This is to certify that the

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EFFECTS OF DAIRY HERD MANAGEMENT MEASURES
ON EARLY LACTATION MILK YIELD

presented by

Kevin J. Dill

has been accepted towards fulfillment
of the requirements for

Ph.D. degree in Animal Science

Hubert Bucholtz
Major professor

Date June 24, 1991

EFFECTS OF DAIRY HERD MANAGEMENT MEASURES ON EARLY LACTATION MILK YIELD

Volume I

By

Kevin Jay Dill

A DISSERTATION

Submitted to
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Department of Animal Science

1991

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ABSTRACT

EFFECTS OF DAIRY HERD MANAGEMENT MEASURES ON EARLY LACTATION MILK YIELD

by

Kevin Jay Dill

Forty-four Michigan, Holstein herds were stratified by herd size and production level. Thirteen management measures each for primiparous and multiparous animals and selected interactions were evaluated for their influence on average 4% fat corrected milk for the first three DHIA production tests using standardized partial regression analysis. Primiparous variables considered included body measures, genetic potential, calving age, health problems, and pre- and postpartum ration measures. Multiparous measures included ration, health, and genetic measures, body measures, and dry period and previous lactation length.

Withers height had the greatest influence on primiparous animal's production in all but one selected model with taller animals producing more milk. Postpartum ration's energy density influenced multiparous animal production the most but was not consistent in its direction. Genetic potential was more important to multiparous models than primiparous.

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Kevin Jay Dill

Production response to ration measures, whether pre- or postpartum, were opposite between parity groups. Prepartum protein and energy interacted with postpartum health problems but differently for each parity group. These production response differences between parities to pre- and postpartum ration measures indicate management differences needed for the two groups.

Greater than 20 variables, quadratic terms, and interactions remained in primiparous and multiparous models. This supports the concept that managers of high producing herds are more cognizant of more details than low producing herds.

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life,

I would like to dedicate this work to the memory of my father, H. Leon Dill. He taught me about cows, people, life, and God and I thank him.

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I would first like to thank God for giving me the ability and opportunity to learn from this experience.

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Thanks to D. Main (who runs a very efficient lab), K. O'Neil, R. Kohn, and C. Burns for assisting me in the laboratory methods used for feed analysis. Thanks to J. Liesman for the much needed guidance in computer, statistical analysis.

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LIST OF ABBREVIATIONS

Data Sets

M - multiparous data

MAL - combines all 3 multiparous data sets (MC, MNG, MNS)

MC - multiparous complete data set

MNG - multiparous data set excluding genetics

MNS - multiparous data set excluding somatic cell count

P - primiparous data

PAL - combines all 3 primiparous data sets (PC, PNG, PNS)

PC - primiparous complete data set

PC2 - primiparous complete data set, model 2

PNG - primiparous data set excluding genetics

PNS - primiparous data set excluding somatic cell count

Models and Equations

M1 - model 1; considers reported prepartum energy and protein values

M2 - model 2; considers estimated prepartum protein values

E1 - equation 1; equation of first choice within a model

E2 - equation 2; equation of second choice within a model

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Variables

ADF, ADF2[a] - postpartum ration acid detergent fiber percentage

AGE, AGE2 - age in months (**primiparous only**)

BCS, BCS2 - body condition score 1-30 days postpartum

CP, CP2 - postpartum ration crude protein percentage

DMI, DMI2 - postpartum dry matter intake in kg/day

DP, DP2 - dry period length in days (**multiparous only**)

ED, ED2 - postpartum ration energy density in Mcal/kg

HEALTH, HEALTH2 - health score

PLL, PLL2 - previous lactation length in days (**multiparous only**)

PTAM, PTAM2 - sire predicted transmitting ability for milk in kg

SCC, SCC2 - somatic cell count linear score

WH, WH2 - withers height in cm (**primiparous only**)

WT, WT2 - body weight in kg

XSNEL, XSNEL2 - reported prepartum energy intake difference from NRC requirements in Mcal NEL/day (**Model 1 only**)

XSPROTES, XSPTES2 - estimated prepartum protein intake difference from NRC requirements in g/day (**Model 2 only**)

XSPROTRD, XSPTRD2 - reported prepartum protein intake difference from NRC requirements in g/day (**Model 1 only**)

Interactions

DMIXWH - DMI X WH

DMIXWT - DMI X WT

DMIXED - DMI X ED

EDXCP - ED X CP

EDXBCS - ED X BCS

EDXHEAL - ED X HEALTH

PTXHEAL - PTAM X HEALTH

XSNELXH - XSNEL X HEALTH

XSPESXH - XSPROTES X HEALTH

XSPRDXH - XSPROTRD X HEALTH

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[a] **ADF2 - squared term**

ADF -

AI -

BCS -

BW or

CI -

CP -

DE -

DHI/DI

DIM -

DIP -

DM -

DMI -

DO -

DP -

ED -

LIST OF NOMENCLATURE

ADF - acid detergent fiber; a feed nutrient measure of the cellulose and lignin content

AI - artificial insemination; as opposed to natural mating

BCS - body condition score; measure of external body reserves

BW or bw - body weight

CI - calving interval; days between two consecutive parturitions

CP - crude protein; a feed nutrient measure determined by multiplying 6.25 times the nitrogen content

DE - digestible energy; energy with the potential to be absorbed

DHI/DHIA - Dairy Herd Improvement/Association; a herd milk production and information service

DIM - days in milk; number of days an animal or group of animals has been producing milk in the current lactation

DIP - degraded intake protein; crude protein broken down in the rumen

DM - dry matter; total feed minus the water weight

DMI - dry matter intake; dry feed weight consumed by an animal

DO - days open; number of days between parturition and conception

DP - dry period; non-lactating period between two consecutive lactations

ED - energy density; Mcal of energy/unit of feed

EE

FCM

F:C -

FFA -

GI -

IOFC -

IP -

IVAD -

IVTD -

Mcal -

NDF -

NEL -

NRC -

PLL -

PTAM -

RHA -

EE - ether extract; laboratory procedure which estimates a feed's lipid content

FCM - fat corrected milk; correction of milk production to a common fat percentage to more accurately compare yields

F:C - forage:concentrate ratio; gross indicator of a ration's ability to provide adequate fiber

FFA - free fatty acids

GI - gastrointestinal; the digestive system which includes the compartmented stomach and intestines

IOFC - income over feed cost

IP - intake protein; crude protein consumed

IVAD - invitro apparent digestibility; IVTD corrected for fecal, metabolic, and endogenous matter

IVTD - invitro true digestibility; laboratory procedure which simulates rumen digestion

Mcal - megacalorie; an energy measure equal to 1 million calories

NDF - neutral detergent fiber; a feed nutrient measure of the total fiber or cell wall content which includes hemicellulose, cellulose, and lignin

NEL - net energy of lactation; energy available to produce product ie. milk

NRC - National Research Council; establishes nutrient requirements for animals

PLL - previous lactation length; number of days an animal lactated or produced milk in the lactation which preceded the current lactation

PTAM - predicted transmitting ability for milk; a measure of the animal's genetic potential for milk

RHA - rolling herd average; monthly determination of a herd's production average for the last 365 days

SCC -

STD EST

TDN -

TMR -

UIP -

SCC - somatic cell count; indicator of mammary infection reported in number/ml of milk

STD EST - standardized estimate; statistical terms which allows comparisons of different variables on an equal basis

TDN - total digestible nutrients; a gross, total feed value measure

TMR - total mixed ration; feeding practice which blends all feeds as opposed to offering feeds separately

UIP - undegraded intake protein; crude protein not broken down in the rumen

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INTRODUCTION

Dairy farm net income levels are constantly under pressure from increasing fixed and/or variable production costs and unstable milk prices. Successful management of a dairy production enterprise requires a skillful operator with the ability to manage the resources available to attain maximum profit (Willett and Albright, 1968; Carley and Fletcher, 1986).

The two key factors which dictate gross receipts of the dairy operation are 1.) herd size and 2.) milk production level (Etgen et al., 1987). Level of milk production is strongly correlated to profit and net farm income (Etgen, et al, 1987). Enterprise viability relies on the manager's skill at using 1.) descriptive, 2.) diagnostic, 3.) predictive, and 4.) prescriptive information to reach herd goals (Appleman and Noble, 1985). Measuring results of management changes through changes in herd production is more effective than using profit as an indicator (Speicher and Lassiter, 1965) because additional factors affect profitability.

Early lactation milk yield is a major determinant of income for that lactation because of 1.) greater income over feed cost (IOFC) and 2.) similar rates of post-peak producti

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production decline within parities, regardless of peak. Therefore, higher production peaks result in greater lactation yields.

The factors which influence early lactation milk yield for both primiparous and multiparous animals include, 1.) genetic level, 2.) body condition, 3.) body weight, 4.) mastitis level, 5.) health problems, 6.) prepartum nutritional adequacy (energy and protein), and 7.) postpartum nutritional adequacy (dry matter intake (DMI), energy, protein, and fiber levels). Stature measurements for primiparous animals are needed as body weight alone is not an adequate measure to indicate desirable body size (Sieber et al., 1988). Furthermore, age at first calving affects milk production (Lush and Schrode, 1950; Keown and Everett, 1985). For multiparous animals, previous lactation (Funk et al., 1987) and dry period length influence milk production levels (Keown and Everett, 1986).

Many researchers have evaluated these factors individually but this ignores interaction and can lose essential information on overall system performance (Congleton, 1984). Legates (1990a) states, "future research will depend heavily on a multidisciplinary approach and connect basic findings to their demonstrated usefulness".

In a 1987 Michigan survey of dairy producers 23.2% were carrying debt-to-asset ratios greater than 70% (Connor et al., 1989). This necessitates that producers increase

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the current herd's ability to service debt or face business exit. It would be beneficial for dairy farmers to know which management area or areas to focus on to maximize early lactation milk yield and thus profitability. Therefore, the objectives for this study were:

1.) to determine the influence of different types and levels of herd management measures on average daily 4% FCM for the first three DHIA production tests.

2.) to determine the combination of herd management measures which have the greatest influence on average daily 4% FCM of the first three DHIA production tests.

3.) to determine differences in herd management measures between herd sizes and production levels.

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LITERATURE REVIEW

Milk Yield

The dairy cow's instinct to produce milk in early lactation is a total physiological commitment (Bauman and Currie, 1980). Each kilogram (kg) increase in peak production results in 200-300 kg more milk for that lactation (Smith, 1990; DHIA Reporter, 1990). McGilliard et al. (1990) determined that net cash income increased curvilinearly with increased production. Therefore, it is profitable to feed and manage for increased production whenever income over total costs is positive (Schmidt and Pritchard, 1987). This is a result of higher producing cows spreading the fixed cost of body maintenance over more units of output (Allaire and Thraen, 1985; Legates, 1990b).

Lactation curves vary by calving season (Keown et al., 1986; Keown and Everett, 1985; Perera et al., 1986; Schaeffer et al., 1977). Also, first lactation animals take longer to reach peak production, have lower peaks, and greater production persistency than than do mature animals (Congleton and Everett, 1980; Shanks et al., 1981a). Research from Dix Arnold and Becker (1936) showed a 9.13% decline for each month post-peak for second and greater lactation animals. Other data (McCraw and Butcher, 1976)

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suggest declines of 11.6% and 5.8% for mature and first lactation animals respectively. Ferris (1981) estimated a decline rate less than 4% for primiparous animals. Schneeberger (1981) stated that selection for maximum yield during the first 100 days in milk (DIM) would decrease persistency. However, other work (Shanks et al., 1981a) shows selection for increased peak yield would not change persistency. Attempts to decrease peak milk yield and increase persistency through selection would result in decreased lactational output (Ferris et al., 1985). Batra et al. (1987) concluded that selection for faster rate to peak yield resulted in an increased peak and greater persistency.

Milking three times versus twice a day results in greater milk output. Lush and Schrode (1950) reported lactational increases of 20% and 16.7% for primiparous and multiparous animals respectively. Amos et al. (1985) and Pearson et al. (1979) recorded higher peaks and greater persistency for primiparous and multiparous animals with milk increases of 25.2 and 18.5% respectively for the lactation. Recently Barnes et al. (1990) measured increases of 14 and 6% respectively for primiparous and multiparous animals.

Management Studies

Waheed et al. (1977) and Mohammed et al. (1982) determined that feeding and management practices were

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interrelated and that herd differences in these practices accounted for 37% of total variance of milk yield. Further results showed that roughage source, amount and timing of concentrate fed to lactating cows and growing heifers, and heifer breeding weight affected milk production. Carley and Fletcher (1986) determined that herds using Dairy Herd Improvement (DHI) records, artificial insemination (AI), forage testing, balanced rations, and feeding concentrates at times other than milking had a 1,066 kg advantage over those herds that did not utilize any of these management tools.

Keown (1988) surveyed producers and discovered that differences in type of grain and forages fed had the greatest impact on rolling herd average (RHA). Bayley and Heizer (1952) interviewed producers regarding nine management areas including nutrition, selection, dry period length, age at calving, and body condition. Producers utilizing milking parlors, regular herd health care, and corn silage as the primary forage realized production increases of 680, 448, and 480 kg respectively (Zweigbaum et al., 1989).

Using DHI records, Appleman et al. (1985) and Schutz et al. (1985) observed in large herds that 39.3% of the variation could be accounted for by differences in 1.) mastitis control, 2.) nutrition, 3.) record keeping and utilization, 4.) reproductive management, 5.) sire selection, and 6.) cow culling. Meadows (1977) examined manage

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management practices and found similar results indicating breeding, feeding, herd health, and females available for culling are of critical importance. A study by Balaine et al. (1982) revealed that feed intake and herd life had positive correlations of 0.27 and 0.19 respectively, while mastitis treatment had a negative correlation (-0.21) on profit.

Nutrition Management

Feed nutrients are utilized for body maintenance, body weight gain, and milk production. Hillers et al. (1979) stated productive benefits of feeding changes for dairy cattle include, singly or in combination, 1.) increased milk yield, 2.) increased component yield, and 3.) improved body condition maintenance. Factors which determine response of production to added concentrate include the cow's genetic ability, stage of lactation, amount of grain currently fed, and forage quality (Smith, 1976; Robinson, 1989).

Feed efficiency is greatest during early lactation (Miller and Hooven, 1969). Part of this is due to mobilization of body reserves which are repleted in late lactation. During periods when milk price is low compared to feed costs, feed costs may approach 70% or greater of the cost of production (Smith, 1976). Achievement of maximum IOFC is dependent on cost of nutrients, value of product, and factors affecting response of production.

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1. <u>Ration Balancing</u>

To determine the proper level of nutrients for a lactating cow one must know the animal's 1.) age, 2.) body weight, 3.) level of milk production, 4.) butterfat percentage, and 5.) body weight change expected (NRC, 1989). The goal of feeding is to maximize the IOFC. Several computer-aided approaches have been explored to accomplish this (Brown and Chandler, 1978; Jones <u>et al</u>., 1980). Oldham and Emmans (1989) suggest that nutritional science is changing from calculating requirements to predicting response through yields of major milk components, rates of change for body fat and protein, and voluntary feed consumption.

In a field study reported by Jones <u>et al</u>. (1978) training level of the person whose feeding recommendations are followed and frequency of balancing rations can result in 354 kg difference in lactational milk yield. Using computer modeling, Lamb <u>et al</u>. (1974) found that concentrate consumed, rate of concentrate feeding, net energy of hay, and hay to concentrate ratios were important factors to production. Varga <u>et al</u>. (1985) studied feeding management and herd health in early lactation of commercial herds. They found excesses of calcium, phosphorous, and protein were correlated with fat cows. Therefore, it appears producers would benefit from improving their ration evaluation strategies (Patton <u>et al</u>., 1989).

2. Dry Matter Intake

Live weight, feed quality, and nutrient requirements are known to influence voluntary DMI (Forbes, 1986; Briceno et al., 1987). Hormonal control of intake is also thought to occur (Baile and Forbes, 1974). Research by Jensen et al. (1942) recorded the positive curvilinear response of milk production to DMI but there is a known inverse relationship between digestibility and intake (Colucci et al., 1982; Conrad et al., 1964; Staples et al., 1984). Others report that gut fill is dependent on forage quality and energy demand (Shaver et al., 1988). The lower tract takes an increasing role in digestion as intake increases (Staples et al., 1984).

Holter et al. (1986) reported a maximum DMI of 1.8% of body weight during the dry period. The gastrointestinal (GI) tract fill and digestive system size are known to increase starting immediately prepartum and continue into the lactation (Barnes et al., 1986; Martin and Ehle, 1986). However, early lactation cows do not consume as much as late lactation cows at the same level of milk production (Journet and Remond, 1976).

3. Energy Level

The peripartum cow is unable to meet energy requirements from the diet (Coppock, 1985) because peak DMI lags behind peak production (NRC, 1989). This results in a negative energy balance causing, loss of adipose tissue and protein reserves (Emery, 1988). DMI is related to the cow's

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cow's energy demand (Conrad, 1966). Therefore, the cow increases DMI in an attempt to meet this need and maintain reserves (Baile, 1975).

Total energy consumed by an animal is related to both the DMI and energy density of the diet. In a trial by Bull et al. (1976) caloric densities below .68 Mcal digestible energy (DE)/liter resulted in physical limitations on intake while densities above .68 caused physiological control of intake. Others (Steele, 1980; Wangesness and Muller, 1981) discovered that in early lactation energy densities above the optimum of 1.67 Mcal NEL/kg not only depressed DMI but also decreased total energy intake with no production differences. Eastridge et al. (1988) reported increased production and DMI for animals consuming a diet with nearly equal amounts of forages and concentrates.

Some (Bayley and Heizer, 1952; Holter et al., 1984) have reported increased DMI, milk yield, and IOFC for increasing concentrates fed. Results of other studies reveal that increasing concentrate DM consumed resulted in an increase in 4% FCM with a concurrent reduction in forage intake (Donker and MacClure, 1982; Flipot et al., 1988). Wagner and Loosli (1967) reported that high levels of concentrate intake have a greater depressing effect on digestible energy (DE) than do forages. While diets with higher levels of non-structural carbohydrates are used more efficiently (MacGregor et al., 1983; Weiss et al., 1989).

Care must be taken as excess energy is also associated with health problems (Keys et al., 1983; Emery et al., 1969). Therefore, both amount and timing of energy feeding must be managed properly.

Added fat has been reported to increase FCM and increase weight gains postpartum (Kronfeld et al., 1980; Skaar et al., 1989). Some have reported decreased DMI (Grummer and Socha, 1989), decreased eating time (Heinrichs et al., 1982), and decreased fiber digestibility with added fat (Brooks et al., 1954) probably due to coating of the fiber particles (Devendra and Lewis, 1974). Polyunsaturated fats did not increase milk yield (Goering et al., 1977) while hydrogenated animal fat have fewer negative effects and increased fat corrected milk yield (Jenkins and Jenny, 1989). Fat added as calcium soaps did not lead to reduced fiber digestibilities (Jenkins and Palmquist, 1984; Schauff and Clark, 1989). High fat diets must have increased amounts of calcium and magnesium added because fat forms soaps with them in the rumen, making these minerals less available (Palmquist and Conrad, 1980; Steele, 1984). Added fat changes the milk fat composition (Yang et al., 1978) and can decrease milk protein content (Dunkley et al., 1977; Horner et al., 1986) however, effect on composition is dependent on stage of lactation (Clapperton and Steele, 1985; Schneider et al., 1988).

4. Protein Level

Crude protein intake from the diet (IP) is either degraded (DIP) or passed through (UIP) the rumen (NRC, 1985). Factors that influence protein breakdown in the rumen include extent of crosslinking, rumen retention time, protein solubility, processing and storage effects, rumen microbial proteolytic activity, and microbial access to the protein (Satter, 1986; NRC, 1985). Protein can increase milk yield by providing additional amino acids, increasing available energy, and altering efficiency of utilization of absorbed nutrients (Chalupa, 1984).

In separate reports comparing 13.5 or 16.5 and 12.2 or 16.2% crude protein (CP) respectively (Roffler and Thacker, 1983a and 1983b; Roffler et al., 1978) observed increased milk yield, 3.5% FCM, DMI, and IOFC for the higher protein ration. In these studies production ranged from 20.5 to 23.0 and 25.7 to 34.0 kg for primiparous and multiparous animals respectively. Others (Forster et al., 1983; Kung and Huber, 1983; Macleod et al., 1984) recorded a similar production and DMI response with milk yields of approximately 27, 26, and 18 kg respectively. Higher protein rations are also known to increase milk fat levels in Jerseys at 17 kg (Baxter et al., 1983) and Holsteins at 35 kg daily milk (Higginbotham et al., 1989). Foldager and Huber (1979) disagree and found no production response, during weeks 3-20 of lactation and 28 kg production level, to 16 as compared to 12.5% CP. Holter et al. (1982)

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reported 14% CP rations were adequate to achieve milk yields of 34-40 kg/day between 46-159 days postpartum. Cressman et al. (1980) found lactating multiparous animals responded to increased protein while primiparous animals did not at 30 and 20 kg of milk per day respectively.

Additions of rumen-protected methionine and lysine increased milk protein percentage and yield for mid-lactation cows fed a corn based diet (Donkin et al., 1989; Rogers et al., 1987) but have no effect on soybean meal diets (Rogers et al., 1989). Protein by-product feeding has been used successfully to meet UIP needs (Clark et al., 1987; Waltz et al., 1989) but microbes still provide the greatest amount of protein to the small intestine (McCarthy et al., 1989). Resistant protein may have greater value in alfalfa silage diets than in corn silage diets (Voss et al., 1988; Annexstad et al., 1987). High UIP is not needed in late lactation (Robinson and Kennelly, 1988).

There has been some concern about high levels of protein decreasing reproductive efficiency (Chalupa, 1984; Visek, 1984). Several have reported increased days open (DO) for increasing protein levels (Edwards et al., 1980; Ferguson et al., 1986; Jordan and Swanson, 1979). Others (Wohlt and Clark, 1978; Carroll et al., 1987b; Howard et al., 1987) reported that protein level had no impact on reproduction. Carroll et al., (1987a) found, however, that when vaginal levels of urea nitrogen exceeded 40 mg/dl no conception occurred. Inconsistency of excess protein's impact on reproductive performance may be due to rumen UIP/DIP dietary differences (Ferguson and Chalupa, 1989).

5. Energy and Protein Interaction

The protein-energy interrelationship can usually be characterized by changing the overall plane of nutrition through digestibility or altering the pattern or efficiency of absorbed nutrients (Oldham, 1984). The type and amount of both energy and protein as well as the ratio of nitrogen to energy will influence the amount of milk produced and feed efficiency (Clark and Davis, 1980). The protein-to-energy-ratio requirement is largely determined by maintenance requirements of microbes and nitrogen recycling that occurs in the rumen (Leng and Nolan, 1984). Relative changes of concentration and undegradibility of protein are affected largely by relative changes of digestibility and intake of energy (Waldo and Glenn, 1984). Rumen degradibility of both starch and protein (Herrera-Saldana and Huber, 1989; Jaquette et al., 1987) as well as digestible organic matter (DOM) (Van Horn et al., 1979) influence response to increased protein levels in the ration.

6. Fiber Level

The recommended amounts of fiber that should be included in the diet of dairy cattle may vary depending on the cow's body condition, feed particle size, diet buffering capacity, feeding frequency, and economics (NRC, 1989). The optimal fiber level probably changes with production level of the cow (Wangesness and Muller, 1981).

