cooperative Dairy Herd Improvement Program Handbook, Fact Sheet, A-4

(4) Bringe, Allan "Individual SCC Helps Keep Uninfected Cows Clean". The Dairy State, Vol. 1, No. 6, (June, 1987) pp. 10-14.

(5) Conlin, Bernard J. "DHI Records Help Make Your Decisions and Your Profit". Hoards Dairyman, Vol. 116, (May 10, 1971) p. 683.

(6) Everett, Robert W. "Now is the for AM-PM testing." Hoards Dairyman, Vol. 126, (March 10, 1981), p. 333.

(7) Hargrove, G. L. and G. R. Gilbert. "Differences in Morning and Evening Sample Miklings and Adjustment to Daily Weights and Percents." Journal of Dairy Science, Vol 67, No. 1, (January, 1984), pp. 194-200.

(8) Majeskie, J. Lee. "How "Shook Factors" Are Used to Make DHI Records More Accurate" Hoards Dairymen, Vol. 125, (March 10, 1980), P. 327.

(9) Majeskie, J. Lee. "Monitor needed for "Official" AM-PM test." Hoards Dairyman, Vol. 126, (March 10, 1981), p. 333

(10) Miller, R. H., N. W. Hooven, Jr., and J. W. Smith. "Associations Among Measures of Economic Efficiency" Journal of Dairy Science, Vol. 54, No. 6, (June, 1971), pp. 867-875.

(11) National DHIA Management Seminar & Lab Workshop Proceedings. 1981.

(12) National Dairy Herd Improvement Association Policy Board. Unified Rules for DHI and DHIR. Washington: USDA, 1988.

(13) Norman, H. D., E. F. Myers and F. N. Dickinson. National Cooperative Dairy herd Improvement Program Handbook, Fact Sheet, K-1, 1985.

(14) Oklahoma Agriculture Statistics. 1988. Dairy Review, pp. 64-71.

(15) Olson, Clarence. Production Records Pay Off at Auction Sales" Hoards Dairyman, Vol. 126, (July 10, 1981), p. 974.

(16) Olson, Clarence. "Shook Factors Make DHI Records More Accurate" Hoards Dairymen, Vol. 126, (May 25, 1981), p. 410.

(17) Pardue, Fred E. "Put Your DHI Records to Work". Hoards Dairyman, Vol. 116, (Aug. 25, 1971) p. 1090

(18) Pelisier, C. L. "How does AM-PM Testing Work for Management Purposes?" Hoards Dairyman, Vol. 126, (April 25, 1981), p. 622.

(19) Schmidt, G. H. and T. R Smith. "Use of Dairy Herd Improvement Testing Programs by Dairy Farmers". Journal of Dairy Science, Vol. 69, No. 12, 1986, pp. 3156-3164.

(20) Smith, T. R. and G. H. Schmidt. "Relationship of Use of Dairy Herd Improvement Records to Herd Performance Measures." Journal of Dairy Science, Vol. 70, No. 12, 1987.

(21) Stout, B. "Oklahoma DHIA Participation By County" Animal Science Facts, Vol. 46, (October 1988) p. 12.

(22) Vines, D. T., B. F. Jenny, R. E. Wright and L. W. Grimes. "Variation in Milk Fat, Protein, and Somatic Cell Count from Four Dairy Herd Improvement Laboratories." Journal of Dairy Science, Vol. 69, No. 8, (August, 1986), pp. 2219-2223.

(23) Voelker, D. E. "Dairy Herd Improvement Associations" Journal of Dairy Science, Vol. 64, No. 6, (June, 1981), pp. 1269-1277.

(24) Wiggans G. R. "Procedures for Calculating Lactation Records." National Cooperative Dairy Herd Improvement Program Handbook, Fact Sheet G-1 1985.

(25) Wiggans G. R. and F. N. Dickinson. National Cooperative Dairy Herd Improvement Program Handbook, Fact Sheet G-2, 1985.

(26) Wiggans, G. R. and M. Grossman. Dairy Herd Improvement Letter, Vol. 56, No. 4 (July, 1980), p. 28.

VITA

Raymond Bryan Stout

Candidate for the Degree of

Master of Science

Thesis: COMPARISON OF MILK YIELD DATA FOR TEST DAY AND LACTATION TO DATE TOTALS WHEN RECORDS ARE MADE UNDER DHIA OR DHI-AP TESTING PLANS

Major Field: Agricultural Education

Biographical:

Personal Data: Born in Ardmore, Ok, September 8, 1961, the son of Jack D. and Jodelle P. Stout. Married to Deborah D. Jones on July 24, 1982.

Education: Graduated from Stillwater High School, Stillwater, Oklahoma, in May, 1979; received Bachelor of Science degree from Oklahoma State University in May, 1984; Completed Requirements for the degree of Master of Science, Oklahoma State University, Stillwater, Oklahoma, December, 1989.

Professional Experience: Sales Representative American Breeders Service, North Central Oklahoma, June 1980-December 1988; Assistant Manager Oklahoma Dairy Herd Improvement Association, Stillwater, Oklahoma, May 1985-December 1988; Manager Oklahoma DHIA, Stillwater, Oklahoma, January 1989