Feed intake is affected by rate and extent of fiber digestion (Allen and Mertens, 1988a) and correlated with neutral detergent fiber (NDF) levels (Mertens, 1982; Allen and Mertens, 1988b; Waldo, 1986; Briceno et al., 1987). A study by Varga et al. (1984) demonstrated that in cows less than 56 days in milk (DIM), slow and fast rates of fiber turnover resulted in no difference in DMI, FCM, daily fat production, and solids non-fat (SNF), however dietary differences in carbohydrate digestion rates varied which did not permit accurate assessment of fiber turnover. Acid detergent fiber (ADF) values are more closely related to energy content (Mertens, 1987).

Rumen fill usually will limit intake before that happens via chemostatic mechanisms in the high producing dairy cow (Fisher et al., 1987). The rate at which undigested portions leave the rumen is a major determinant of intake (Mertens and Ely, 1979; Troelsen and Campbell, 1968), however, the size of the potentially digestible fraction is more important (Mertens and Ely, 1982). Robinson et al. (1987a,b) found that the rumen rate of NDF digestion increased curvilinearly.

Rate of reduction of cell wall particle size limits voluntary intake of forages (Smith et al., 1983). Rumination has the greatest effect on reduction of particle size and therefore would have an impact on intake (Welch, 1982). Fiber level (Beauchemin and Buchanan-Smith, 1989; Kaiser and Combs, 1989) and animal size (Ho Bae et al., 1983) affect rumination time. However, Ulyatt et al. (1986) state that the material present in the rumen at any one time is predominantly less than the 2-4 mm threshold size needed to exit and therefore particle size reduction is not the rate-limiting step in rumen clearance.

A major concern of low diet fiber levels is reduced FCM yield. Acid detergent fiber (ADF) levels are the most frequently used indicator of a ration's ability to prevent milk fat depression (Lofgren and Warner, 1970). This problem has been corrected by adding sodium bicarbonate and/or magnesium oxide (Erdman et al., 1988; Schaefer et al., 1982; Snyder et al., 1983; Thomas et al., 1984) but not limestone (Rogers et al., 1982; Rogers et al., 1985. Sometimes, however, no response has been reported (Arambel et al., 1988) or response may vary with forage type (Canale and Stokes, 1988). Jasaitis et al., (1987) found greater buffering capacity for legume forages as compared to energy or low protein feeds, or grass forages. Results from a study by McBurney et al. (1986) indicated cation-exchange capacity was positively correlated with NDF lignin and nitrogen content as well as lignin:ADF ratio of the NDF. Buffering requirements appear to be a function of salivary buffer secretion, feedstuff buffering capacity, and feed acidity (Erdman, 1988).

7. Grouping

Many have evaluated animal and profitability response to various nutritional management approaches. Grouping cows based on both protein and energy needs rather than test day milk, FCM, or FCM/bw$^{.75}$ resulted in more homogeneous groups and no difference in milk yield (McGilliard et al., 1983; Schucker et al., 1988). Stallings and McGilliard (1984) suggest using lead factors in which 83% of animals in a group are fed greater than or equal to requirements. Varying ration energy content during different stages of lactation is more economical than feeding one ration throughout. To accomplish this, research has been done with grouping and/or individual concentrate availability. Clark et al. (1980) discovered no difference in production or reproduction in one versus three lactation groups. However first lactation Guernseys produced more milk in the stratified system. Others (Wilk et al., 1978; Davenport et al., 1983) reported similar results for one group fed a constant amount of concentrate throughout lactation compared to two groups fed concentrate according to production level. Some have reported a minimal production decrease by moving cows from one production group to another (Clark et al., 1977) while others recorded sharp drops in production (Akinyele and Spahr, 1975; Moseley et al., 1976). Cassel et al. (1984) found concentrates fed via transponder feeders, in one-group total mixed rations (TMR), or two-group TMR had r

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respective returns on investments of \$4.15, \$4.03, or \$3.71. This type of concentrate feeding works well in herds that cannot be grouped (Hutjens, 1976) and therefore has limited application.

8. Prepartum Feeding

Dry cows have lower intakes than lactating cows (Emery, 1988) and experience a further intake depression at parturition (Marquardt et al., 1977). This requires proper nutrition management immediately prepartum to balance the increasing nutrient needs of the fetus and initiation of lactation.

Cows fed corn silage and a liquid protein supplement during the dry period have been found to have greater calving difficulty (Nocek et al., 1983). A 15% CP ration has been reported to cause health problems (Julien, 1977). Feeding animals protein at 80% of requirements for the last 60 days of the dry period resulted in reduced DMI and resulting losses in production in the following lactation (Chew et al., 1984). Conflicting results exist as Curtis et al. (1985) demonstrated that increased energy and protein during the last 3 weeks of the dry period reduced certain health problems associated with parturition.

Feeding cows to increase body weight during the dry period has been shown to increase the chance of ketosis (Correa et al., 1990). Other studies indicate that overconsumption of energy prepartum did not impair production when high energy was fed as part of a TMR

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postpartum (Boisclair et al., 1986; Boisclair et al., 1987). Milk fat depression does occur, however, in some instances of cows fed high energy prepartum (Jaquette et al., 1988).

Body Condition

Early in lactation, animals are known to utilize body reserves to meet demands of high milk production (Coppock, 1985). While water turns over most rapidly (Martin and Ehle, 1986), adipose tissue and tissue protein provide the needed energy, with fat providing the greater amount (Ferguson et al., 1990). The source of the protein is skeletal muscle; its proportional response to changes in nutrition are higher than other organs (MacRae, 1990). Williams et al. (1989) found that the energy density for energy mobilized from tissue in early lactation is greater than that apparently restored in late lactation. The total amount of energy deposited, however, equals the amount of energy removed.

Producers can subjectively measure animal reserves using a body condition system reported by Mulvany (1977). Edmonson et al. (1989) found consistent results between body scores and actual condition, but body weight and frame size cannot be correlated with body condition (Wildman et al., 1982). Ducker et al. (1985) noted body condition score (BCS) is a good measure of energy balance of the previous four weeks.

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It has been reported that the greatest weight loss is associated with the greatest milk yield (Ruvuna et al., 1986; Upham et al., 1990). Bayley and Heizer (1952) noted that heifers produced 386 kg more when calving in "excellent" as compared to "good" condition. Animals on diet with a forage to concentrate (F:C) ratio of 72:28 were not able to consume adequate energy and therefore had lower BCS and milk yield compared to animals fed a diet with 53:47 F:C ratio (Eastridge et al., 1988). Larger, primiparous animals lost more weight during early lactation and gained less in late lactation (Lin et al., 1985). Some have reported reduced intake for fat cows (Bines and Morant, 1983; Garnsworthy and Topps, 1982) but also greater production (Garnsworthy and Jones, 1987). Patton (1989), however, reported no effect of body condition on early lactation DMI but a positive influence on post peak FCM.

Body Measures

Body weight plays a more significant role in first lactation yield than does age (Fisher et al., 1983; Allison, 1985). Several have found a positive correlation between production traits and body measurements (Donker et al., 1983; Lin et al., 1985; Lin et al., 1988). Donker and Mac Clure (1982) observed that milk production and forage intake increased with body weight but at a curvilinear rate. Miller and McGilliard (1959) noted a 91 kg advantage in milk yield for each 45 kg of additional body weight (BW) fo

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for first lactation animals. Keown and Everett (1986) found that weight at parturition played a positive, significant role in milk yield, with an optimum range of 544-567 kg. Sieber et al. (1988) disagree and conclude that taller animals with lower body weight, smaller heart girth and larger paunch have greater milk yields.

Age at Calving

Age appears to have a greater influence on production for primiparous than for multiparous animals (Keown and Everett, 1985). Lush and Schrode (1950) reported increased milk yields for first lactation animals calving at an older age. Miller and McGilliard (1959) and later Lin et al. (1988) reported that an older age at first calving resulted in increased production but this advantage was not maintained throughout productive life. For each month the age at first calving is reduced, an economic value equivalent to 138 kg is gained in total profit to 72 months of age (Lin and Allaire, 1977). This is further supported with age at first calving having a small, negative correlation (-.05) with productive life span, total life span, and number of parturitions (Silva et al., 1986).

Gill and Allaire (1976) found 22.5-23.5 months of age at first calving optimizes total lifetime performance. Smith and Schmidt (1987) observed that age at first calving declined between 1976-1983 for 543 Ohio dairy herds and was significantly correlated to the increase in milk production. In practice, producers associate younger first calving ages with increased calving difficulty but research suggests this difficulty is more related to body size than to age (Sieber et al., 1988; Thompson et al., 1983).

Dry Period Length and Previous Lactation Length

The goal for producers is to maximize each animal's profit/day of herd life. This necessitates that animals be producing high levels of milk for as many days as possible. Days open is the primary measure of reproductive performance in dairy cattle (Lee et al., 1989). Days open affects the animal's total milk yield potential in that calving interval (CI) is a summation of the variable days open and the relatively fixed gestation length. Some (Holman et al., 1984; Schmidt, 1989) have determined the optimum CI is 13 months while others (Reyes et al., 1981) noted IOFC did not differ for CI between 13-15 months. Funk et al. (1987) and Pedron et al. (1989) reported that as previous days open increased current lactation yields increased. However, Schneider et al. (1981) found similar milk for animals bred 88 or 121 days postpartum. Others recorded that animals with higher peak production maximized profits with fewer DO (Weller et al., 1985). Olds et al. (1979b) determined that for each additional DO between 40 and 140 reduces annual milk yield by 4.5 and 8.6 kg for primiparous and multiparous animals respectively.

Optimal dry period length is a function of management and genetics and is a balance between production lost in the current lactation and production gain in the subsequent lactation. Dias and Allaire (1982) cited that lactations with shorter CI, higher production, or younger animals required longer dry periods. Funk et al. (1987) determined that animals dry less than 40 days produced at least 180 kg less milk than those dry the optimum 60-69. Others (Schaeffer and Henderson, 1972; Keown and Everett, 1986) found a 50-60 day dry period to be ideal although dry periods of 40-49 or 60-69 days did not differ greatly from the ideal. Dix Arnold and Becker (1936) found that a 31-60 day dry period allowed maximum daily milk yield in the following lactation. Yet another study (O'Connor and Oltenacu, 1988) suggests that optimal dry period length is dependent on not only age at calving but season of calving.

Genetic Level

Research reported by Mao et al. (1972) shows that 83-90% of variation in production between herds is caused by variables other than sire effects. Heritability, however, of mature equivalent (ME) milk is high enough (0.30) to make progress through selection (Bath et al., 1985). Shanks et al. (1978) found that high pedigreed animals produced more milk and had a greater profit than daughters of average sires. Others report using sires with 865 kg higher genetic values for milk yield resulted in

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approximately 25 and 30% more milk during first and second lactations respectively (Barnes et al., 1990). Betrand et al. (1985) determined that daughters of sires with high predicted difference for milk, even with higher feed, breeding, and health costs, had 18% greater lifetime profit. However, genetic antagonism may exist between production and body weight and reproductive efficiency (Badinga et al., 1985; Olds et al., 1979a; Seykora and McDaniel, 1983).

Herd Health

1. General Health

Hillman (1982) stated that chronic stress can predispose cows to metabolic and infectious diseases. Certainly the dairy cow immediately prepartum and in early lactation is experiencing stress. Most disorders occur in association with initiation of lactation (Shanks et al., 1981b) with four times as many health problems in early as in late lactation (Hansen et al., 1979). Wherever health costs rise with production, the increased IOFC more than compensates for the added cost (Shanks et al., 1978; Hansen et al., 1979b; Shanks et al., 1981b). Galton et al. (1977) reported that while herds on a health program averaged 255 kg less milk/lactation they returned $0.16/cow/d more than controls.

There is strong evidence to suggest that health problems for a given animal are interrelated (Erb and

Martin, 1980a; Erb and Martin 1980b; Erb et al., 1981a; Erb et al., 1981b; Grohn et al., 1989; Curtis et al., 1985). Thompson et al. (1983) and Shanks et al. (1981b) agreed and further noted that all health problems, except dystocia, increased with parity. Dystocia and twining are known to depress subsequent milk yield (Djemali et al., 1987; Chapin and Van Vleck, 1980). Larger animals within a breed have greater need for health care, with digestive disorders being the main difference (Mahoney et al., 1986).

All dairy cows immediately postpartum have some level of hepatic fat infiltration (Gerloff et al., 1986), although the reason is unknown (Skaar et al., 1989). The liver's conversion of large amounts of mobilized free fatty acids to ketone bodies, and the body's ability to utilize or remove them, results in bovine ketosis. Depressed intake is a characteristic of ketosis (Foster, 1988). Severity of ketosis probably depends heavily on the liver's ability to metabolize increased uptake of FFA (Fronk et al., 1980). A high grain diet throughout a previous lactation results in fatty livers during the current lactation (Keys et al., 1983), and overconditioned animals have more periparturient disorders (Fronk et al., 1980). Carstairs et al. (1981) found that animals fed 135% of requirements during the first 84 days postpartum had twice as many health problems during the first 3 months of lactation. Most health problems can be minimized to acceptable levels through proper balance of nutrition and body reserves.

2. Mastitis

Mammary infection costs are the largest component of total health care costs (Shanks et al., 1981b). Mastitis is known to reduce both the quantity (Jones et al., 1984) and quality (Cue et al., 1987) of milk. Blosser (1979) reported a production loss of 386 kg/cow/year ($81.32) due to subclinical mastitis, with a total cost of $117.35/cow/year. Morse et al. (1987) observed a range of losses from $29.73 to $223.98 for discarded milk alone, the amount depending on animal parity (older cows having larger losses). Very few animals (6.1%) account for over 50% of discarded milk in a given herd (Morse et al., 1987). Fetrow et al. (1988) reported a 190 kg reduction in rolling herd average (RHA) for each unit increase in somatic cell linear score. Somatic cell count (SCC) is reported to account for approximately 16% of variation between herd production averages (Appleman et al., 1985).

Rates and severity of mastitis differ among herds, seasons, parity, and stage of lactation, with greater rates in summer, first lactation animals, and during the first seven days postpartum (Hogan et al., 1989; Kennedy et al., 1982). Others , however, reported greater occurrence rates for older cows (Morse et al., 1988; Oliver and Mitchell, 1983).

Genetic selection for reduced mastitis has met with limited success due to low to moderate heritabilities (Monardes et al., 1983; Vecht et al., 1985). Therefore, the problem is controlled through environmental management and milking practices (Goodger et al., 1988). Zweigbaum et al. (1989) found that herd mastitis was reduced 0.9% for each recommended practice followed.

Summary

Findings from the literature suggest the following;

1.) DMI is positively related to milk production.

2.) Type and level of energy, protein, and fiber interact to influence DMI and therefore milk yield.

3.) Body weight is positively related to DMI.

4.) Age at first calving is positively related to body weight.

5.) Nutrition management, both pre- and postpartum influence milk production.

6.) Body reserves play a significant role in health problems and milk yield.

7.) Occurrence of health and mastitis problems reduce production.

8.) Genetic ability of the animal sets production potential.

9.) There are optimal lengths of dry period and previous lactation.

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No studies have looked at these variable simultaneously. Therefore, the following management measures were evaluated for primiparous animals: 1.) postpartum body condition score, 2.) withers height, 3.) body weight, 4.) age at calving, 5.) sire PTAM, 6.) periparturient health problems, 7.) SCC, 8.) prepartum energy and protein intake differences from maintenance, and 9.) postpartum DMI, energy density, ADF, and CP levels. The same measures were made for multiparous animals and included dry period length and previous lactation length while withers height and age at calving were not considered.

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MATERIALS AND METHODS

Herd Selection

Using July 1989 Dairy Herd Improvement (DHI) records, Holstein herds in southern lower Michigan were selected which 1.) milked twice a day, 2.) used the SCC test, and 3.) had 3 or more animals each of first lactation and second lactation or greater animals due to calve in October of 1989. Primiparous animal's data included in analysis ranged from 1-10 animals/herd while multiparous animals ranged from 1-8. Michigan DHI Field Technicians and County Extension Agents were contacted to determine operations which daily weighed or measured feeds. Producers were then contacted, by letter and telephone, to request participation in the study.

Four groups of 11 herds each were selected based on herd size (small - < 130 and large - ≥ 130 cows) and production level (low - < 8,636.4 and high - ≥ 8,636.4 kg RHAs) for a total of 44 herds (Appendix Table 53). Group 1 (small, low producing) herd's averages were 90.45 cows and a 7,617.7 RHA with standard deviations of 26.10 and 401.54 respectively. Group 2 (small, high producing) herds averaged 81.73 cows and a 9,465.0 RHA with respective s

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standard deviations of 27.31 and 683.10. Group 3 (large, low producing) herds averaged 190.1 cows with a 7,645.8 RHA and respective standard deviations of 48.42 and 500.61. Group 4 (large, high producing) herd's averages were 189.9 cows and a 9,455.0 RHA with 48.51 and 589.38 as standard deviations respectively. Information for herd 43, which would have been in Group 3, was not included in the analysis because milking three times a day began during the study.

Herd Visits

1. Initial Farm Visit

Each initial herd visit was made between October 10 and November 1, 1989. General farm information was recorded, including bunk space, type of milking facilities, water availability, and use of a scheduled veterinary program. Feeding and housing information was recorded for dry cows and heifers (2 weeks prior to calving), and for cows in first lactation or in second and greater lactation for fewer than 100 days in milk (DIM). Housing information included management group size, age, and housing type. Amounts of feeds fed, manner of feeding (separate or TMR) and feedings per day were recorded. Feeds samples (0.5 kg) were taken, as TMR when possible, for each management group, using the guidelines of Hesterman and Frahm (1987). Each animal on study had a body condition score assigned according to Patton *et al*. (1988). Heart girth measures were made on each postpartum animal on study while withers measures were recorded on first lactation animals only. Producers were provided with a data sheet and requested to record any health information on the selected animals which could potentially reduce milk production.

2. <u>Second and Third Farm Visits</u>

Second and third visits to each farm were made between November 7-18 and December 4-13, 1989 respectively. During each visit, feeding information was recorded and feed samples taken as described earlier. On the second visit, body condition and hearth girth measures were taken on those animals that had since initiated lactation.

Milk Composition, Genetic Level, Calving Age, Dry Period and Previous Lactation Length

Milk yield, butterfat, and SCC were determined, using the Michigan DHI Herd Production Report (HPR), for each animal's first three postpartum production tests. Reported 4% FCM and SCC values are averages, within lactation groups, of these first three tests. Age at calving was taken from the first month's test HPR. Length of dry period and previous lactation lengths were determined by difference from dates reported on previous HPR. Predicted transmitting ability of sire for milk (PTAM) was noted from the February 1990 Michigan DHI Herd Inventory (HI). If the sire was not identified on the HI, the producer was contacted and resulting sire identification was submitted v

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to the Holstein Association (Brattleboro, VT) to determine PTAM.

Animal Measures and Herd Health

Heart girth and BCS reported values were averages, within lactation group, for the measure taken on the first postpartum farm visit for each animal. Body weights were determined from heart girth measures (Davis et al., 1961). Withers values are averaged for first lactation animals only. Producer-recorded information on herd health was used to create an index by averaging the number of health incidents for animals within lactation groups.

Feed Analysis

Feed samples, for each management group and farm visit, were placed in plastic bags and frozen at -30^{o} C after each day of farm visits. Samples were moved from freezer to refrigerator the day before to thaw and allow handling. For farms which fed ingredients separately, composites were made in proportion to weights reported to be fed and placed in a tared 24 X 40 X 10 cm aluminum pan, weighed, and dried at 55^{o}C for 72 hours and weighed again to determine dry weight. Entire samples were used for farms using a TMR. Total ration dry matter was determined using the formula:

1. Ration dry matter % = (dry weight/wet weight) X 100

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a 1 mm screen using a Wiley Mill and then approximately 100 g was sealed in a collection vial.

Samples were analyzed sequentially and in duplicate for neutral detergent fiber (NDF) and acid detergent fiber (ADF) using methods described by Goering and Van Soest (1970). The NDF procedure was modified by omitting decahydronapthalene and sodium sulfite, substituting triethylene glycol for 2-ethoxyethanol (Cherney et al., 1989), and the inclusion of 2 ml of a 4% alpha-amylase (Sigma Co., St. Louis, MO) solution (Robertson and Van Soest, 1977). NDF and ADF with duplicate values having differences of greater than 1.5 units were run until this difference was reached. Ash content was determined after igniting samples for 5 hours at 500°C. Crude protein (CP) values were determined using the total nitrogen method reported by Hach et al. (1985) and multiplying by 6.25. Gravimetric dry matter content was determined after drying for 24 hours at 100°C.

Energy Determination

Ether extract (EE) content was determined with a 2 g sample in filter paper using the following formula:

2. EE % = ((dry sample wt. - extracted sample wt.)/dry sample wt.) X 100

In vitro true digestibility (IVTD) was determined using the Goering and Van Soest (1970) method with incubation terminated at 36 hours. In vitro apparent digestibility

(IVAD), total digestible nutrients (TDN), and net energy for lactation (NEL) were calculated according to following equations:

3. IVAD = IVTD - 12.9 (Van Soest, 1982)
4. TDN% = IVAD + 1.25(EE%) - total ash (Lofgreen, 1953)
5. NEL (Mcal/kg) = 0.0245 X TDN% - 0.12 (Moe and Tyrrell, 1976)

Animal Intake and Nutrient Measures

Reported DMI for lactating and nonlactating animals was determined according to the following equation:

6. Reported DMI = amount fed (kg) X ration DM%

For dry cows and heifers near parturition energy and DMI requirements were calculated using the following guidelines from NRC (1988):

7. Energy required (Mcal NEL) = 0.104 Mcal NEL X BW (kg)$^{.75}$
8. Estimated DMI (kg) = energy required (Mcal NEL)/ ration energy density (Mcal NEL/kg)

Protein requirements (g/day) were determined by interpolation using NRC (1988) reported values. Protein and energy differences from requirements were calculated for reported DMI while protein differences only were determined for estimated DMI.

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Statistical Analysis

Four data sets were used for both primiparous (P) and multiparous groups (M); 1.) complete information (C), 2.) excluding genetic information (NG), 3.) excluding SCC information (NS), and 4.) combining all three data sets (C, NG, and, NS) within lactation group but excluding genetic and SCC information (AL). All statistical analyses were performed using SAS (SAS Institute Inc., Cary, NC, release 6.03, 1988).

Simple correlations were determined between all variables using the general linear model (GLM). Least square means were determined between small vs. large herds and low vs. high producing herds using the GLM. Multiple regression equations were generated for each data set using two different models with daily 4% FCM as the dependent variable.

P model 1 included:

$$Y = B_0 + B_1 x_{i1} + B_{11} x_{i1}^2 + B_2 x_{i2} + B_{22} x_{i2}^2 + \ldots B_k x_{ik} + B_{kk} x_{ik}^2 + B_{12}(x_{ik} x_{ik}) + E_i$$

where Y = dependent variable (daily 4% FCM)

B_0 = intercept

B_1 = coefficient for linear effect of variable x_{i1}

B_{11} = coefficient for quadratic effect of variable x_{i1}

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B_{12} = coefficient for interaction effect of x_{i1} and x_{i2} variables

etc.

E_i = error term

and i = 1, 2, ... n (number of herds), j = 1, 2, ... k (number of variables) for each of the following linear (VAR) and quadratic (VAR2) variables;

1) body condition score 1-30 days postpartum (BCS, BCS2)
2) body weight in kg (WT, WT2)
3) age in months (AGE, AGE2)
4) withers height in cm (WH, WH2)
5) sire PTAM in kg (PTAM, PTAM2)
6) SCC linear score (SCC, SCC2)
7) health score (HEALTH, HEALTH2)
8) reported prepartum energy intake difference from NRC requirements in Mcal NEL/day (XSNEL, XSNEL2)
9) reported prepartum protein intake difference from NRC requirements in g/day (XSPROTRD, XSPTRD2)
10) postpartum ration energy density in Mcal/kg (ED, ED2)
11) postpartum ration ADF percentage (ADF, ADF2)
12) postpartum ration CP percentage (CP, CP2)
13) postpartum dry matter intake in kg/day (DMI, DMI2)

P model 1 independent variable interactions included;

A) DMI X WH (DMIXWH)

B) DMI X WT (DMIXWT)

C) DMI X ED (DMIXED)

D) ED X CP (EDXCP)

E) ED X BCS (EDXBCS)

F) ED X HEALTH (EDXHEAL)

G) XSPROTRD X HEALTH (XSPRDXH)

H) XSNEL X HEALTH (XSNELXH)

I) PTAM X HEALTH (PTXHEAL)

P model 2 independent variables excluded XSNEL and XSPROTRD but included;

14) estimated prepartum protein intake difference from NRC requirements in g/day (XSPROTES, XSPTES2)

PM2 excluded interactions XSPRDXH and XSNELXH but included;

J) XSPROTES X HEALTH (XSPESXH)

PNG and CNG model 1 and model 2 excluded PTAM and therefore excluded the PTXHEAL interaction. PNS and CNS model 1 and model 2 excluded SCC.

For M model 1 and model 2 variables AGE and WH were replaced by;

15) dry period length in days (DP, DP2)

16) previous lactation length in days (PLL, PLL2)

Therefore, DMIXWH was not considered for any M model but other interactions were included as in primiparous models. For any PAL or MAL model, neither PTAM and SCC nor the PTXHEAL interaction were included.

Final model(s) selection was made using the fewest variables while optimizing the model's significance level and adjusted (ADJ) R^2 value. Standardized estimates (STD EST) were determined for each selected model variable. This procedure establishes unitless standard deviations (STD DEV) to compare magnitude of influence on the dependent variable for a given independent variable while holding all other variables constant.

RESULTS AND DISCUSSION

It is suggested the reader understand the variable terms defined in the **Statistical Analysis** section (p. 36) of the **MATERIALS AND METHODS** and also found in **LIST OF ABBREVIATIONS** preceding the **INTRODUCTION.** This will facilitate understanding abbreviations unique to this study used throughout the **RESULTS AND DISCUSSION.** It is further recommended that the following be read in order 1) **SUMMARY AND CONCLUSIONS** (p. 204), 2) **Primiparous Discussion** (p. 112), 3) **Multiparous Discussion** (p. 117), and 4) **General Discussion** (p. 123) prior to reading the remainder of this section.

Primiparous Animals

1. Complete Data

Correlation analysis (Appendix Table 5) of the primiparous complete (PC) data set (Appendix Tables 6 and 7) resulted in values of significance between XSNEL and XSPROTRD, ED and ADF, and WT and BCS (terms as defined in **MATERIALS AND METHODS** and **LIST OF ABBREVIATIONS**) with r values of .8754, -.8587, and .5666 respectively.

For PC model 1 an R^2 and adjusted (ADJ) R^2 of .8664 and .5190 were obtained (Table 1). Model variables having a major (standardized estimate (STD EST) absolute values $\geq$

Table 1

PRIMIPAROUS COMPLETE DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	1942.391297	587.969860	0.0080	0.0000
BCS	-382.887439	122.791950	0.0109	-34.4718
BCS2	18.715079	6.541615	0.0169	9.1710
AGE	-12.380856	5.510434	0.0484	-7.1868
AGE2	0.262755	0.105822	0.0324	8.4292
WT	0.154424	0.447720	0.7373	1.3803
WT2	-0.001624	0.000515	0.0103	-14.7071
PTAM	-0.011885	0.007784	0.1578	-0.7834
PTAM2	0.000015	0.000007	0.0504	1.0300
SCC	3.923242	1.360597	0.0163	0.8437
HEALTH	-5.883926	6.320372	0.3738	-0.6446
HEALTH2	4.887582	3.096436	0.1455	0.8960
XSNEL	-1.801625	0.732193	0.0336	-2.7206
XSNEL2	0.135483	0.036920	0.0043	5.4641
XSPROTRD	-0.005820	0.002809	0.0651	-1.1862
XSPTRD2	-0.000002	0.000001	0.1192	-1.1933
ED	-1592.351297	632.813565	0.0306	-27.8054
ED2	417.562805	214.611987	0.0803	23.6431
ADF	12.304814	4.553360	0.0222	8.0880
ADF2	-0.282739	0.110634	0.0286	-7.2603
CP	33.491242	16.189618	0.0654	13.2301
CP2	-0.303849	0.275722	0.2963	-4.1866
DMI	-35.020080	8.935713	0.0029	-23.8911
DMIXWT	0.068640	0.017466	0.0028	29.1346
EDXCP	-13.587054	11.142875	0.2507	-10.3581
EDXBCS	163.927793	57.385538	0.0171	26.5271
XSNELXH	-1.098056	0.340938	0.0092	-1.5428

Model Summary

R^2 = .8664
Adjusted R^2 = .5190
Degrees of Freedom (Error) = 10
Mean Square Error = 10.045

[a]STD EST = Standardized estimate

20), positive impact on daily 4% FCM were DMIXWT, EDXBCS, and ED2; BCS, ED, and DMI had a major, negative association with FCM. Quadratic variable WT2 and interaction EDXCP had moderate (10 < STD EST absolute value < 20), negative and CP a moderate, positive affects. BCS2, AGE2, ADF, and XSNEL2 had minor (5 < STD EST absolute value < 10), positive with ADF2 and AGE a negative influence. Removing CP2 and the EDXCP interaction from the model resulted in R^2 and ADJ R^2 values of .7914 and .4224 respectively. Figure 1 is a graphic representation of the STD EST of variables which have major, moderate, and minor influences on daily milk yield from Table 1.

Model 2 (Table 2) differed, however, as WH and DMI had major, positive and WH2 and DMIXWH had major, negative affects on milk yield. DMIXED and ED had minor, negative but a ED2 minor positive association (Figure 2). While deleting model variables CP and EDXCP did result in an increased ADJ R^2 the lower .6549 R^2 value was not as acceptable in comparison to the selected model's R^2 value of .6882.

Comparison of means (Table 3) for large versus small herds revealed significantly (P < .10) lesser values for large herds in AGE, WH, and XSPROTRD with greater values for ED and CP. XSNEL approached this level of significance, being lower in larger herds. High producing herds had a significant (P < .10) advantage in PTAM. Furthermore, FCM, CP, and HEALTH nearly reached

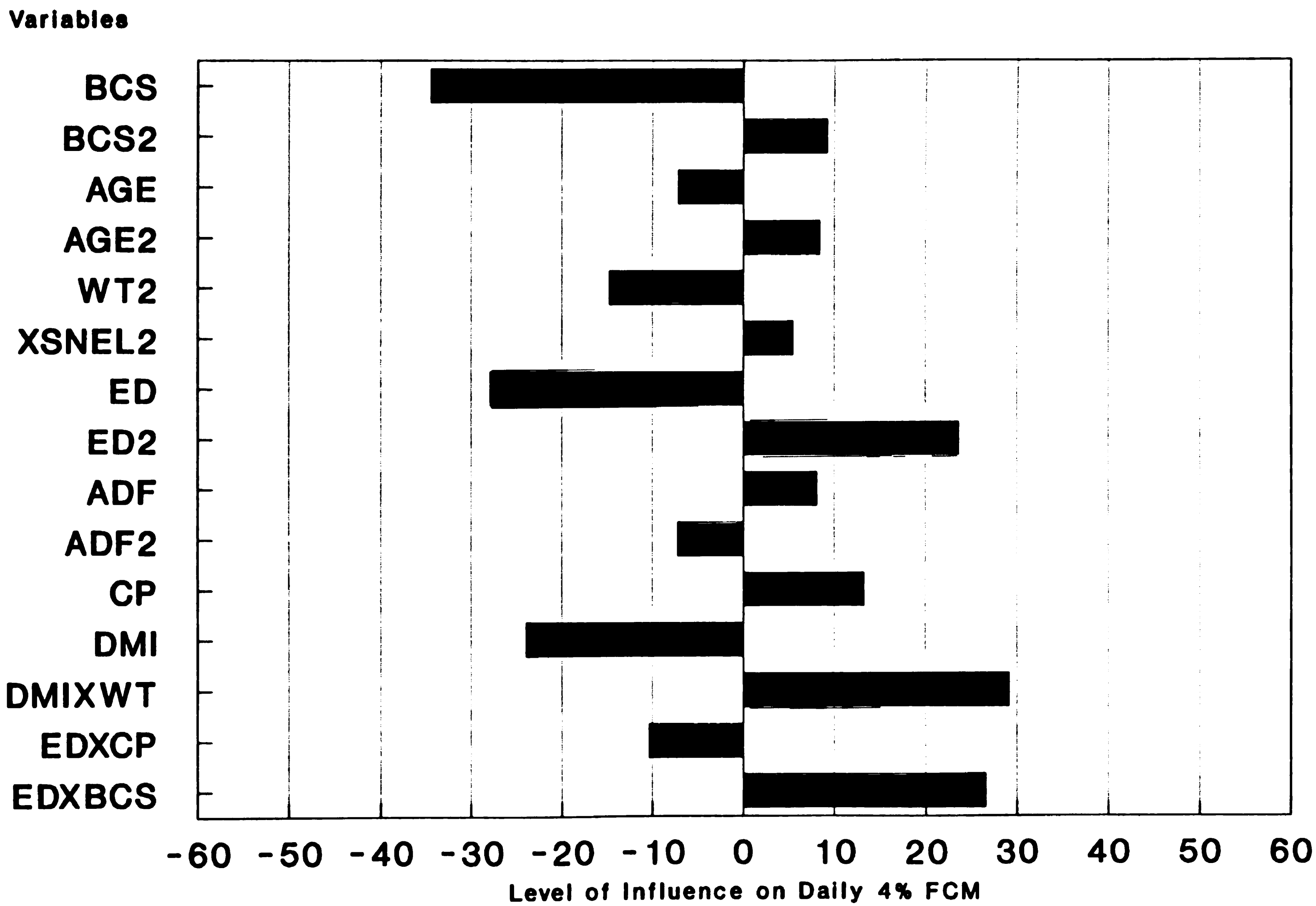

Figure 1: PRIMIPAROUS COMPLETE DATA MODEL ONE EQUATION ONE (Table 1).

Table 2

PRIMIPAROUS COMPLETE DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-5394.723163	1980.224916	0.0139	0.0000
BCS	4.495690	2.655495	0.1077	0.4048
WH	74.187545	25.933897	0.0104	48.3673
WH2	-0.242013	0.094169	0.0193	-42.8593
WT	-0.189300	0.150371	0.2242	-1.6921
HEALTH	3.780365	1.723467	0.0416	0.4141
XSPROTES	-0.005788	0.003862	0.1512	-0.3203
ED	-288.158345	408.047634	0.4891	-5.0318
ED2	127.738579	127.071017	0.3281	7.2328
ADF	7.216042	3.282150	0.0412	4.7431
ADF2	-0.170775	0.088838	0.0705	-4.3853
CP	-7.419273	13.587528	0.5917	-2.9308
DMI	49.049417	18.130508	0.0145	33.4621
DMI2	0.104049	0.088855	0.2569	3.2772
DMIXWH	-0.338471	0.122887	0.0131	-32.7459
DMIXWT	0.007690	0.006788	0.2721	3.2642
DMIXED	-7.378081	3.135464	0.0302	-8.7534
EDXCP	4.836222	8.216648	0.5635	3.6869
XSPESXH	0.027912	0.009359	0.0080	0.8718

Model Summary

R^2 = .6882
Adjusted R^2 = .3764
Degrees of Freedom (Error) = 18
Mean Square Error = 13.024

[a]STD EST = Standardized estimate

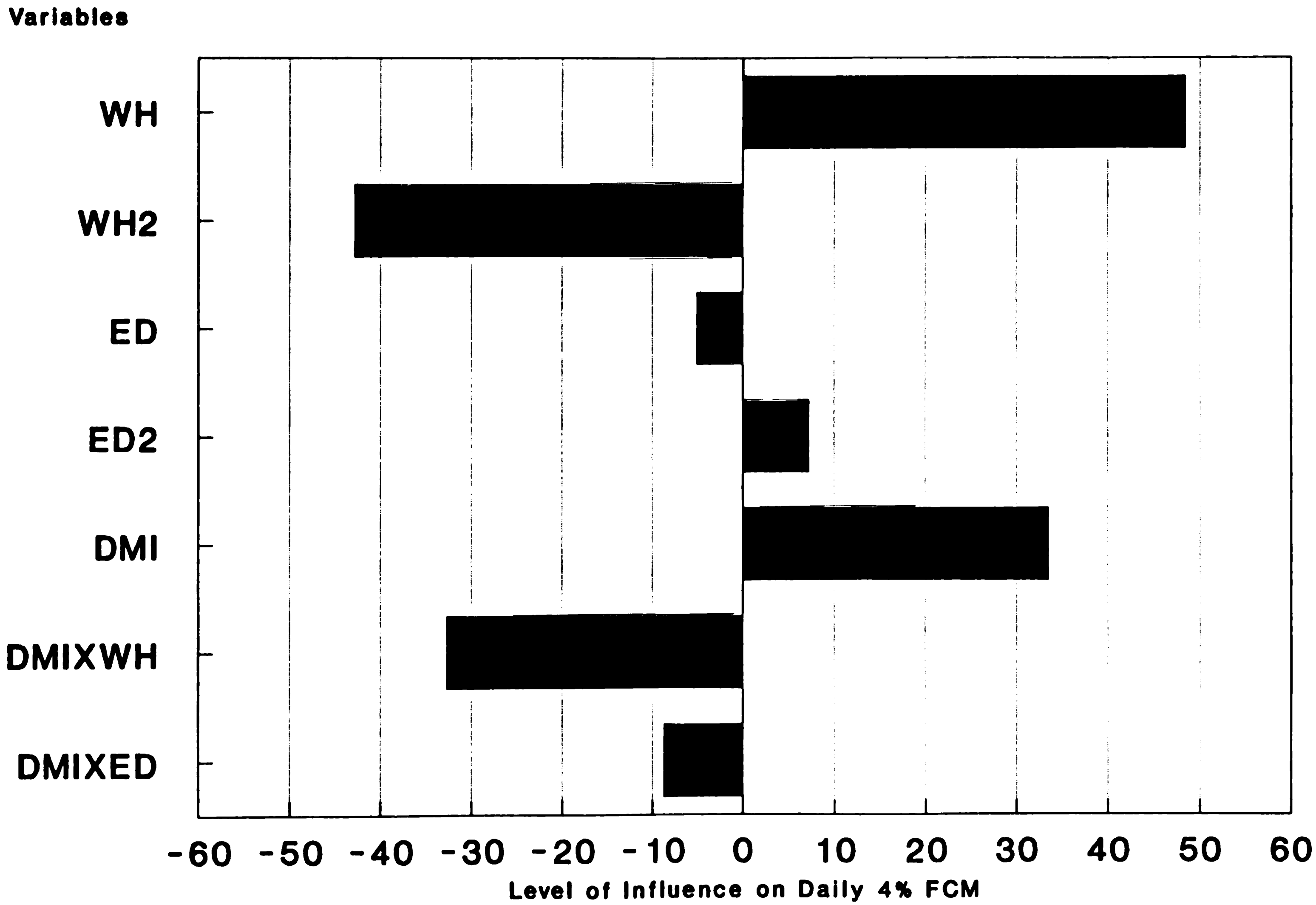

Figure 2: PRIMIPAROUS COMPLETE DATA MODEL TWO EQUATION ONE (Table 2).

Table 3

PRIMIPAROUS COMPLETE DATA - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
FCM (kg/d)	Large	17	24.66	5.011	24.55	0.2244
	Small	20	26.38	4.124	26.38	
	High	19	26.72	3.801	26.71	0.1004
	Low	18	24.39	5.096	24.22	
	Overall	37	25.58	4.570		
BCS	Large	17	2.67	0.447	2.67	0.1662
	Small	20	2.86	0.368	2.86	
	High	19	2.84	0.412	2.83	0.3131
	Low	18	2.70	0.409	2.70	
	Overall	37	2.77	0.411		
AGE (months)	Large	17	25.16	1.771	25.16	0.0797
	Small	20	26.74	3.080	26.74	
	High	19	25.87	2.624	25.83	0.7924
	Low	18	26.16	2.751	26.06	
	Overall	37	26.01	2.653		
WH (cm)	Large	17	134.8	2.724	134.8	0.0553
	Small	20	136.7	2.986	136.7	
	High	19	136.4	3.167	136.3	0.2404
	Low	18	135.3	2.753	135.2	
	Overall	37	135.8	2.980		
WT (kg)	Large	17	507.1	42.98	506.9	0.6415
	Small	20	513.4	39.84	513.4	
	High	19	517.3	43.19	517.0	0.3311
	Low	18	503.3	38.12	503.4	
	Overall	37	510.5	40.85		

Table 3 - continued

PRIMIPAROUS COMPLETE DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
PTAM (kg)	Large	17	339.9	351.6	354.1	0.3397
	Small	20	448.6	253.0	448.6	
	High	19	496.3	193.3	494.1	0.0662
	Low	18	314.6	367.0	308.7	
	Overall	37	407.9	301.3		
SCC	Large	17	2.07	1.02	2.06	0.4574
	Small	20	2.31	0.96	2.31	
	High	19	2.27	0.88	2.62	0.6564
	Low	18	2.13	1.10	2.11	
	Overall	37	2.20	0.98		
HEALTH	Large	17	0.433	0.641	0.443	0.6491
	Small	20	0.367	0.356	0.367	
	High	19	0.272	0.282	0.272	0.1190
	Low	18	0.529	0.641	0.537	
	Overall	37	0.397	0.501		
XSNEL (Mcal NEL/d)	Large	17	7.54	5.66	7.50	0.1018
	Small	20	11.28	7.52	11.30	
	High	19	10.60	7.72	10.49	0.3373
	Low	18	8.46	5.94	8.29	
	Overall	37	9.56	6.90		
XSPROTRD (g/d)	Large	17	820.8	899.2	820.3	0.0982
	Small	20	1338.4	912.9	1338.4	
	High	19	1197.6	1176.7	1179.2	0.5160
	Low	18	988.1	591.2	979.4	
	Overall	37	1100.6	931.4		

Table 3 - continued

PRIMIPAROUS COMPLETE DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
XSPROTES (g/d)	Large	17	25.53	291.3	30.21	0.1884
	Small	20	141.35	208.0	141.35	
	High	19	52.47	290.6	47.38	0.3601
	Low	18	125.78	207.7	124.18	
	Overall	37	88.14	252.9		
ED (Mcal NEL/kg)	Large	17	1.676	0.0488	1.676	0.0630
	Small	20	1.627	0.0943	1.627	
	High	19	1.661	0.0595	1.662	0.4370
	Low	18	1.638	0.0971	1.642	
	Overall	37	1.650	0.0798		
ADF (%)	Large	17	18.69	2.139	18.68	0.2712
	Small	20	19.78	3.559	19.78	
	High	19	18.83	2.757	18.83	0.4262
	Low	18	19.76	3.255	19.63	
	Overall	37	19.28	3.004		
CP (%)	Large	17	17.80	1.707	17.79	0.0908
	Small	20	16.79	1.797	16.79	
	High	19	17.74	1.560	17.76	0.1097
	Low	18	16.75	1.946	16.82	
	Overall	37	17.26	1.805		
DMI (kg/d)	Large	17	22.85	2.957	22.86	0.9993
	Small	20	22.86	3.325	22.86	
	High	19	22.64	2.497	22.64	0.6929
	Low	18	23.08	3.725	23.07	
	Overall	37	22.85	3.118		

[a]N = Number of herds
[b]STD DEV = Standard deviation

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significance at the .10 level with FCM and CP being greater for high herds and HEALTH being less.

2. <u>Excluding Genetic Data</u>

Correlations (Appendix Table 12) for XSNEL and XSPROTRD, ED and ADF, and WT and BCS were .8695, -.8480, and .5194 respectively for the primiparous data set which excluded genetic information (PNG) (Appendix Tables 13 and 14). In addition, WT and WH displayed an r value worth noting (.6029).

PNG model 1 values of .8761 for R^2 and .6904 for ADJ R^2 were achieved (Table 4). Variables WH and DMI had a major, positive impact while a negative effect was obtained from WH2 and DMIXWH. CP and DMI2 had moderate, positive and EDXCP a moderate, negative influence on production. ED and ADF and DMIXED and ADF2 had minor, positive and negative affects respectively (Figure 3).

PNG model 2 (Table 5) again showed major influences on production from WH and WH2, positive and negative respectively. The interactions DMIXWT and EDXCP both showed moderate, positive while DMI and ED2 exhibited minor, negative influences on FCM (Figure 4).

Lower means for XSNEL and XSPROTRD were significant at $P < .05$ with BCS being significantly less at $P < .10$ for large herds (Table 6). CP and ED were significantly greater for larger herds at $P < .10$. XSPROTES approached being significantly less for larger herds. FCM and CP were

Table 4

PRIMIPAROUS NO GENETIC DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-5538.907777	1016.885962	0.0001	0.0000
BCS	29.448813	15.540004	0.0763	2.7189
BCS2	-4.306359	2.829995	0.1476	-2.1745
WH	67.389216	13.237296	0.0001	51.6550
WH2	-0.226812	0.047250	0.0002	-47.0993
WT	0.157200	0.299489	0.6069	1.5138
WT2	-0.000201	0.000296	0.5074	-1.9330
SCC	-0.605955	0.582199	0.3134	-0.1248
HEALTH	14.610672	4.447140	0.0047	1.8312
HEALTH2	-3.017074	1.953534	0.1420	-0.6414
XSNEL	0.850712	0.235830	0.0024	1.5002
XSPROTRD	-0.004376	0.001925	0.0371	-1.0443
XSPTRD2	0.000000	0.000000	0.3691	0.3486
ED	322.172465	119.905061	0.0162	6.7957
ADF	7.785804	1.716126	0.0003	6.0199
ADF2	-0.204779	0.049346	0.0008	-6.2034
CP	24.168372	9.811090	0.0255	11.1261
CP2	-0.132332	0.146753	0.3806	-2.1202
DMI	29.845497	11.261878	0.0175	24.4485
DMI2	0.280803	0.061323	0.0003	10.5485
DMIXWH	-0.243916	0.072319	0.0039	-28.0180
DMIXED	-5.833244	2.422686	0.0285	-8.2357
EDXCP	-11.133016	6.707418	0.1164	-10.0896
XSPRDXH	0.010334	0.003466	0.0088	1.3502
XSNELXH	-1.707563	0.392797	0.0005	-2.4412

Model Summary

R^2 = .8761
Adjusted R^2 = .6904
Degrees of Freedom (Error) = 16
Mean Square Error = 4.565

[a]STD EST = Standardized estimate

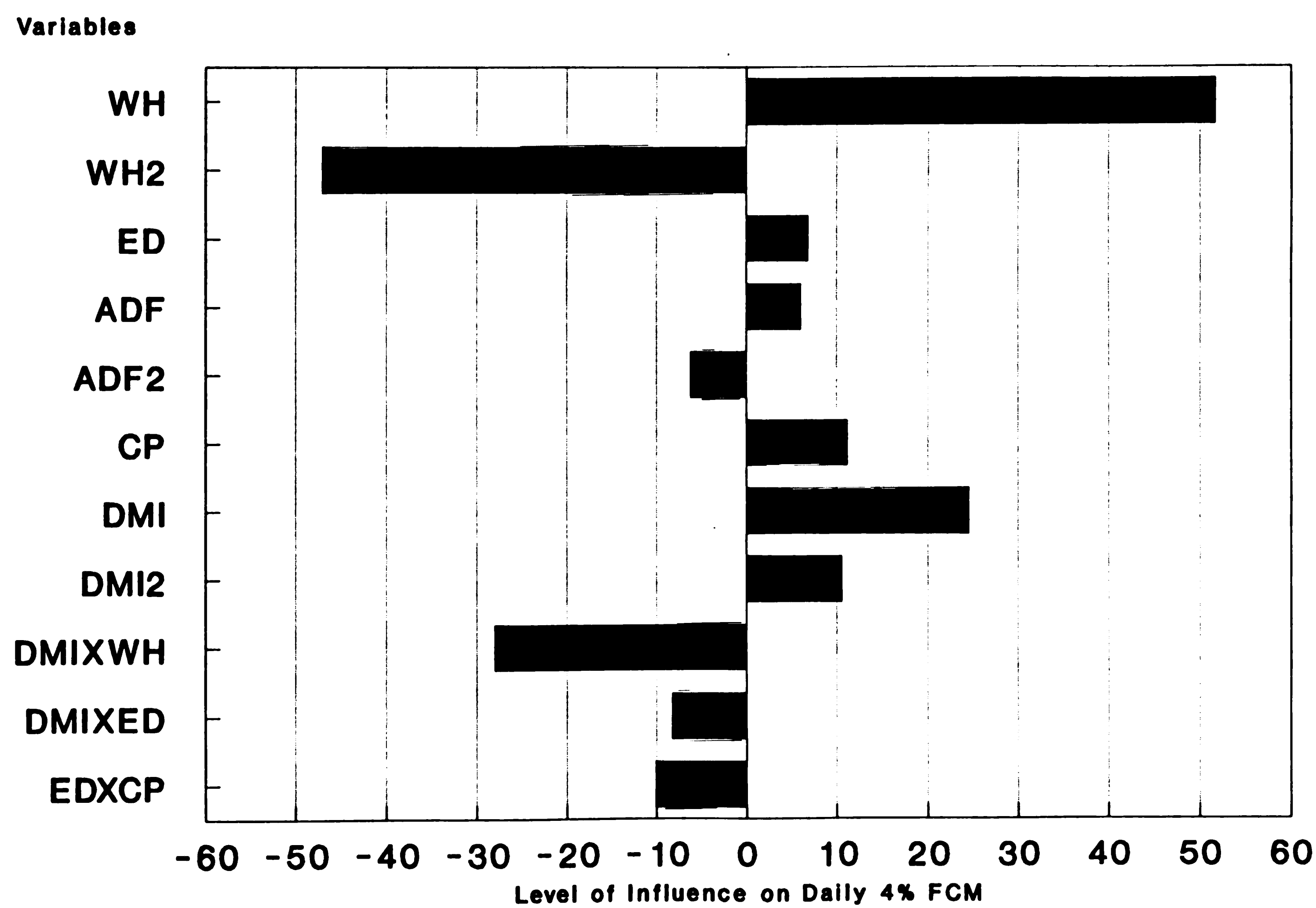

Figure 3: PRIMIPAROUS NO GENETIC DATA MODEL ONE EQUATION ONE (Table 4).

Table 5

PRIMIPAROUS NO GENETIC DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-2096.858815	1126.550823	0.0791	0.0000
BCS	-23.640473	30.476197	0.4480	-2.1827
BCS2	5.574697	5.648170	0.3367	2.8150
AGE	-2.001210	7.211553	0.7846	-1.2866
AGE2	0.045440	0.131332	0.7334	1.6031
WH	34.378539	15.829017	0.0435	26.3517
WH2	-0.124978	0.058475	0.0466	-25.9526
WT	-0.489839	0.218298	0.0377	-4.7171
SCC	-5.494859	5.918510	0.3655	-1.1321
SCC2	0.841000	1.135800	0.4686	0.8959
XSPROTES	-0.002137	0.002898	0.4704	-0.1434
XSPTES2	-0.000004	0.000009	0.6245	-0.0988
ED	102.985811	295.651314	0.7316	2.1723
ED2	-75.481488	103.334287	0.4745	-5.1894
ADF	2.329507	2.480817	0.3602	1.8012
ADF2	-0.049662	0.067972	0.4744	-1.5044
CP	-8.188790	13.487809	0.5514	-3.7698
CP2	-0.281078	0.207561	0.1924	-4.5033
DMI	-8.732337	8.667416	0.3271	-7.1532
DMI2	0.028246	0.071946	0.6992	1.0611
DMIXWT	0.020703	0.009370	0.0403	10.2107
DMIXED	-2.086688	2.405870	0.3972	-2.9461
EDXCP	11.166506	10.334101	0.2942	10.1199

<u>Model Summary</u>

R^2 = .6731
Adjusted R^2 = .2736
Degrees of Freedom (Error) = 18
Mean Square Error = 10.708

[a]STD EST = Standardized estimate

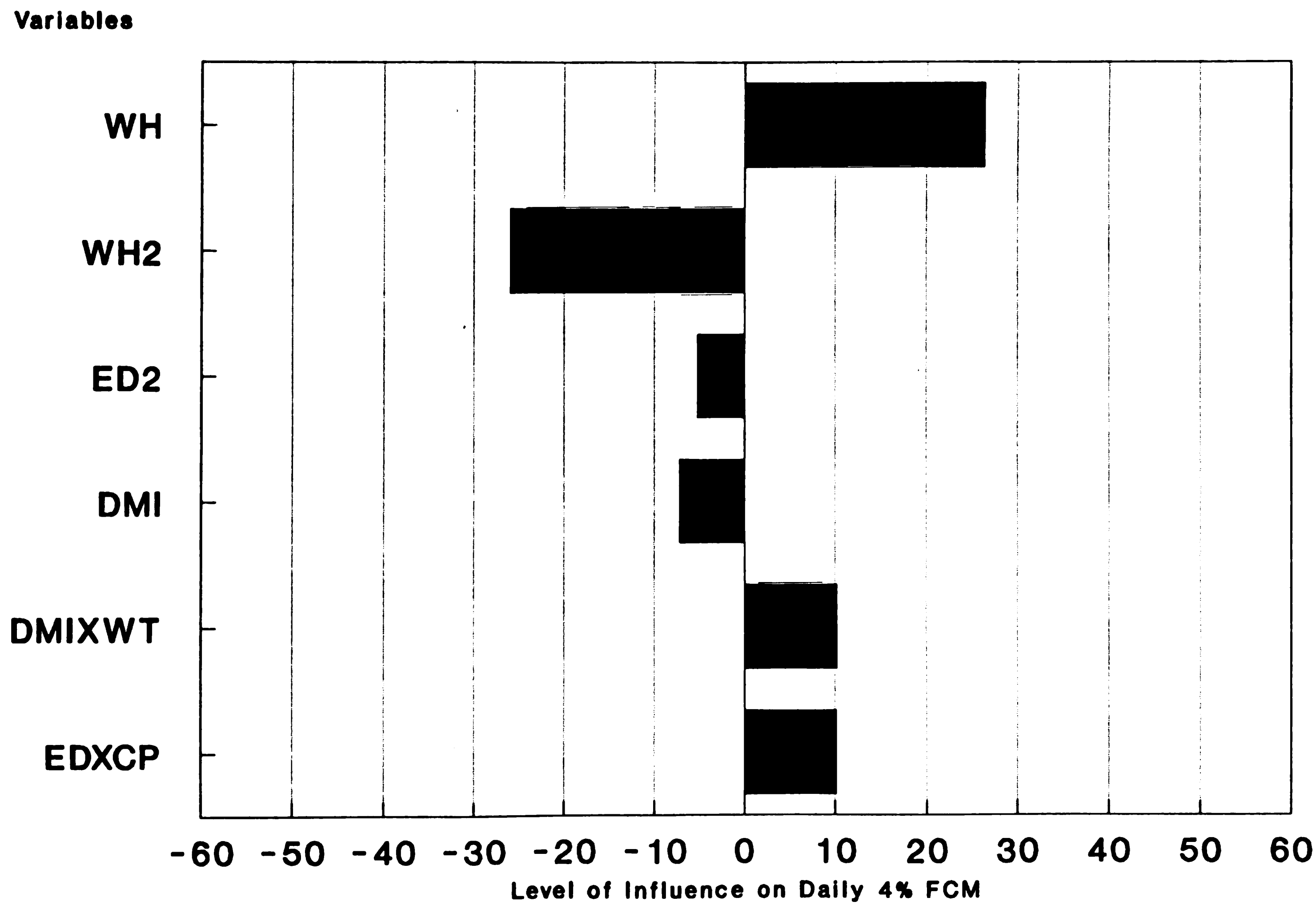

Figure 4: PRIMIPAROUS NO GENETIC DATA MODEL TWO EQUATION ONE (Table 5).

Table 6

PRIMIPAROUS NO GENETIC DATA - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
FCM (kg/d)	Large	20	25.65	4.411	25.65	0.4351
	Small	21	26.51	3.258	26.56	
	High	20	27.39	3.759	27.39	0.0331
	Low	21	24.85	3.571	24.82	
	Overall	41	26.09	3.839		
BCS	Large	20	2.68	0.367	2.68	0.0536
	Small	21	2.88	0.319	2.89	
	High	20	2.83	0.311	2.83	0.3396
	Low	21	2.73	0.317	2.73	
	Overall	41	2.78	0.354		
AGE (months)	Large	20	25.72	1.946	25.72	0.3319
	Small	21	26.49	2.878	26.50	
	High	20	26.16	2.556	26.16	0.8959
	Low	21	26.07	2.445	26.05	
	Overall	41	26.11	2.468		
WH (cm)	Large	20	135.4	3.058	135.4	0.2201
	Small	21	136.5	2.788	136.6	
	High	20	136.3	3.300	136.3	0.5251
	Low	21	135.7	2.609	135.7	
	Overall	41	136.0	2.943		
WT (kg)	Large	20	504.5	40.02	504.5	0.3398
	Small	21	515.5	33.92	515.8	
	High	20	514.4	40.66	514.4	0.4777
	Low	21	506.0	33.58	505.9	
	Overall	41	510.1	36.97		

Table 6 - continued

PRIMIPAROUS NO GENETIC DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
SCC	Large	20	2.08	0.850	2.08	0.6359
	Small	21	2.18	0.748	2.19	
	High	20	2.29	0.773	2.29	0.2278
	Low	21	1.98	0.797	1.98	
	Overall	41	2.13	0.791		
HEALTH	Large	20	0.365	0.587	0.365	0.8164
	Small	21	0.333	0.368	0.329	
	High	20	0.262	0.270	0.262	0.2760
	Low	21	0.431	0.616	0.432	
	Overall	41	0.349	0.481		
XSNEL (Mcal NEL/d)	Large	20	7.27	5.22	7.27	0.0405
	Small	21	11.59	7.50	11.64	
	High	20	10.30	7.61	10.30	0.4178
	Low	21	8.70	5.94	8.61	
	Overall	41	9.48	6.77		
XSPROTRD (g/d)	Large	20	774.8	854.9	774.8	0.0391
	Small	21	1364.0	898.2	1374.5	
	High	20	1173.2	1146.7	1173.2	0.4780
	Low	21	984.6	641.4	973.2	
	Overall	41	1076.6	916.2		
XSPROTES (g/d)	Large	20	20.1	296.1	20.1	0.1478
	Small	21	139.4	205.5	139.7	
	High	20	61.3	281.2	61.3	0.6496
	Low	21	100.1	238.6	98.3	
	Overall	41	81.2	257.7		

Table 6 - continued

PRIMIPAROUS NO GENETIC DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
ED (Mcal NEL/kg)	Large	20	1.672	0.062	1.672	0.0845
	Small	21	1.627	0.092	1.628	
	High	20	1.657	0.062	1.657	0.6127
	Low	21	1.642	0.097	1.644	
	Overall	41	1.650	0.089		
ADF (%)	Large	20	19.04	2.364	19.04	0.4668
	Small	21	19.77	3.470	19.72	
	High	20	18.98	2.757	18.97	0.3926
	Low	21	19.82	3.167	19.78	
	Overall	41	19.41	2.969		
CP (%)	Large	20	17.74	1.600	17.74	0.0609
	Small	21	16.70	1.806	16.73	
	High	20	17.69	1.534	17.69	0.0870
	Low	21	16.74	1.884	16.78	
	Overall	41	17.20	1.768		
DMI (kg/d)	Large	20	22.64	3.105	22.64	0.7983
	Small	21	22.92	3.254	22.90	
	High	20	22.81	2.551	22.81	0.9398
	Low	21	22.76	3.688	22.73	
	Overall	41	22.78	3.145		

[a]N = Number of herds
[b]STD DEV = Standard deviation

significantly greater for higher producing herds at $P < .05$ and $P < .10$ respectively.

3. <u>Excluding Somatic Cell Count Data</u>

Correlation analysis (Appendix Table 19) of the primiparous data set exluding SCC (PNS) (Appendix Tables 20 and 21) between XSNEL and XSPROTRD, ED and ADF, WT and WH, and WT and BCS were again of importance with respective values of .8803, - .8607, .5890, and .5382.

Regression of PNS data had R^2 and ADJ R^2 values of .8241 and .5824 for model 1 (Table 7). The next best model, which included XSPROTRD and its quadratic term XSPTRD2, had resulting R^2 and ADJ R^2 values of .8374 and .5587 and was therefore not selected. WH and DMI had major, positive while DMIXWH and WH2 had major, negative associations with daily 4% FCM. The interactions EDXBCS and DMIXWT had moderate, positive while the linear term BCS had moderate, negative impacts. DMIXED, CP2, WT and AGE had minor, negative while CP, DM2, and AGE2 had minor, positive production influence (Figure 5).

The PNS model 2 (Table 8) regression selected had an R^2 of .7101 and ADJ R^2 of .4492. In the second choice (Table 9) AGE and the EDXBCS interaction were kept, with EDXBCS displaying moderate, positive evidence. Once again DMI and WH had major, positive impacts while their interaction (DMIXWH) had a major, negative association. EDXCP had a moderate, positive result and DMIXED and the quadratic WH2 term a moderate, negative. DMIXWT and DMI2

Table 7

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-3047.151588	898.312485	0.0037	0.0000
BCS	-141.627591	71.077728	0.0637	-12.6779
AGE	-10.315292	6.405918	0.1269	-6.2928
AGE2	0.187884	0.115936	0.1246	6.2887
WH	44.179689	12.161242	0.0022	32.5523
WH2	-0.128692	0.044370	0.0104	-25.6782
WT	-0.686146	0.188897	0.0022	-6.3100
PTAM	-0.006998	0.004061	0.1042	-0.5146
HEALTH	-0.990192	1.741683	0.5776	-0.1181
XSNEL	-0.889853	0.338774	0.0183	-1.5367
XSNEL2	0.043741	0.014579	0.0085	1.9651
ED	-94.958219	110.665960	0.4035	-1.8819
ADF	5.810813	2.323382	0.0236	4.2537
ADF2	-0.167113	0.065169	0.0208	-4.7799
CP	18.051312	4.983348	0.0023	8.2041
CP2	-0.486796	0.140962	0.0033	-7.6633
DMI	36.960300	16.102672	0.0356	28.6870
DMI2	0.181783	0.081663	0.0407	6.4835
DMIXWH	-0.368185	0.103303	0.0026	-40.2063
DMIXWT	0.029339	0.008182	0.0025	13.8056
DMIXED	-6.680419	3.135594	0.0490	-9.1152
EDXBCS	84.938274	42.448441	0.0627	14.3337
PTXHEAL	0.012114	0.006536	0.0824	0.6200

Model Summary

R^2 = .8241
Adjusted R^2 = .5824
Degrees of Freedom (Error) = 16
Mean Square Error = 6.848

[a]STD EST = Standardized estimate

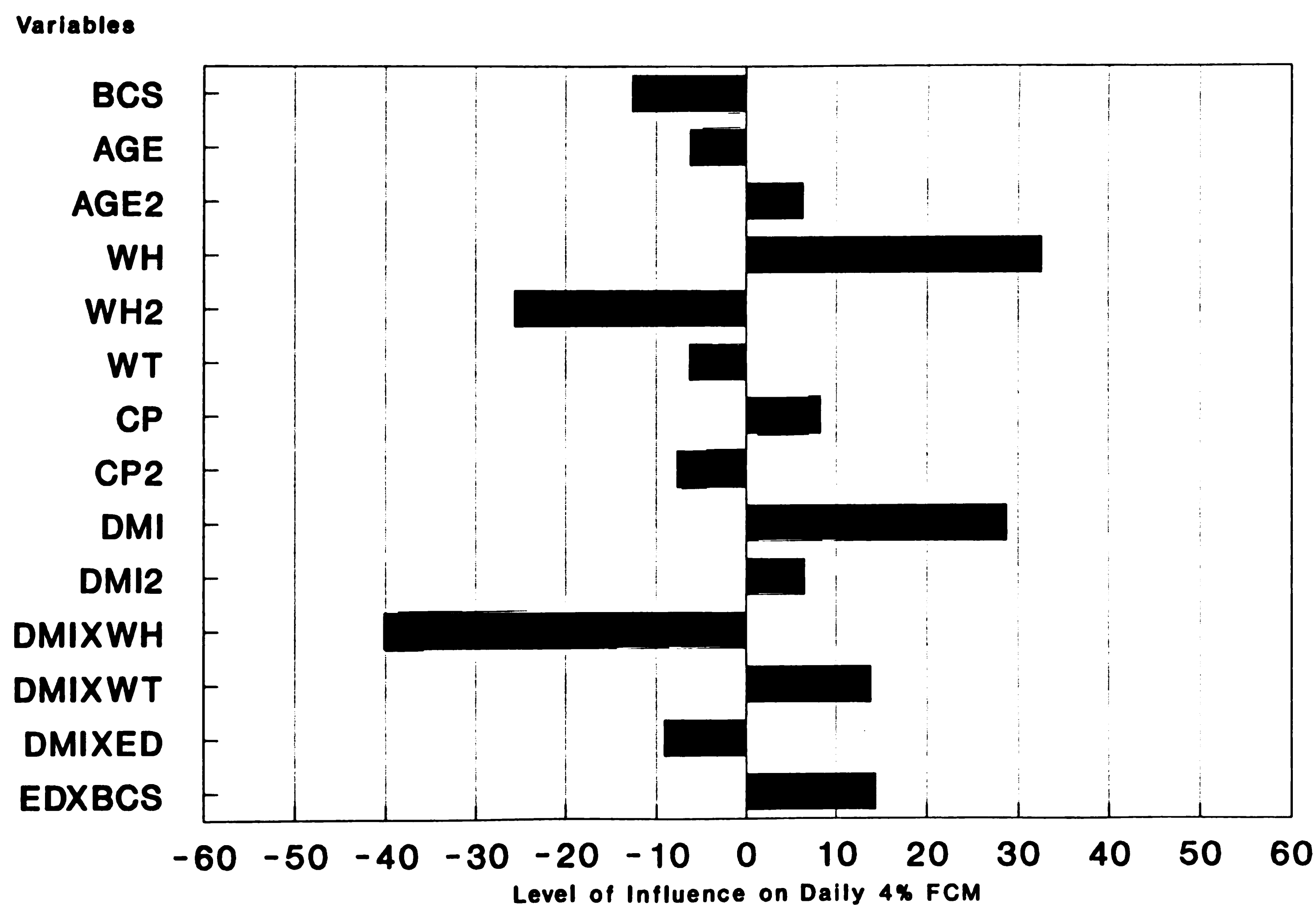

Figure 5: PRIMIPAROUS NO SOMATIC CELL COUNT DATA MODEL ONE EQUATION ONE (Table 7).

Table 8

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-2551.455634	1042.495517	0.0237	0.0000
BCS	5.918387	2.363891	0.0211	0.5298
WH	33.946862	14.006375	0.0250	25.0126
WH2	-0.097644	0.050173	0.0658	-19.4831
WT	-0.465348	0.175681	0.0154	-4.2795
PTAM	-0.003254	0.003870	0.4104	-0.2393
HEALTH	-0.198891	1.882191	0.9169	-0.0237
ED	-34.263214	115.443476	0.7697	-0.6790
ADF	6.561207	1.998301	0.0037	4.8030
ADF2	-0.177107	0.056743	0.0054	-5.0657
CP	-11.706496	10.157276	0.2627	-5.3205
CP2	-0.236811	0.128432	0.0801	-3.7280
DMI	32.529815	15.840463	0.0533	25.2482
DMI2	0.173599	0.079611	0.0413	6.1916
DMIXWH	-0.277237	0.111500	0.0219	-30.2747
DMIXWT	0.019089	0.007511	0.0194	8.9824
DMIXED	-7.938293	2.999865	0.0155	-10.8315
EDXCP	12.694364	6.295424	0.0574	11.2310
PTXHEAL	0.011819	0.006396	0.0795	0.6050

Model Summary

R^2 = .7101
Adjusted R^2 = .4492
Degrees of Freedom (Error) = 20
Mean Square Error = 9.031

[a]STD EST = Standardized estimate

Table 9

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
MODEL TWO EQUATION TWO

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-2528.073142	1107.726756	0.0349	0.0000
BCS	-60.021829	80.904424	0.4677	-5.3729
AGE	-0.113588	0.285699	0.6956	-0.0693
WH	33.766461	14.649561	0.0333	24.8797
WH2	-0.093698	0.052433	0.0908	-18.6959
WT	-0.518665	0.197955	0.0173	-4.7698
PTAM	-0.005148	0.004656	0.2834	-0.3785
HEALTH	-0.412536	1.983661	0.8376	-0.0492
ED	-69.662212	131.892840	0.6038	-1.3806
ADF	7.850776	2.578094	0.0070	5.7470
ADF2	-0.212238	0.072370	0.0089	-6.0705
CP	-5.937315	12.598256	0.6431	-2.6984
CP2	-0.249542	0.135203	0.0815	-3.9284
DMI	37.844279	18.114653	0.0512	29.3731
DMI2	0.166248	0.083528	0.0620	5.9294
DMIXWH	-0.310910	0.124219	0.0222	-33.9518
DMIXWT	0.021329	0.008503	0.0219	10.0364
DMIXED	-8.889775	3.331515	0.0157	-12.1298
EDXCP	9.511980	7.538151	0.2231	8.4155
EDXBCS	39.393279	48.289400	0.4253	6.6478
PTXHEAL	0.014002	0.007399	0.0746	0.7167

<u>Model Summary</u>

R^2 = .7210
Adjusted R^2 = .4110
Degrees of Freedom (Error) = 18
Mean Square Error = 9.658

[a]STD EST = Standardized estimate

had minor, positive and CP and ADF2 negative affects. Figures 6 and 7 represent Tables 8 and 9 respectively.

Means comparisons (Table 10) revealed larger herds had significantly ($P < .05$) greater ED and smaller WH measures. CP levels were significantly greater at $P < .10$ while AGE, XSNEL, and XSPROTRD approached this level. Higher producing herds had significantly greater FCM ($P < .05$). At the $P < .10$ significance level PTAM was higher but HEALTH was lower for high producing herds.

4. <u>All Primiparous Data Sets Combined</u>

Data sets PC (Appendix Tables 6 and 7), PNG (Appendix Tables 13 and 14), and PNS (Appendix Tables 20 and 21) were combined into a primiparous all (PAL) data set for regression purposes only. In both PAL models 1 and 2, the highest R^2 was achieved with all linear, quadratic, and interaction terms included. The optimal model selected had R^2 and ADJ R^2 values of .7514 and .6899 for model 1 (Table 11) and .6197 and .5356 for model 2 (Table 12). Variable WH had a major, positive impact while WH2 and DMIXWH had major, negative affects on production. DMI had a positive association in both models but at moderate and major levels in models 1 (Figure 8) and 2 (Figure 9) respectively. Variables BCS2, AGE, AGE2, and WT2 were not kept in either model; XSPTRD2, EDXCP, and EDXHEAL were not present in the final model 1 while CP2 was not in model 2.

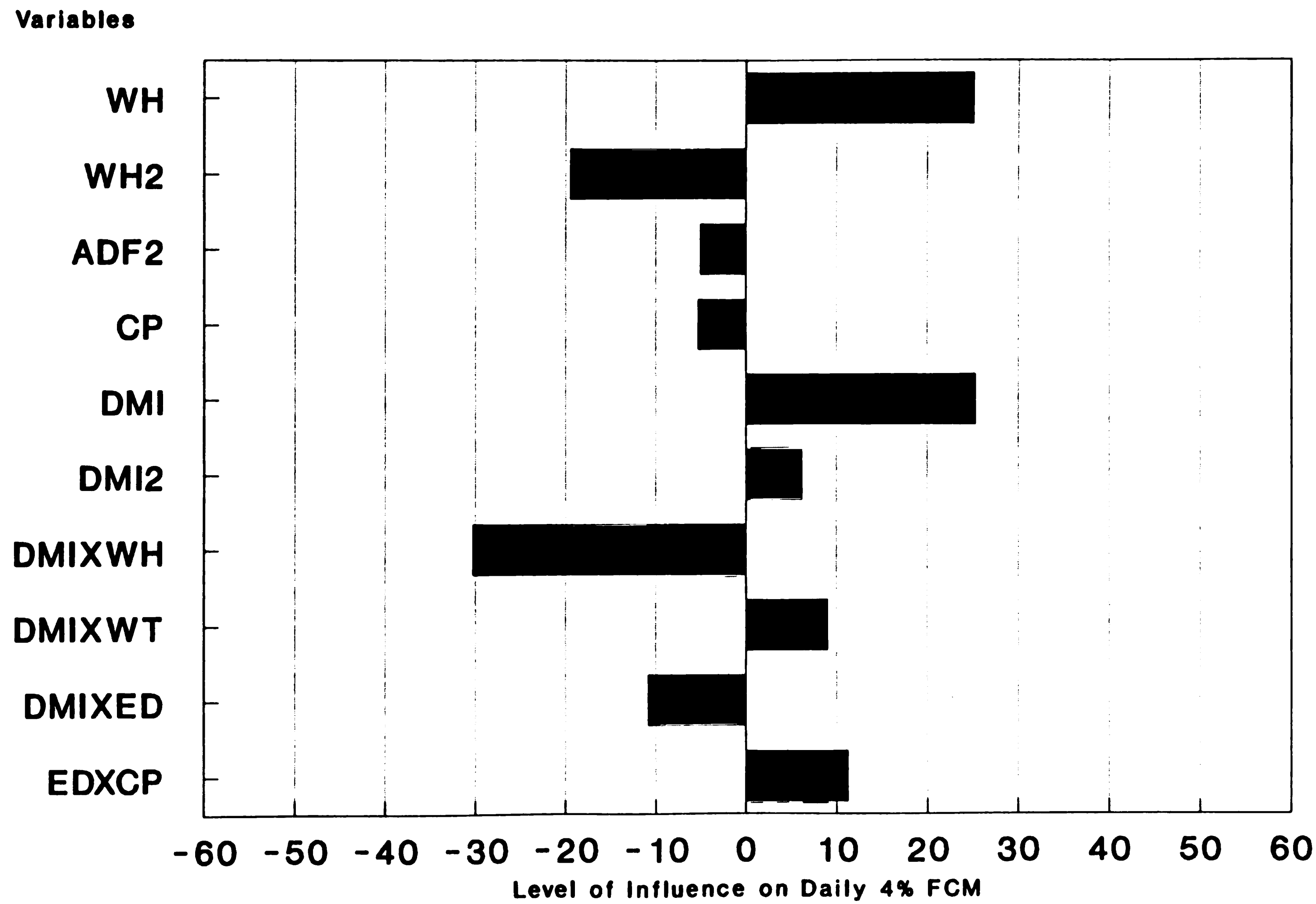

Figure 6: PRIMIPAROUS NO SOMATIC CELL COUNT DATA MODEL TWO EQUATION ONE (Table 8).

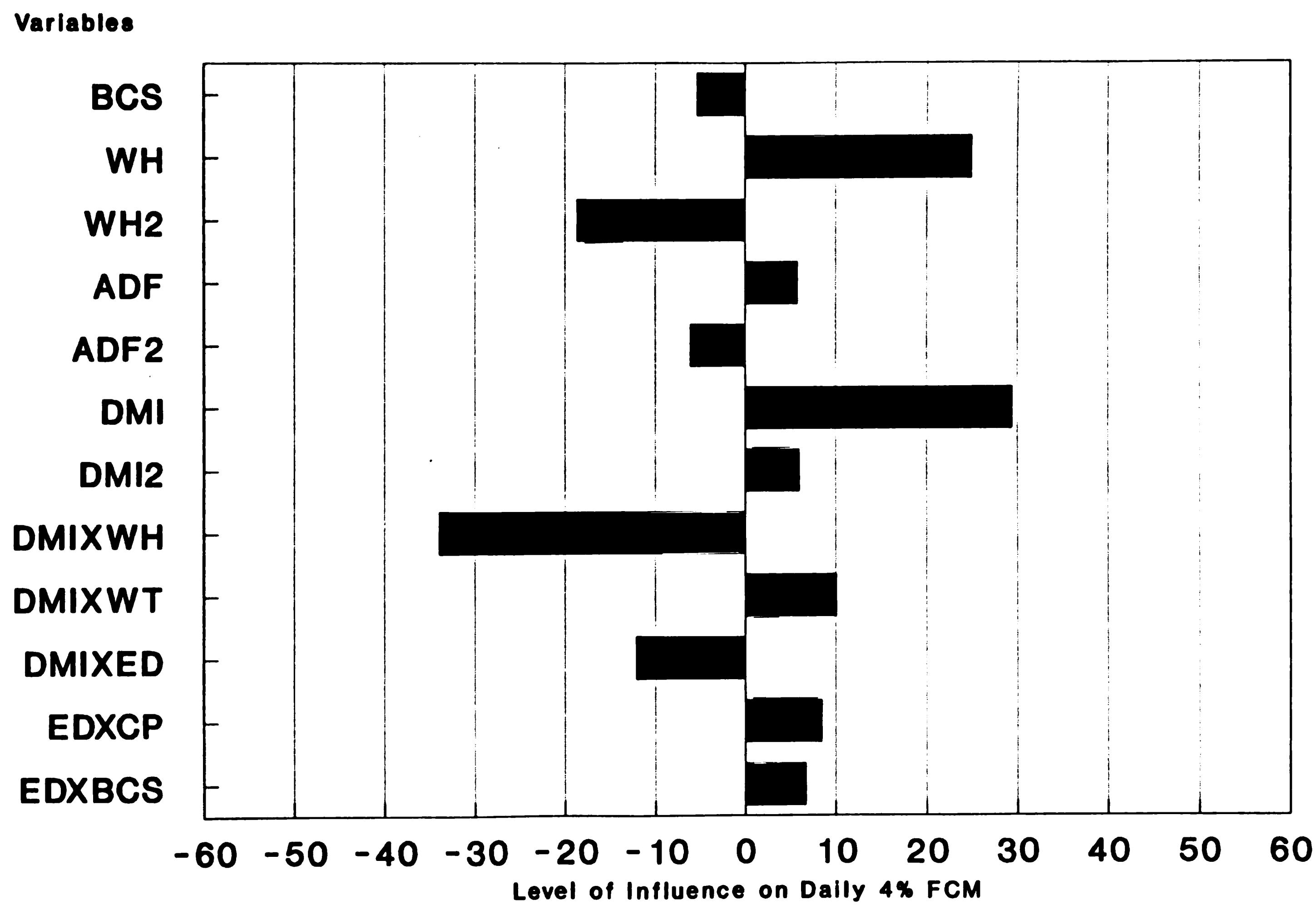

Figure 7: PRIMIPAROUS NO SOMATIC CELL COUNT DATA MODEL TWO EQUATION TWO (Table 9).

Table 10

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
FCM (kg/d)	Large	18	25.18	5.334	24.93	0.2644
	Small	21	26.64	4.199	26.60	
	High	21	27.32	4.076	27.31	0.0431
	Low	18	24.39	5.096	24.22	
	Overall	39	26.12	4.049		
BCS	Large	18	2.67	0.434	2.67	0.2124
	Small	21	2.84	0.367	2.84	
	High	21	2.82	0.399	2.81	0.3850
	Low	18	2.70	0.409	2.70	
	Overall	39	2.76	0.362		
AGE (months)	Large	18	25.33	1.874	25.32	0.1012
	Small	21	26.73	3.002	26.74	
	High	21	26.03	2.550	26.00	0.9389
	Low	18	26.16	2.751	26.07	
	Overall	39	26.10	2.470		
WH (cm)	Large	18	134.9	2.656	134.8	0.0339
	Small	21	136.9	3.048	136.9	
	High	21	136.6	3.161	136.5	0.1586
	Low	18	135.3	2.753	135.2	
	Overall	39	136.0	2.984		
WT (kg)	Large	18	507.3	41.70	507.0	0.6037
	Small	21	514.3	39.06	513.8	
	High	21	517.8	41.14	517.4	0.2898
	Low	18	503.3	38.11	503.4	
	Overall	39	510.6	37.24		

Table 10 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
PTAM (kg)	Large	18	344.6	347.3	335.8	0.2704
	Small	21	445.7	247.0	441.9	
	High	21	471.4	205.1	468.9	0.0998
	Low	18	314.6	367.0	308.7	
	Overall	39	399.0	297.8		
HEALTH	Large	18	0.409	0.630	0.429	0.7094
	Small	21	0.365	0.347	0.369	
	High	21	0.261	0.275	0.261	0.0889
	Low	18	0.529	0.641	0.537	
	Overall	39	0.375	0.483		
XSNEL (Mcal NEL/d)	Large	18	7.25	5.62	7.20	0.1321
	Small	21	10.73	5.76	10.69	
	High	21	9.68	7.88	9.59	0.5688
	Low	18	8.46	5.94	8.29	
	Overall	39	9.12	6.99		
XSPROTRD (g/d)	Large	18	787.3	883.8	789.6	0.1108
	Small	21	1284.1	923.9	1277.9	
	High	21	1103.4	1155.3	1088.2	0.7178
	Low	18	998.1	591.2	979.4	
	Overall	39	1054.8	928.3		
XSPROTES (g/d)	Large	18	23.8	282.7	32.4	0.1581
	Small	21	146.2	204.0	145.8	
	High	21	58.8	279.2	54.0	0.3787
	Low	18	125.8	207.7	124.2	
	Overall	39	89.7	247.9		

Table 10 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
ED	Large	18	1.679	0.0430	1.678	0.0310
(Mcal	Small	21	1.623	0.0937	1.622	
NEL/kg)	High	21	1.658	0.0633	1.659	0.4874
	Low	18	1.638	0.0971	1.642	
	Overall	39	1.649	0.0803		
ADF	Large	18	18.66	2.081	18.64	0.1833
(%)	Small	21	19.89	3.504	19.93	
	High	21	18.95	2.715	18.94	0.4735
	Low	18	19.76	3.255	19.63	
	Overall	39	19.32	2.964		
CP	Large	18	17.77	1.662	17.74	0.0606
(%)	Small	21	16.65	1.866	16.63	
	High	21	17.53	1.709	17.55	0.2120
	Low	18	16.75	1.946	16.82	
	Overall	39	17.17	1.840		
DMI	Large	18	22.80	2.875	22.82	0.8633
(kg/d)	Small	21	22.61	3.424	22.64	
	High	21	22.38	2.595	22.39	0.5211
	Low	18	23.08	3.725	23.07	
	Overall	39	22.70	3.143		

[a]N = Number of herds
[b]STD DEV = Standard deviation

Table 11

PRIMIPAROUS ALL DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-3200.874773	557.560249	0.0001	0.0000
BCS	-64.902550	26.908980	0.0178	-5.8691
WH	45.102021	7.176656	0.0001	32.2043
WH2	-0.144725	0.025634	0.0001	-28.0157
WT	-0.261915	0.064161	0.0001	-2.4139
HEALTH	10.641056	2.362715	0.0001	1.2500
HEALTH2	-1.947305	1.168274	0.0989	-0.3881
XSNEL	-0.120804	0.189550	0.5255	-0.2001
XSNEL2	0.027956	0.006604	0.0001	1.2228
XSPROTRD	-0.001603	0.000965	0.1001	-0.3566
ED	-213.448995	133.799333	0.1140	-4.1252
ED2	67.658275	42.446150	0.1143	4.2483
ADF	8.104517	1.262781	0.0001	5.8054
ADF2	-0.213742	0.034491	0.0001	-5.9877
CP	11.896391	2.452326	0.0001	5.1618
CP2	-0.325764	0.070534	0.0001	-4.9145
DMI	24.301864	6.582879	0.0004	18.3286
DMI2	0.212290	0.033617	0.0001	7.3628
DMIXWH	-0.229702	0.042321	0.0001	-24.4044
DMIXWT	0.010369	0.002859	0.0005	4.7688
DMIXED	-5.103834	1.325215	0.0002	-6.6977
EDXBCS	40.513937	16.128098	0.0137	6.8032
XSPRDXH	0.004819	0.002016	0.0189	0.6338
XSNELXH	-1.095025	0.203543	0.0001	-1.5370

<u>Model Summary</u>

R^2 = .7514
Adjusted R^2 = .6899
Degrees of Freedom (Error) = 93
Mean Square Error = 5.270

[a]STD EST = Standardized estimate

Table 12

PRIMIPAROUS ALL DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-3034.866678	730.020096	0.0001	0.0000
BCS	5.062435	1.240406	0.0001	0.4578
WH	43.293340	9.247326	0.0001	30.9129
WH2	-0.139848	0.033104	0.0001	-27.0715
WT	-0.296829	0.081478	0.0004	-2.7357
HEALTH	-46.221608	18.930408	0.0165	-5.4295
HEALTH2	-2.409966	1.278285	0.0624	-0.4803
XSPROTES	-0.002688	0.001847	0.1488	-0.1636
XSPTES2	-0.000007	0.000004	0.0513	-0.1536
ED	-233.470300	171.763495	0.1773	-4.5122
ED2	91.783860	51.434781	0.0775	5.7631
ADF	6.713250	1.398514	0.0001	4.8089
ADF2	-0.173275	0.038444	0.0001	-4.8541
CP	-9.273973	6.080154	0.1305	-4.0239
DMI	29.700692	7.604123	0.0002	22.4004
DMI2	0.064859	0.040844	0.1156	2.2495
DMIXWH	-0.200149	0.049071	0.0001	-21.2646
DMIXWT	0.012422	0.003607	0.0009	5.7129
DMIXED	-7.427155	1.554738	0.0001	-9.7465
EDXCP	6.068559	3.657438	0.1004	5.1312
EDXHEAL	31.552623	11.552227	0.0075	6.2244
XSPESXH	0.013038	0.004287	0.0030	0.4162

Model Summary

R^2 = .6197
Adjusted R^2 = .5356
Degrees of Freedom (Error) = 95
Mean Square Error = 7.892

[a]STD EST = Standardized estimate

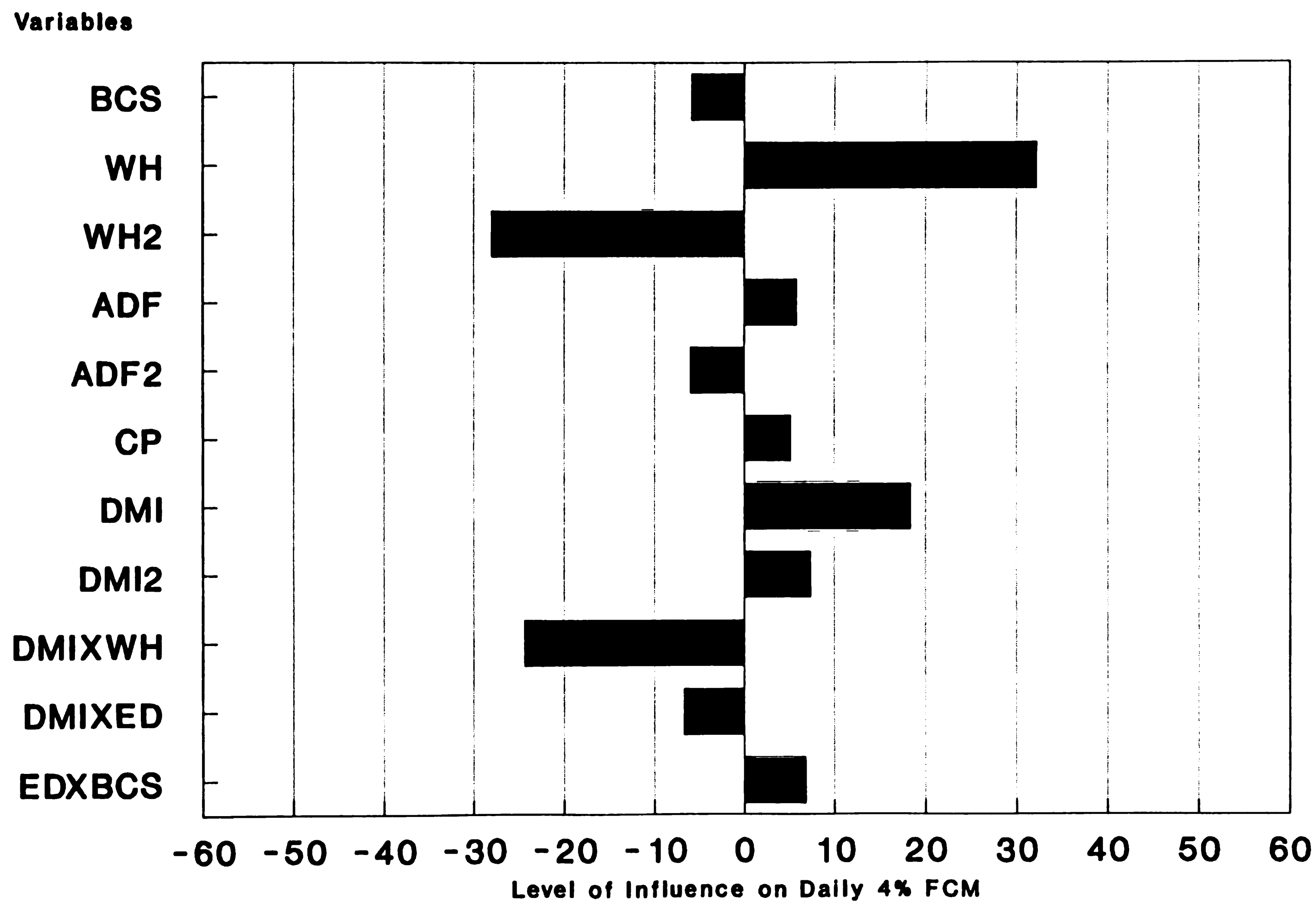

Figure 8: PRIMIPAROUS ALL DATA MODEL ONE EQUATION ONE (Table 11).

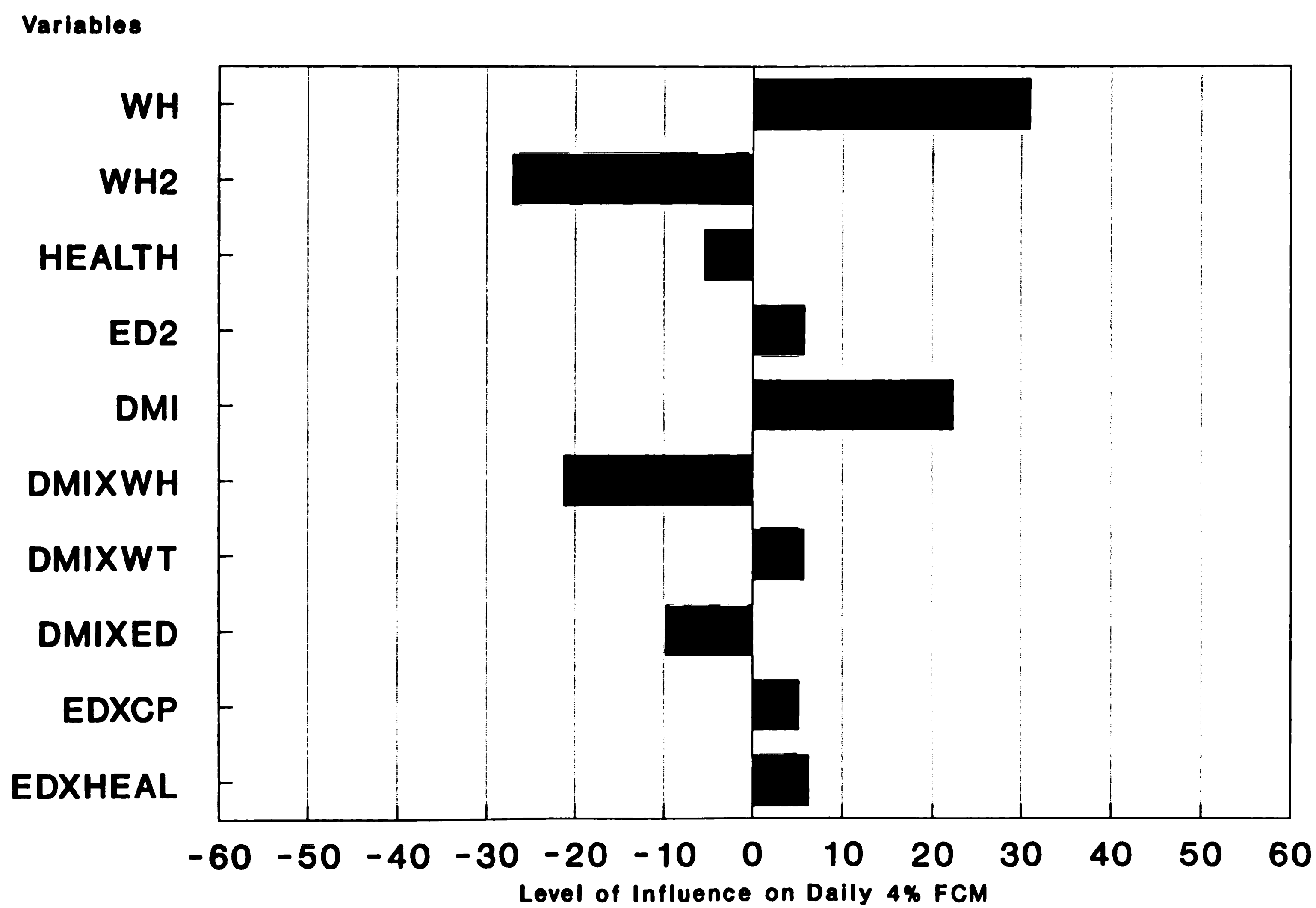

Figure 9: PRIMIPAROUS ALL DATA MODEL TWO EQUATION ONE (Table 12).

Multiparous Animals

1. Complete Data

Correlation analysis (Appendix Table 29) of multiparous complete (MC) data (Appendix Tables 30 and 31) resulted in values of significance for ED and ADF (-.8343), XSNEL and XSPROTRD (.8285), XSPROTRD and BCS (.5744), ED and WT (-.5344), ADF and WT (.5337), and WT and BCS (.5036).

MC model 1 regression results (Table 13) showed a remarkably high R^2 of .9603 accompanied with an ADJ R^2 of .8361. An alternative model (Table 14), which included quadratic terms BCS2 and SCC2 and the XSPRDXH interaction, had respective R^2 and ADJ R^2 of .9747 and .8330. Daily 4% FCM yield was influenced positively of major magnitude by DMIXED, ED2, EDXHEAL, and DMIXWT. However, ED, DMI, and HEALTH showed dramatic, negative impacts on production with respective STD EST values of -59.97, -51.72, and -36.59. Three quadratic terms, DMI2, WT2, and CP2, had moderate, negative results while CP had a positive affect. Of minor, negative importance to milk yield was DP; however, its quadratic term (DP2) was positive. Graphic results of Tables 13 and 14 are found in Figures 10 and 11 respectively.

Model 2 for MC data (Table 15) again showed major, negative and positive associations from DMI and DMIXED respectively with CP now exhibiting a major, positive influence (Figure 12). DMIXWT, EDXHEAL, and HEALTH had the

Table 13

MULTIPAROUS COMPLETE DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	5072.854238	773.925255	0.0002	0.0000
BCS	15.572033	3.899590	0.0040	0.7665
DP	-2.386570	0.387500	0.0003	-5.3575
DP2	0.016477	0.002769	0.0003	5.0054
WT	0.161846	0.699926	0.8229	1.1683
WT2	-0.001596	0.000545	0.0191	-13.1710
PTAM	-0.012002	0.005089	0.0461	-0.4570
PTAM2	0.000069	0.000014	0.0010	1.3246
SCC	-2.938812	0.840951	0.0081	-0.4629
HEALTH	-474.549359	70.891644	0.0002	-36.5875
HEALTH2	5.123606	4.448930	0.2827	0.5510
XSNEL	2.486420	0.599513	0.0032	2.2980
XSNEL2	-0.121916	0.025706	0.0015	-2.4344
XSPROTRD	-0.005983	0.002810	0.0659	-0.7372
ED	-4919.247565	830.900639	0.0004	-59.9669
ED2	1034.313591	218.093266	0.0015	41.2697
ADF	-5.177270	3.021392	0.1250	-2.3976
ADF2	0.214218	0.086133	0.0377	3.8149
CP	48.108431	8.809862	0.0006	13.6104
CP2	-1.289919	0.247912	0.0008	-12.8774
DMI	-110.091643	16.554002	0.0002	-51.7189
DMI2	-0.572784	0.119705	0.0014	-13.1840
DMIXWT	0.065569	0.010067	0.0002	23.3886
DMIXED	60.234613	7.533812	0.0001	45.5983
EDXHEAL	309.833042	45.699579	0.0001	39.4576
PTXHEAL	-0.105892	0.023230	0.0019	-4.2446

Model Summary

R^2 = .9603
Adjusted R^2 = .8361
Degrees of Freedom (Error) = 8
Mean Square Error = 6.537

[a]STD EST = Standardized estimate

Table 14

MULTIPAROUS COMPLETE DATA
MODEL ONE EQUATION TWO

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	5653.065444	1041.058510	0.0029	0.0000
BCS	72.864464	47.559181	0.1861	3.5867
BCS2	-10.599542	8.942713	0.2892	-2.6802
DP	-2.564269	0.521919	0.0044	-5.7564
DP2	0.017904	0.003660	0.0045	5.4389
WT	0.815178	0.918447	0.4154	5.8843
WT2	-0.002044	0.000753	0.0420	-16.8706
PTAM	-0.014257	0.006521	0.0805	-0.5428
PTAM2	0.000082	0.000018	0.0062	1.5836
SCC	-5.785953	3.726295	0.1812	-0.9113
SCC2	0.643229	0.761178	0.4366	0.5229
HEALTH	-586.028921	131.133683	0.0066	-45.1825
HEALTH2	7.040949	5.027252	0.2202	0.7572
XSNEL	3.924828	1.283368	0.0282	3.6274
XSNEL2	-0.187657	0.064576	0.0336	-3.7471
XSPROTRD	-0.010906	0.004258	0.0506	-1.3437
ED	-6012.170994	1161.985957	0.0035	-73.2899
ED2	1368.474405	313.238630	0.0072	54.6029
ADF	-0.050912	4.500628	0.9914	-0.0236
ADF2	0.069026	0.131861	0.6230	1.2293
CP	45.297195	9.283267	0.0046	12.8151
CP2	-1.201117	0.261546	0.0059	-11.9909
DMI	-104.977753	21.744375	0.0048	-49.3165
DMI2	-0.557117	0.147859	0.0131	-12.8234
DMIXWT	0.059631	0.014472	0.0092	21.2704
DMIXED	58.777821	9.914921	0.0019	44.4955
EDXHEAL	381.521064	82.457807	0.0057	48.5871
XSPRDXH	0.005882	0.005258	0.3141	0.6436
PTXHEAL	-0.137206	0.033884	0.0098	-5.4997

Model Summary

R^2	= .9747
Adjusted R^2	= .8330
Degrees of Freedom (Error)	= 5
Mean Square Error	= 6.661

[a]STD EST = Standardized estimate

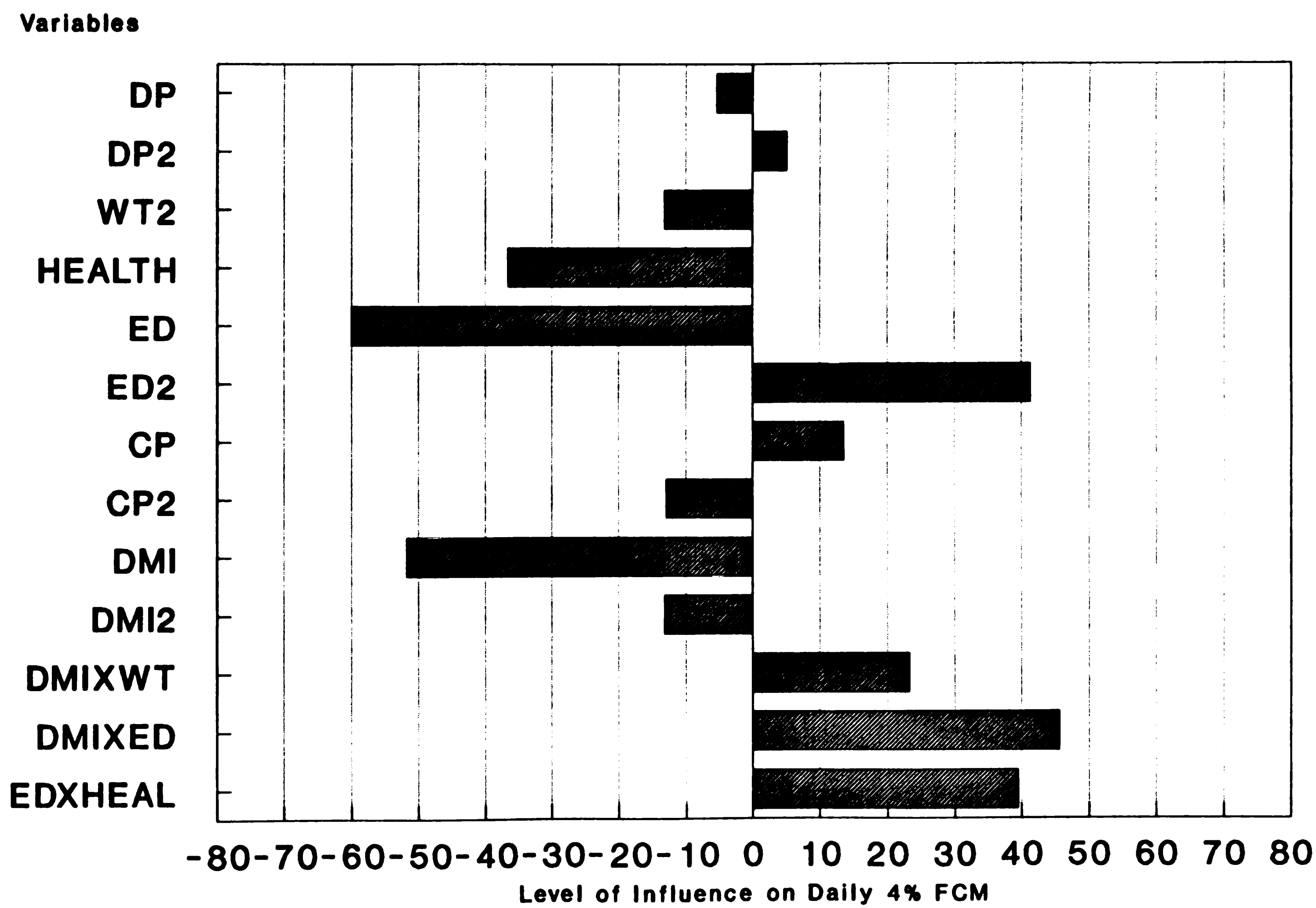

Figure 10: MULTIPAROUS COMPLETE DATA MODEL ONE EQUATION ONE (Table 13).

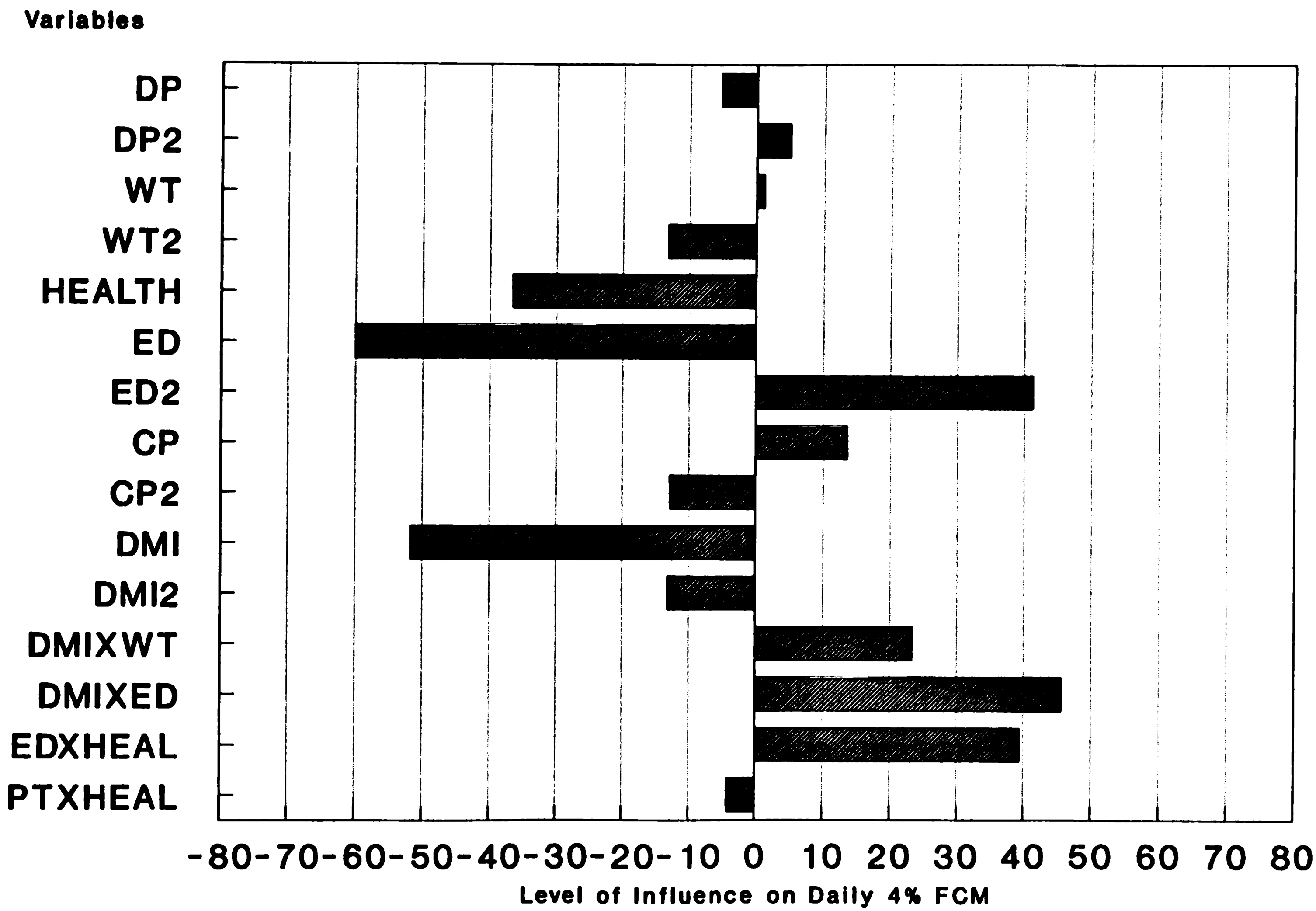

Figure 11: MULTIPAROUS COMPLETE DATA MODEL ONE EQUATION ONE (Table 14).

Table 15

MULTIPAROUS COMPLETE DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	607.511846	647.065316	0.3663	0.0000
BCS	-48.904428	61.367170	0.4410	-2.4073
BCS2	10.440246	11.718048	0.3905	2.6399
DP	-0.598879	0.648792	0.3742	-1.3444
DP2	0.004791	0.004623	0.3205	1.4554
WT	-0.179506	0.957379	0.8544	-1.2957
WT2	-0.000966	0.000763	0.2297	-7.9731
PTAM	0.004114	0.007610	0.5987	0.1566
SCC	-9.631145	5.086046	0.0826	-1.5170
SCC2	1.354620	1.002518	0.2016	1.1013
HEALTH	-167.904731	65.106219	0.0241	-12.9454
ED	-278.106894	300.736614	0.3733	-3.3902
ADF	-5.662867	3.341137	0.1159	-2.6225
ADF2	0.219039	0.095615	0.0409	3.9008
CP	88.245635	22.135086	0.0018	24.9656
CP2	-1.236880	0.308304	0.0017	-12.3479
DMI	-80.400098	24.931032	0.0073	-37.7704
DMIXWT	0.050766	0.015020	0.0055	18.1082
DMIXED	31.271212	10.386591	0.0108	23.6727
EDXCP	-25.849019	11.816445	0.0492	-14.0578
EDXHEAL	106.528406	39.644477	0.0198	13.5665
PTXHEAL	-0.021388	0.013420	0.1370	-0.8573

Model Summary

R^2 = .8322
Adjusted R^2 = .5385
Degrees of Freedom (Error) = 12
Mean Square Error = 18.410

[a]STD EST = Standardized estimate

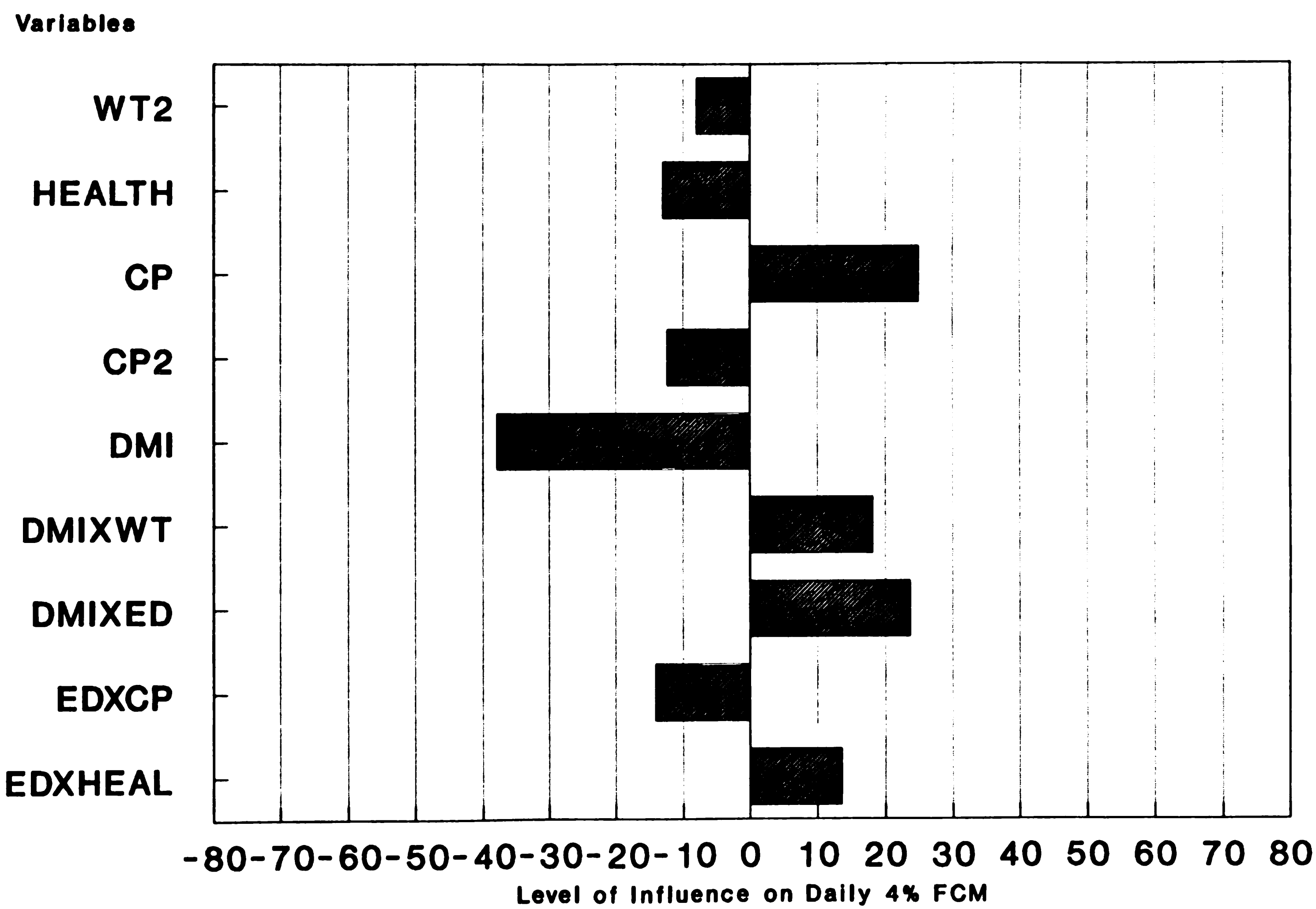

Figure 12: MULTIPAROUS COMPLETE DATA MODEL TWO EQUATION ONE (Table 15).

same, negative direction of impact on production as in model 1 (Table 13) but at a moderate level. EDXCP appeared as having a moderately, negative influence while CP2 and WT2 continued their negative sign with increased production.

HEALTH and CP had significantly greater ($P < .05$) means for larger herds (Table 16). XSPROTES was less for larger herds at the $P < .10$ level and XSPROTRD approached significance ($P = .1069$). High producing herds had significantly higher daily 4% FCM ($P < .05$) with PTAM and CP significant at $P < .10$.

2. Excluding Genetic Data

Correlations (Appendix Table 36) of significant magnitude for multiparous animals excluding genetic data (MNG) (Appendix Tables 37 and 38) were found for ED and ADF, XSNEL and XSPROTRD, and XSPROTRD and BCS with respective values of -.8408, .8344, and .5786.

The selected model, after regression analysis, for CNG model 1 indicated R^2 and ADJ R^2 of .5771 and .2311 respectively (Table 17). The alternative model (Table 18), deleting PLL, PLL2, HEALTH, EDXHEAL, and XSPRDXH, achieved an ADJ R^2 of .2860 but R^2 dropped to .5180. ED and ED2 had major, positive and negative impacts respectively on milk yield. The linear term BCS had a moderate, positive influence while its interaction with ED demonstrated moderate, negative pressure. HEALTH and ADF2 had minor, positive but ADF and EDXHEAL minor, negative affects.

Table 16

MULTIPAROUS COMPLETE DATA - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
FCM (kg/d)	Large	19	34.18	6.586	33.87	0.7568
	Small	15	35.28	6.127	34.52	
	High	20	36.93	5.013	37.05	0.0094
	Low	14	31.43	6.739	31.34	
	Overall	34	34.66	6.316		
BCS	Large	19	2.50	0.339	2.50	0.2507
	Small	15	2.65	0.260	2.63	
	High	20	2.60	0.326	2.61	0.4356
	Low	14	2.52	0.293	2.52	
	Overall	34	2.56	0.311		
DP (days)	Large	19	60.89	14.93	61.13	0.8445
	Small	15	61.07	13.69	62.13	
	High	20	58.37	13.93	58.23	0.1877
	Low	14	64.69	14.19	65.03	
	Overall	34	60.97	14.18		
PLL (days)	Large	19	341.4	45.50	342.4	0.2367
	Small	15	326.3	22.49	326.3	
	High	20	331.7	36.53	331.2	0.6396
	Low	14	339.1	39.67	337.5	
	Overall	34	334.7	37.45		
WT (kg)	Large	19	574.3	46.67	572.4	0.8060
	Small	15	575.4	45.82	576.5	
	High	20	578.4	40.65	577.7	0.6980
	Low	14	569.7	53.06	571.3	
	Overall	34	574.8	45.59		

Table 16 - continued

MULTIPAROUS COMPLETE DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
PTAM (kg)	Large	19	277.8	223.7	246.7	0.9980
	Small	15	278.0	268.3	264.9	
	High	20	340.0	190.3	339.2	0.0870
	Low	14	189.1	281.8	190.4	
	Overall	34	277.9	240.5		
SCC	Large	19	2.35	1.032	2.35	0.8002
	Small	15	2.41	0.980	2.44	
	High	20	2.34	0.942	2.33	0.7216
	Low	14	2.44	1.099	2.46	
	Overall	34	2.38	0.995		
HEALTH	Large	19	0.531	0.565	0.513	0.0457
	Small	15	0.178	0.271	0.171	
	High	20	0.438	0.422	0.417	0.3685
	Low	14	0.286	0.527	0.267	
	Overall	34	0.375	0.487		
XSNEL (Mcal NEL/d)	Large	19	6.25	5.31	6.21	0.2895
	Small	15	8.71	6.36	8.45	
	High	20	7.93	6.69	8.09	0.4681
	Low	14	6.48	4.46	6.57	
	Overall	34	7.33	5.84		
XSPROTRD (g/d)	Large	19	657.7	851.9	641.1	0.1069
	Small	15	1099.1	614.7	1095.1	
	High	20	912.2	911.7	930.6	0.6506
	Low	14	767.1	556.1	805.6	
	Overall	34	852.4	778.2		

Table 16 - continued

MULTIPAROUS COMPLETE DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
XSPROTES (g/d)	Large	19	15.7	334.3	11.9	0.0841
	Small	15	182.5	228.5	198.2	
	High	20	73.8	312.2	78.0	0.6079
	Low	14	111.4	292.5	132.1	
	Overall	34	89.3	300.3		
ED (Mcal NEL/kg)	Large	19	1.675	0.0754	1.678	0.1756
	Small	15	1.649	0.0792	1.642	
	High	20	1.668	0.0668	1.669	0.5005
	Low	14	1.658	0.0920	1.651	
	Overall	34	1.664	0.0770		
ADF (%)	Large	19	18.51	2.322	18.43	0.5884
	Small	15	18.68	3.636	18.98	
	High	20	18.29	2.790	18.22	0.3370
	Low	14	19.02	3.162	19.20	
	Overall	34	18.59	2.925		
CP (%)	Large	19	18.15	1.583	18.10	0.0490
	Small	15	17.05	1.892	16.89	
	High	20	18.08	1.514	18.04	0.0750
	Low	14	17.08	2.029	16.95	
	Overall	34	17.67	1.787		
DMI (kg/d)	Large	19	24.32	2.777	24.28	0.8192
	Small	15	24.10	3.288	24.03	
	High	20	24.07	2.888	24.47	0.5706
	Low	14	23.87	3.151	23.84	
	Overall	34	24.22	2.967		

[a]N = Number of herds
[b]STD DEV = Standard deviation

Table 17

MULTIPAROUS NO GENETIC DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-3212.936128	1403.558168	0.0320	0.0000
BCS	344.952581	209.414080	0.1137	15.3601
DP	0.132652	0.110431	0.2424	0.3177
PLL	-0.899509	0.917262	0.3374	-4.6889
PLL2	0.001343	0.001352	0.3315	4.7433
WT	-0.038461	0.037483	0.3160	-0.2503
HEALTH	80.629620	59.942078	0.1923	5.9254
XSPROTRD	-0.007616	0.003441	0.0376	-0.9868
XSPTRD2	0.000005	0.000002	0.0085	1.8020
ED	3581.686405	1400.802994	0.0180	46.9493
ED2	-909.031470	337.499771	0.0133	-39.0120
ADF	-16.172429	6.853836	0.0276	-7.8860
ADF2	0.452097	0.185957	0.0237	8.5700
CP	9.890460	7.441938	0.1975	2.9954
CP2	-0.278849	0.215729	0.2096	-2.9457
DMI	1.000708	0.418466	0.0258	0.5053
EDXBCS	-206.798400	128.377425	0.1215	-15.5679
EDXHEAL	-47.040871	35.086345	0.1937	-5.7029
XSPRDXH	-0.003289	0.003596	0.3703	-0.3335

<u>Model Summary</u>

R^2 = .5771
Adjusted R^2 = .2311
Degrees of Freedom (Error) = 22
Mean Square Error = 28.251

[a]STD EST = Standardized estimate

Table 18

MULTIPAROUS NO GENETIC DATA
MODEL ONE EQUATION TWO

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-3839.065484	1169.108200	0.0028	0.0000
BCS	459.060678	164.564409	0.0096	20.4411
DP	0.184004	0.084150	0.0376	0.4407
WT	-0.055212	0.031116	0.0873	-0.3593
XSPROTRD	-0.008900	0.002735	0.0031	-1.1533
XSPTRD2	0.000006	0.000002	0.0010	1.8622
ED	4019.524681	1218.522099	0.0027	52.6886
ED2	-996.227649	298.295859	0.0025	-42.7542
ADF	-17.545822	6.091287	0.0077	-8.5557
ADF2	0.484017	0.165102	0.0068	9.1751
CP	12.066615	6.530975	0.0756	3.6545
CP2	-0.347343	0.188949	0.0770	-3.6693
DMI	1.070156	0.367869	0.0072	0.5403
EDXBCS	-277.003022	100.549567	0.0104	-20.8529

Model Summary

R^2 = .5180
Adjusted R^2 = .2860
Degrees of Freedom (Error) = 27
Mean Square Error = 26.234

[a]STD EST = Standardized estimate

Tables 17 and 18 are represented graphically by Figures 13 and 14 respectively.

Results from CNG model 2 regression were not as successful with selected model (Table 19) R^2 and ADJ R^2 values of .5424 and -.0169 respectively. An alternative model (Table 20) had 8 fewer independent variables but an R^2 value of .4137 with no real increase in ADJ R^2. STD EST for ED and HEALTH were of moderate, positive influence while ED2 had a moderate, negative outcome on FCM (Figures 15 and 16). The EDXHEAL interaction and the linear PLL had minor, negative impacts while its quadratic term (PLL2) was positive.

Means for large MNG herds were lower for BCS ($P < .05$) (Table 21) and greater for CP ($P < .10$). ED and XSPROTRD approached significance at the $P < .10$, with large herds having greater and lesser values respectively. For high producing herds both FCM and CP were greater ($P < .05$).

3. <u>Excluding Somatic Cell Count Data</u>

Correlations (Appendix Table 43) of the multiparous data set excluding SCC (MNS) (Appendix Tables 44 and 45) again displayed importance for ED and ADF (-.8389), XSNEL and XSPROTRD (.8364), and XSPROTRD and BCS (.5965).

Regression of MNS data yielded a model with respective values of .8354 and .5568 for R^2 and ADJ R^2 (Table 22). ED was of major, negative importance to production. However, the quadratic term (ED2) had moderate, positive effect as

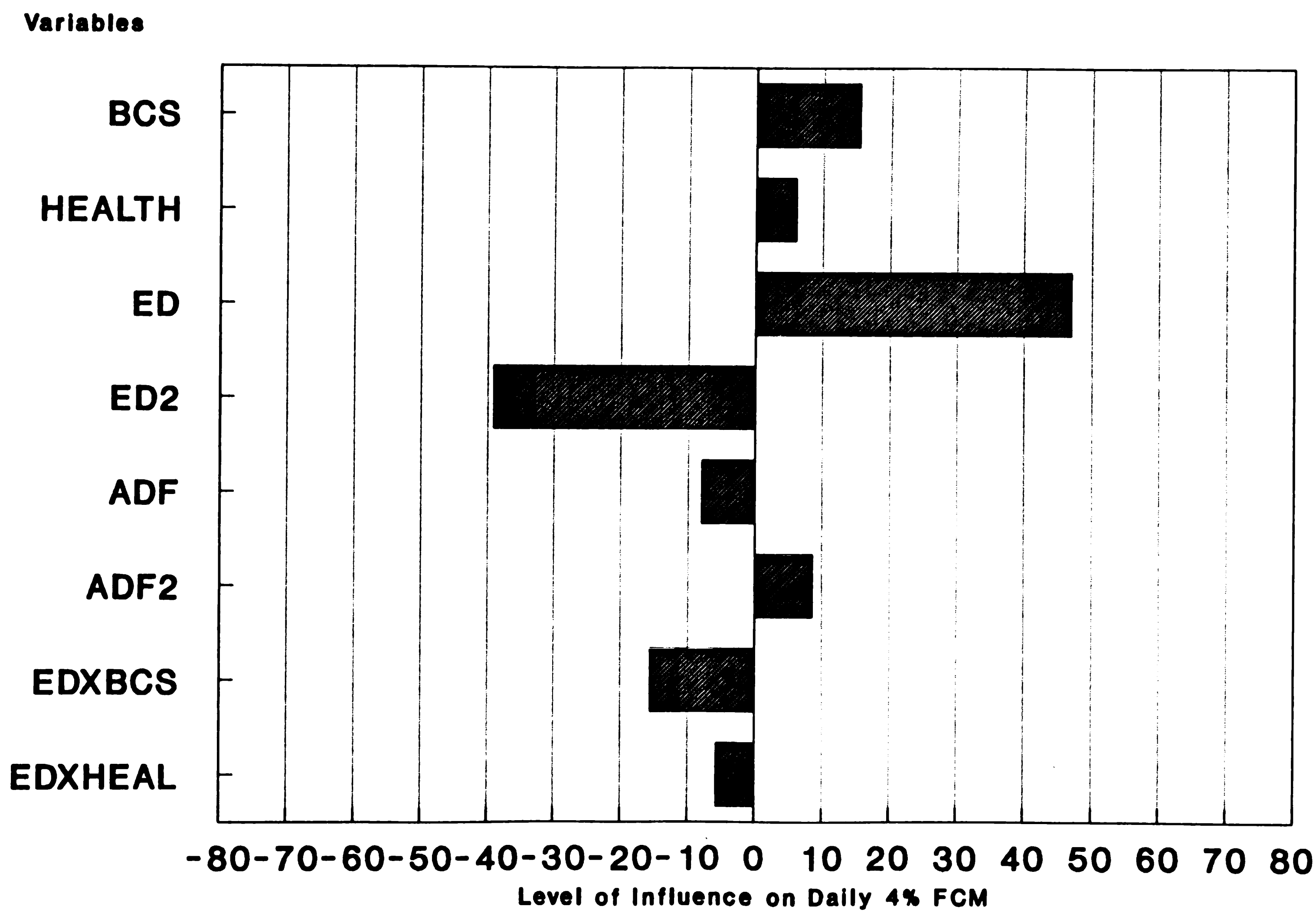

Figure 13: MULTIPAROUS NO GENETIC DATA MODEL ONE EQUATION ONE (Table 17).

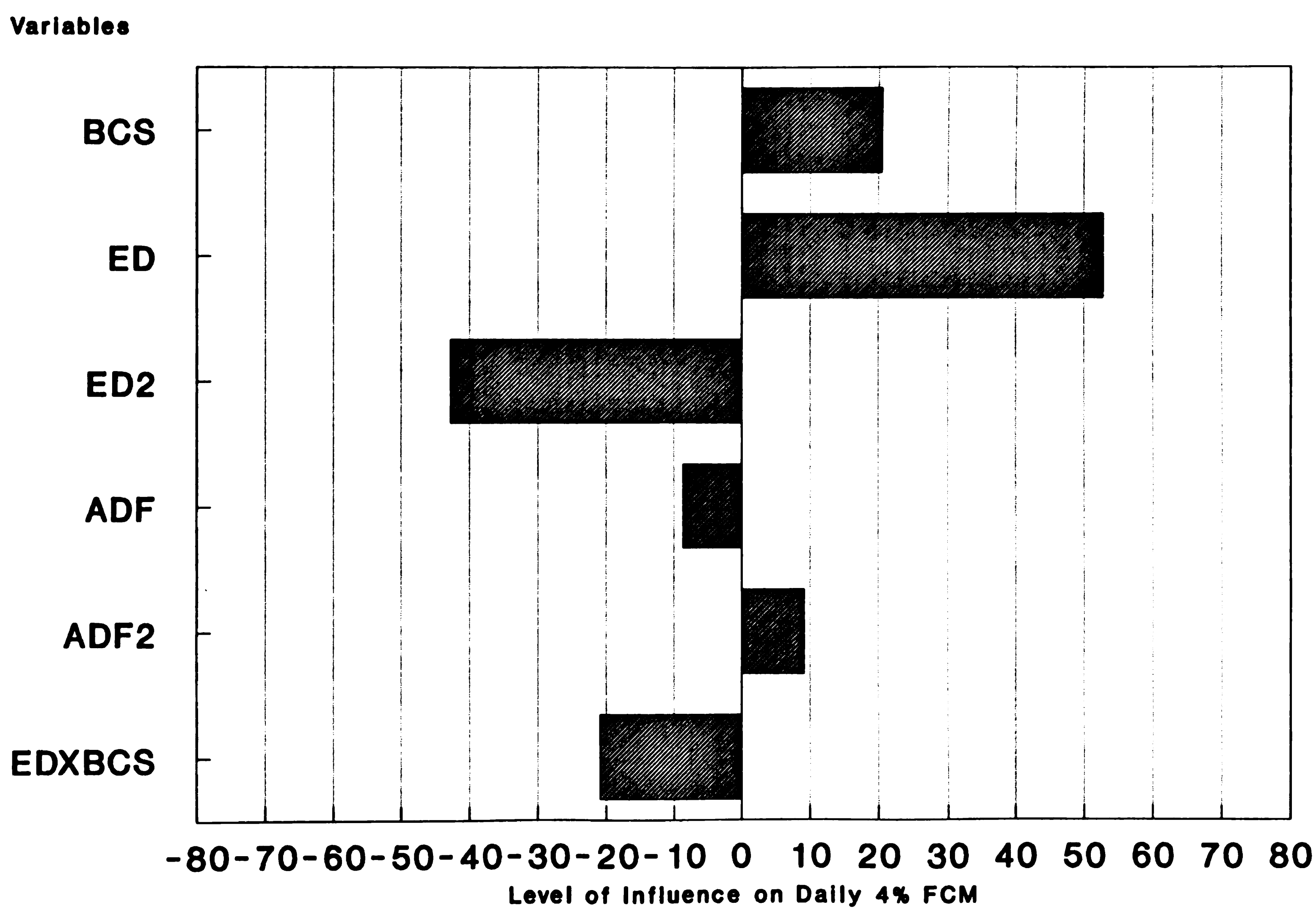

Figure 14: MULTIPAROUS NO GENETIC DATA MODEL ONE EQUATION TWO (Table 18).

Table 19

MULTIPAROUS NO GENETIC DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-447.719757	594.976211	0.4615	0.0000
BCS	-90.382172	79.884868	0.2727	-4.0246
BCS2	19.168859	15.091303	0.2202	4.5067
DP	-0.303842	0.687358	0.6637	-0.7277
DP2	0.001799	0.004506	0.6944	0.6661
PLL	-1.463951	1.000817	0.1608	-7.6311
PLL2	0.002168	0.001472	0.1580	7.6600
SCC	-3.367668	7.072575	0.6397	-0.5240
SCC2	0.516634	1.279012	0.6910	0.4309
HEALTH	141.160600	85.759137	0.1171	10.3737
HEALTH2	-2.765026	5.172711	0.5995	-0.2644
XSPROTES	-0.000197	0.006284	0.9753	-0.0097
XSPTES2	-0.000004	0.000011	0.7369	-0.0729
ED	941.545019	772.606854	0.2387	12.3419
ED2	-267.127788	230.194932	0.2610	-11.4641
ADF	-3.935667	4.838909	0.4267	-1.9191
ADF2	0.121058	0.133396	0.3761	2.2948
CP	3.063828	9.681658	0.7553	0.9279
CP2	-0.079822	0.278297	0.7775	-0.8432
DMI	1.125319	9.343774	0.9055	0.5682
DMI2	-0.006317	0.198910	0.9750	-0.1479
EDXHEAL	-81.541332	51.409469	0.1301	-9.8855
XSPESXH	-0.014362	0.013415	0.2985	-0.3901

Model Summary

R^2 = .5424
Adjusted R^2 = -.0169
Degrees of Freedom (Error) = 18
Mean Square Error = 37.364

[a]STD EST = Standardized estimate

Table 20

MULTIPAROUS NO GENETIC DATA
MODEL TWO EQUATION TWO

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-501.306847	492.363841	0.3180	0.0000
BCS	-82.197214	66.443298	0.2271	-3.6601
BCS2	17.997488	12.641100	0.1664	4.2313
PLL	-1.206781	0.840292	0.1629	-6.2906
PLL2	0.001769	0.001243	0.1666	6.2477
HEALTH	102.101643	62.424996	0.1140	7.5033
XSPROTES	-0.002833	0.005556	0.6143	-0.1396
ED	933.471330	619.733405	0.1441	12.2361
ED2	-272.249173	185.076789	0.1533	-11.6839
ADF	-4.618239	4.121987	0.2728	-2.2519
ADF2	0.130756	0.112301	0.2549	2.4786
CP	7.513330	7.581366	0.3308	2.2755
CP2	-0.190976	0.221089	0.3956	-2.0174
EDXHEAL	-60.473681	37.152813	0.1156	-7.3314
XSPESXH	-0.011971	0.011175	0.2939	-0.3252

Model Summary

R^2 = .4137
Adjusted R^2 = .0981
Degrees of Freedom (Error) = 26
Mean Square Error = 33.138

[a]STD EST = Standardized estimate

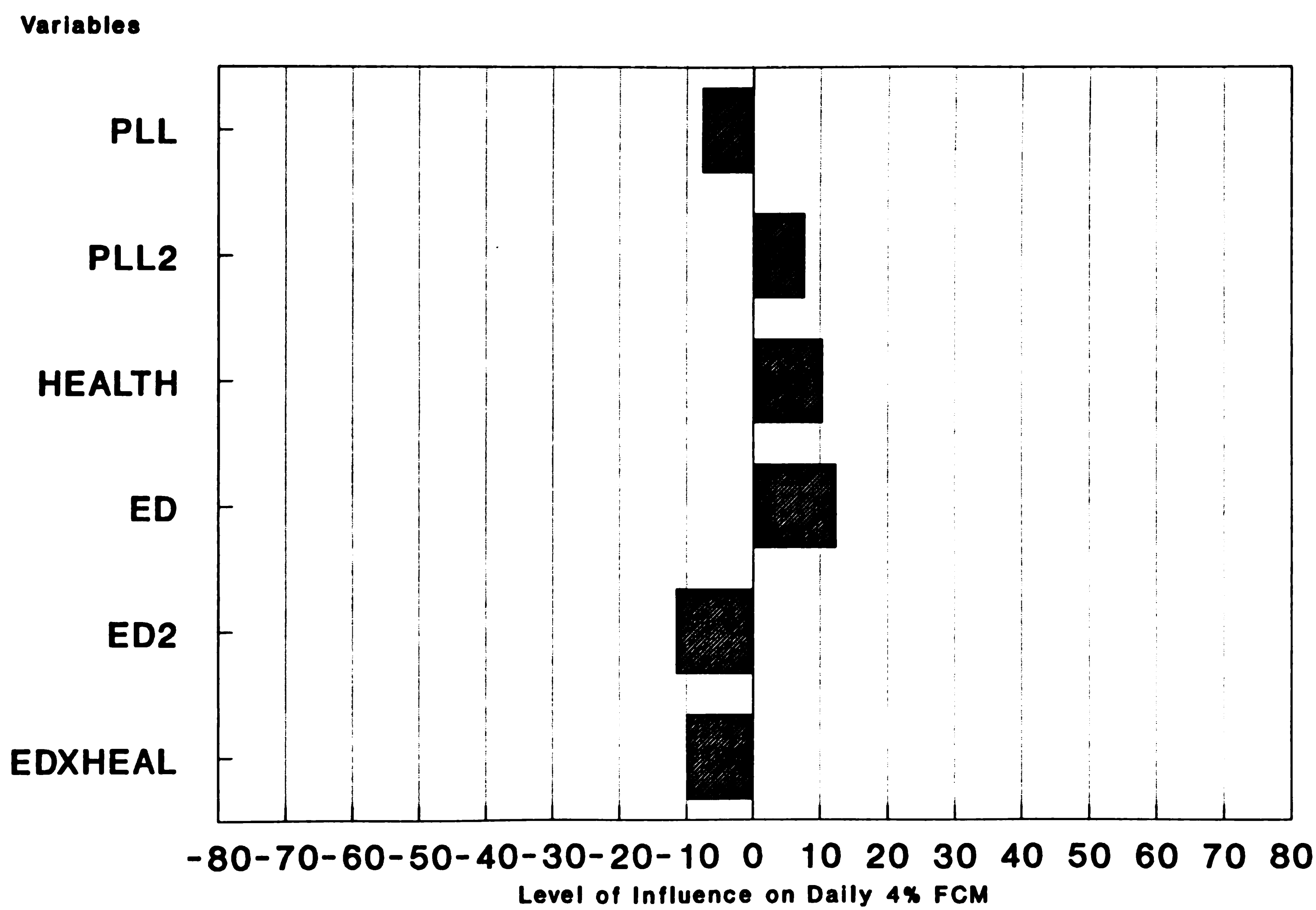

Figure 15: MULTIPAROUS NO GENETIC DATA MODEL TWO EQUATION ONE (Table 19).

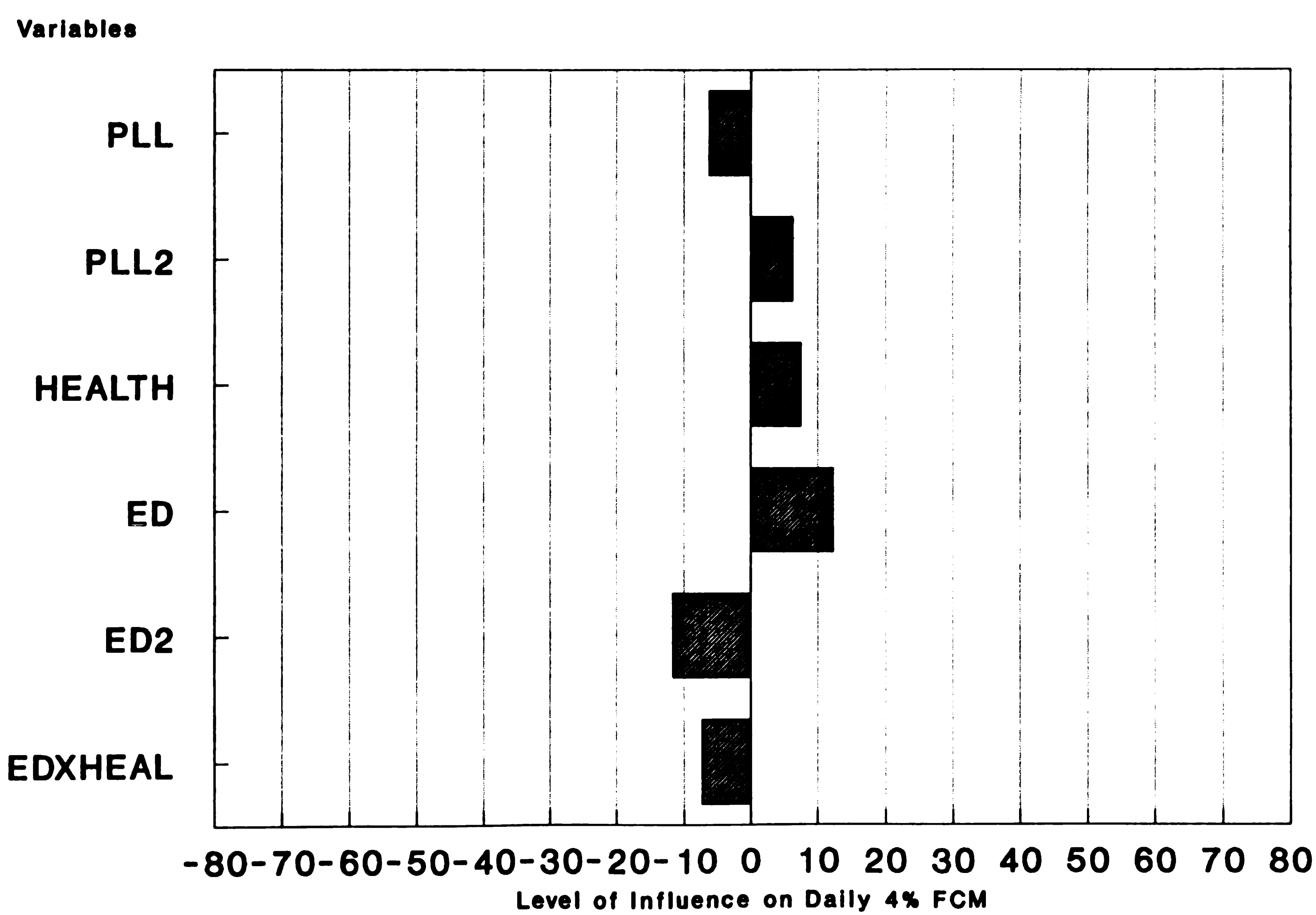

Figure 16: MULTIPAROUS NO GENETIC DATA MODEL TWO EQUATION TWO (Table 20).

Table 21

MULTIPAROUS NO GENETIC DATA - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
FCM (kg/d)	Large	20	33.80	7.015	33.80	0.2776
	Small	21	35.48	5.051	35.60	
	High	20	37.90	4.886	37.90	0.0004
	Low	21	31.58	5.562	31.50	
	Overall		34.71	6.062		
BCS	Large	20	2.50	0.285	2.50	0.0131
	Small	21	2.70	0.217	2.71	
	High	20	2.60	0.319	2.60	0.9665
	Low	21	2.61	0.221	2.60	
	Overall		2.60	0.270		
DP (days)	Large	20	62.56	18.70	62.56	0.7146
	Small	21	60.89	9.38	60.83	
	High	20	59.98	12.99	59.98	0.4674
	Low	21	63.35	15.98	63.41	
	Overall		61.71	14.52		
PLL (days)	Large	20	337.5	31.50	337.5	0.4462
	Small	21	330.0	32.02	329.9	
	High	20	327.1	27.37	327.1	0.1921
	Low	21	339.9	34.66	340.3	
	Overall		333.7	31.60		
WT (kg)	Large	20	581.7	37.72	581.7	0.9483
	Small	21	581.0	41.96	580.8	
	High	20	580.9	36.88	580.9	0.9422
	Low	21	581.8	42.66	581.6	
	Overall		581.3	39.45		

Table 21 - continued

MULTIPAROUS NO GENETIC DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
SCC	Large	20	2.44	0.972	2.44	0.8065
	Small	21	2.37	0.938	2.37	
	High	20	2.30	0.939	2.30	0.5210
	Low	21	2.50	0.960	2.50	
	Overall		2.41	0.943		
HEALTH	Large	20	0.403	0.502	0.403	0.4515
	Small	21	0.296	0.390	0.296	
	High	20	0.417	0.430	0.417	0.3395
	Low	21	0.282	0.460	0.281	
	Overall		0.348	0.445		
XSNEL (Mcal NEL/d)	Large	20	6.02	5.28	6.02	0.2490
	Small	21	8.22	6.67	8.26	
	High	20	7.89	6.71	7.89	0.4387
	Low	21	6.43	5.43	6.39	
	Overall		7.14	6.06		
XSPROTRD (g/d)	Large	20	618.8	829.8	618.8	0.1474
	Small	21	975.5	717.3	982.3	
	High	20	908.3	916.4	908.3	0.3861
	Low	21	699.9	643.3	692.8	
	Overall		801.5	785.4		
XSPROTES (g/d)	Large	20	3.3	311.0	3.3	0.1743
	Small	21	132.5	279.2	133.9	
	High	20	72.3	315.3	72.3	0.9382
	Low	21	66.8	289.7	64.9	
	Overall		69.4	298.6		

Table 21 - continued

MULTIPAROUS NO GENETIC DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
ED	Large	20	1.679	0.0627	1.679	0.1007
(Mcal	Small	21	1.637	0.0894	1.638	
NEL/kg)	High	20	1.664	0.0663	1.664	0.6309
	Low	21	1.650	0.0914	1.652	
	Overall		1.657	0.0795		
ADF	Large	20	18.67	2.307	18.67	0.5887
(%)	Small	21	19.23	3.501	19.17	
	High	20	18.37	2.732	18.37	0.2330
	Low	21	19.52	3.115	19.48	
	Overall		18.96	2.956		
CP	Large	20	17.97	1.632	17.97	0.0592
(%)	Small	21	16.90	1.903	16.94	
	High	20	17.99	1.585	17.99	0.0495
	Low	21	16.87	1.927	16.91	
	Overall		17.42	1.836		
DMI	Large	20	23.22	2.958	23.22	0.4624
(kg/d)	Small	21	23.93	3.188	23.95	
	High	20	24.04	2.409	24.04	0.3588
	Low	21	23.15	3.580	23.13	
	Overall		23.58	3.060		

[a]N = Number of herds
[b]STD DEV = Standard deviation

Table 22

MULTIPAROUS NO SOMATIC CELL COUNT DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	1153.989472	695.432515	0.1210	0.0000
BCS	-374.857162	185.798366	0.0648	-15.4499
BCS2	15.430585	13.105458	0.2601	3.3549
DP	0.027305	0.721399	0.9704	0.0479
DP2	-0.002401	0.005606	0.6755	-0.5913
WT	3.139628	0.931437	0.0050	19.0551
WT2	-0.002735	0.000799	0.0045	-19.2291
PTAM	-0.012082	0.006851	0.1013	-0.4405
PTAM2	0.000073	0.000017	0.0011	1.3714
HEALTH	39.473814	9.145215	0.0008	2.7149
HEALTH2	10.553511	7.927879	0.2060	0.9633
XSNEL	1.963795	0.947809	0.0587	1.7670
XSNEL2	-0.072900	0.055560	0.2122	-1.3737
XSPROTRD	-0.010909	0.003845	0.0140	-1.2841
XSPTRD2	0.000001	0.000002	0.5406	0.3802
ED	-2053.715633	653.911875	0.0078	-24.3032
ED2	500.146496	164.713853	0.0095	19.3663
ADF	2.179644	0.765817	0.0138	0.9600
CP	1.422749	0.782243	0.0920	0.3997
DMI	-0.441046	0.363560	0.2467	-0.2072
EDXBCS	191.802788	89.492051	0.0516	13.4267
XSPRDXH	-0.004985	0.004033	0.2383	-0.4937
PTXHEAL	-0.113396	0.028504	0.0016	-3.7087

<u>Model Summary</u>

R^2 = .8254
Adjusted R^2 = .5568
Degrees of Freedom (Error) = 13
Mean Square Error = 19.211

[a]STD EST = Standardized estimate

did WT and the EDXBCS interaction (Figure 17). WT2 and BCS exhibited moderate, negative impact on production.

WT and WT2 had moderate, positive and negative influence for MNS model 2 (Table 23) with an R^2 of .7587 and ADJ R^2 of .5979. A second model (Table 24), with ED2 and XSPESXH included, had respective R^2 and ADJ R^2s of .7721 and .5802. This did increase the measured impact of both ED and ED2 to moderate, positive levels (Figures 18 and 19).

Larger herds had significantly ($P < .05$) larger ED and CP means (Table 25). Prepartum protein intake differences (XSPROTES and XSPROTRD) were significantly smaller at the $P < .05$ and .10 levels respectively. Higher producing herds had higher FCM ($P < .05$) and PTAM ($P < .10$) while DP approached significance, being lower for high herds.

4. <u>All Multiparous Data Sets Combined</u>

As with the primiparous data, the three multiparous data sets MC (Appendix Tables 30 and 31), MNG (Appendix Tables 37 and 38), and MNS (Appendix Tables 44 and 45) were combined into the multiparous all (MAL) data set for regression analysis. MAL model 1 regression (Table 26) resulted in R^2 and ADJ R^2 of .4959 and .3477 respectively. An alternative model (Table 27), which excluded DP, its quadratic term, and the XSNELXH interaction, had an R^2 of .4729 and slightly lower ADJ R^2. ED and ED2 displayed major, positive and negative influences respectively on milk yield (Figures 20 and 21). DMI and EDXBCS moderately

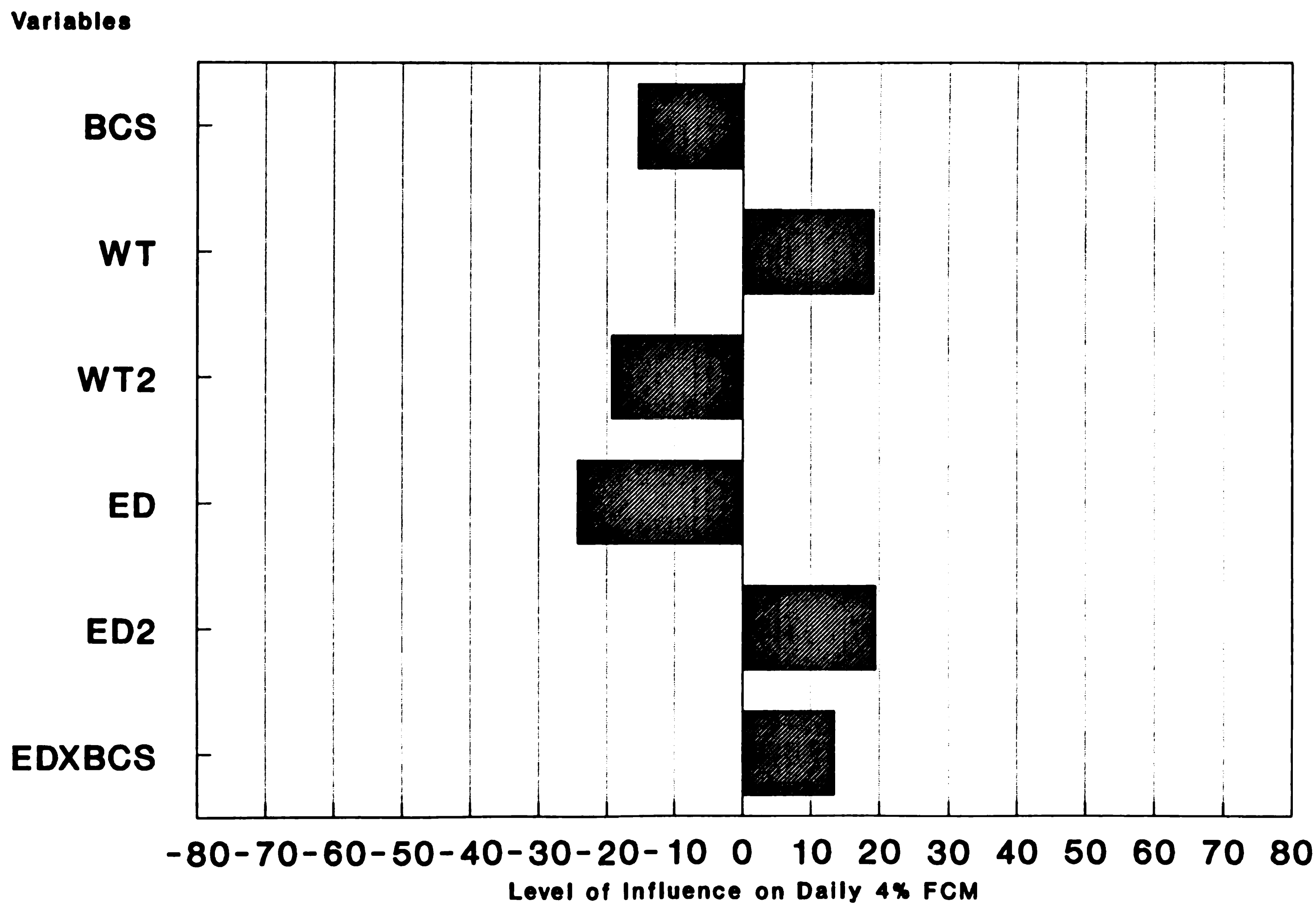

Figure 17: MULTIPAROUS NO SOMATIC CELL COUNT DATA MODEL ONE EQUATION ONE (Table 22).

Table 23

MULTIPAROUS NO SOMATIC CELL COUNT DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-853.959770	221.655231	0.0009	0.0000
BCS	14.842558	4.230488	0.0021	0.6117
DP	-0.245129	0.098839	0.0217	-0.4302
WT	2.574162	0.672359	0.0010	15.6232
WT2	-0.002261	0.000584	0.0009	-15.8952
PTAM	-0.008941	0.005505	0.1193	-0.3260
PTAM2	0.000054	0.000012	0.0003	1.0150
HEALTH	23.574268	5.779533	0.0005	1.6214
HEALTH2	12.912040	5.038542	0.0181	1.1786
XSPROTES	-0.011479	0.003286	0.0022	-0.5116
ED	77.580128	27.350911	0.0099	0.9181
ADF	-3.220506	2.059854	0.1329	-1.4184
ADF2	0.143361	0.058693	0.0235	2.4285
CP	0.744567	0.500592	0.1518	0.2092
PTXHEAL	-0.093093	0.016806	0.0001	-3.0447

<u>Model Summary</u>

R^2 = .7587
Adjusted R^2 = .5979
Degrees of Freedom (Error) = 21
Mean Square Error = 17.429

[a]STD EST = Standardized estimate

Table 24

MULTIPAROUS NO SOMATIC CELL COUNT DATA
MODEL TWO EQUATION TWO

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-490.490116	463.494160	0.3032	0.0000
BCS	16.002135	4.459843	0.0020	0.6595
DP	-0.227860	0.102453	0.0385	-0.3999
WT	2.695112	0.807159	0.0034	16.3572
WT2	-0.002361	0.000695	0.0030	-16.6014
PTAM	-0.008599	0.005780	0.1532	-0.3135
PTAM2	0.000054	0.000013	0.0004	1.0221
HEALTH	26.641028	6.651110	0.0008	1.8323
HEALTH2	11.589624	5.771170	0.0591	1.0579
XSPROTES	-0.009611	0.004007	0.0269	-0.4283
ED	-440.570310	655.139456	0.5094	-5.2136
ED2	157.815617	200.717940	0.4414	6.1108
ADF	-0.863156	3.530729	0.8095	-0.3801
ADF2	0.079895	0.095767	0.4145	1.3534
CP	0.681497	0.517948	0.2039	0.1914
XSPESXH	-0.007852	0.007916	0.3337	-0.2039
PTXHEAL	-0.095846	0.017615	0.0001	-3.1347

Model Summary

R^2 = .7721
Adjusted R^2 = .5802
Degrees of Freedom (Error) = 19
Mean Square Error = 18.195

[a]STD EST = Standardized estimate

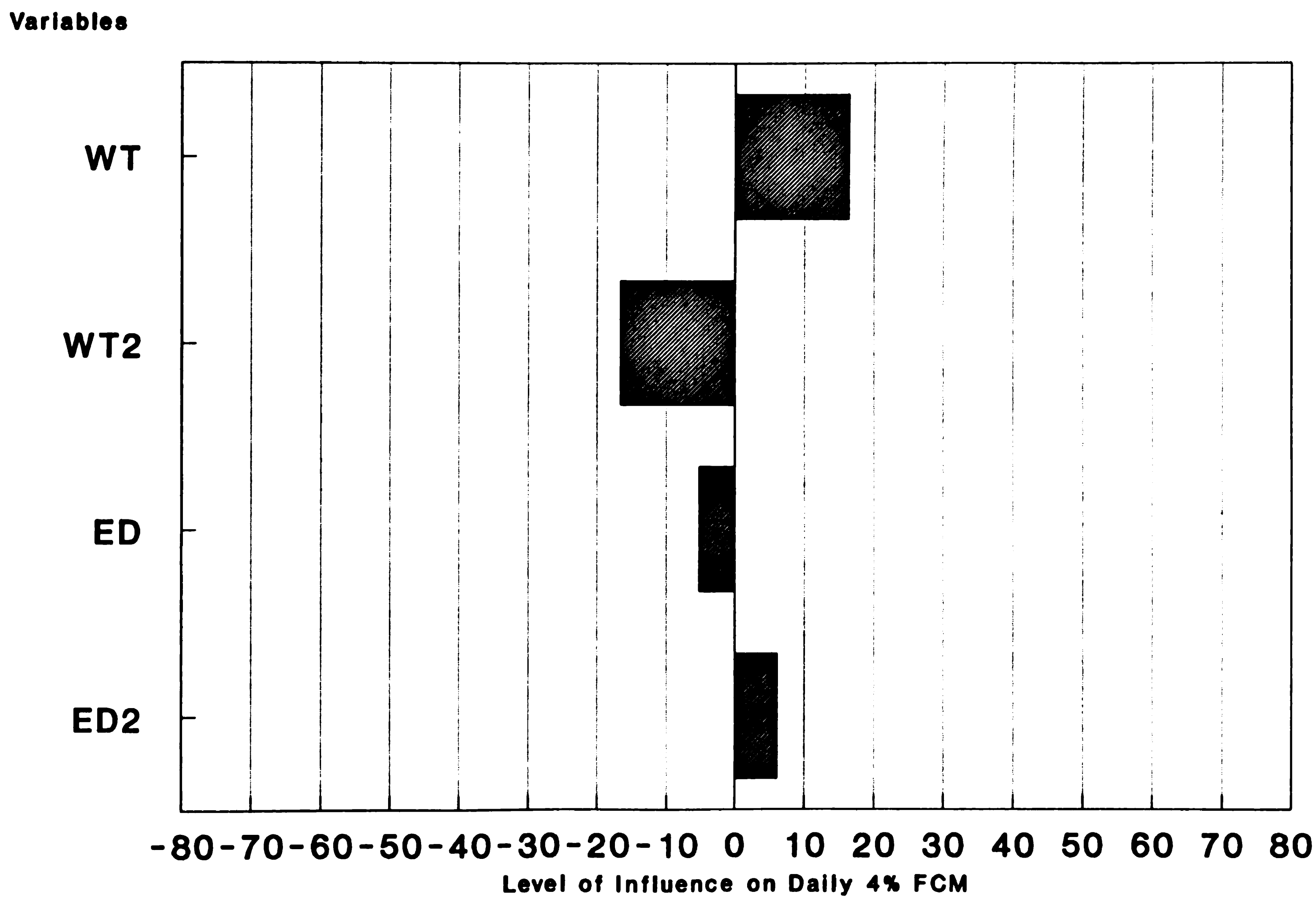

Figure 19: MULTIPAROUS NO SOMATIC CELL COUNT DATA MODEL TWO EQUATION TWO (Table 24).

Table 25

MULTIPAROUS NO SOMATIC CELL COUNT DATA - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
FCM (kg/d)	Large	19	34.67	6.974	34.30	0.8364
	Small	17	35.92	6.365	34.74	
	High	22	37.70	5.395	37.70	0.0045
	Low	14	31.43	6.739	31.34	
	Overall	36	35.49	6.583		
BCS	Large	19	2.48	0.319	2.48	0.1544
	Small	17	2.68	0.261	2.63	
	High	22	2.59	0.311	2.59	0.4785
	Low	14	2.52	0.293	2.52	
	Overall	36	2.58	0.271		
DP (days)	Large	19	59.53	13.88	59.95	0.1577
	Small	17	61.53	14.47	62.87	
	High	22	57.79	13.49	57.79	0.1454
	Low	14	64.69	14.19	65.03	
	Overall	36	60.24	11.55		
PLL (days)	Large	19	341.7	45.54	342.7	0.3149
	Small	17	330.2	24.39	329.3	
	High	22	334.5	36.10	334.5	0.8162
	Low	14	339.1	39.67	337.5	
	Overall	36	332.5	28.76		
WT (kg)	Large	19	573.3	45.89	571.6	0.6541
	Small	17	577.7	44.31	578.7	
	High	22	579.0	39.13	579.0	0.6256
	Low	14	569.7	53.06	571.3	
	Overall	36	578.6	39.60		

Table 25 - continued

MULTIPAROUS NO SOMATIC CELL COUNT DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
PTAM (kg)	Large	19	278.7	224.0	265.4	0.8785
	Small	17	301.0	263.3	277.9	
	High	22	352.9	189.6	352.9	0.0541
	Low	14	189.1	281.8	190.4	
	Overall	36	289.2	240.0		
HEALTH	Large	19	0.461	0.543	0.452	0.1608
	Small	17	0.235	0.382	0.213	
	High	22	0.398	0.421	0.398	0.4374
	Low	14	0.286	0.572	0.267	
	Overall	36	0.349	0.453		
XSNEL (Mcal NEL/d)	Large	19	6.05	5.44	6.04	0.4258
	Small	17	7.90	6.45	7.73	
	High	22	7.21	6.78	7.21	0.7636
	Low	14	6.48	4.46	6.57	
	Overall	36	6.92	5.92		
XSPROTRD (g/d)	Large	19	598.3	850.6	589.8	0.0899
	Small	17	1149.1	621.0	1055.1	
	High	22	839.2	898.5	839.2	0.9002
	Low	14	767.1	556.1	805.6	
	Overall	36	811.2	774.9		
XSPROTES (g/d)	Large	19	-14.0	307.5	-13.8	0.0193
	Small	17	209.0	232.6	224.3	
	High	22	78.5	300.1	78.5	0.5833
	Low	14	111.4	292.5	132.1	
	Overall	36	91.3	293.4		

Table 25 - continued

MULTIPAROUS NO SOMATIC CELL COUNT DATA - MEANS

Variable	Herd Category	N	Mean	STD DEV	Least Square Mean	P Value
ED	Large	19	1.687	0.0590	1.689	0.0241
(Mcal	Small	17	1.633	0.0878	1.627	
NEL/kg)	High	22	1.664	0.0697	1.664	0.6074
	Low	14	1.658	0.0920	1.651	
	Overall	36	1.661	0.0779		
ADF	Large	19	18.27	2.110	18.23	0.2428
(%)	Small	17	19.11	3.605	19.41	
	High	22	18.45	2.773	18.45	0.4574
	Low	14	19.02	3.162	19.20	
	Overall	36	18.67	2.900		
CP	Large	19	18.07	1.591	18.04	0.0455
(%)	Small	17	16.96	1.984	16.77	
	High	22	17.85	1.706	17.85	0.1537
	Low	14	17.08	2.029	16.95	
	Overall	36	17.55	1.849		
DMI	Large	19	24.24	2.821	24.21	0.6391
(kg/d)	Small	17	23.69	3.435	23.69	
	High	22	24.06	3.127	24.06	0.8465
	Low	14	23.87	3.151	23.84	
	Overall	36	23.98	3.092		

[a]N = Number of herds
[b]STD DEV = Standard deviation

Table 26

MULTIPAROUS ALL DATA
MODEL ONE EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-2012.488993	659.976435	0.0031	0.0000
BCS	226.381686	92.508414	0.0165	10.1675
DP	-0.250015	0.261954	0.3426	-0.5350
DP2	0.002177	0.001761	0.2197	0.6759
PLL	0.043116	0.022191	0.0553	0.2227
WT	0.681702	0.436040	0.1217	4.4920
WT2	-0.001073	0.000384	0.0064	-8.1746
HEALTH	137.412442	42.715595	0.0018	10.0183
XSNEL	-1.043220	0.513552	0.0453	-0.9815
XSNEL2	0.033303	0.024589	0.1792	0.6826
XSPROTRD	-0.003539	0.002444	0.1513	-0.4366
XSPTRD2	0.000004	0.000001	0.0017	1.3897
ED	2284.424702	682.353600	0.0012	28.2721
ED2	-653.850533	178.501086	0.0004	-26.4864
ADF	-11.870142	3.455768	0.0009	-5.5051
ADF2	0.350258	0.094675	0.0004	6.2728
CP	-4.869521	10.880621	0.6556	-1.4079
CP2	-0.327460	0.146857	0.0284	-3.3159
DMI	-21.073784	7.408160	0.0056	-10.1801
DMIXWT	0.022737	0.006182	0.0004	8.0869
DMIXED	5.036462	2.915447	0.0877	4.0401
EDXCP	9.677536	6.725461	0.1538	5.4290
EDXBCS	-133.507287	56.283071	0.0199	-10.0755
EDXHEAL	-81.852500	25.491200	0.0019	-9.8344
XSPRDXH	-0.009463	0.004248	0.0285	-0.9743
XSNELXH	0.605849	0.574148	0.2943	0.4664

Model Summary

R^2 = .4959
Adjusted R^2 = .3477
Degrees of Freedom (Error) = 85
Mean Square Error = 25.612

[a]STD EST = Standardized estimate

Table 27

MULTIPAROUS ALL DATA
MODEL ONE EQUATION TWO

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-1864.284226	624.277321	0.0037	0.0000
BCS	166.966724	84.396643	0.0510	7.4990
PLL	0.039924	0.020709	0.0571	0.2062
WT	0.587967	0.426084	0.1711	3.8744
WT2	-0.000905	0.000368	0.0158	-6.8968
HEALTH	134.196198	36.491272	0.0004	9.7838
XSNEL	-0.974284	0.504206	0.0565	-0.9166
XSNEL2	0.037057	0.024584	0.1353	0.7596
XSPROTRD	-0.004006	0.002302	0.0854	-0.4942
XSPTRD2	0.000004	0.000001	0.0013	1.3017
ED	2147.427204	637.758468	0.0011	26.5766
ED2	-626.128200	167.262892	0.0003	-25.3634
ADF	-10.891987	3.143098	0.0008	-5.0514
ADF2	0.321980	0.086037	0.0003	5.7664
CP	-4.950014	10.388677	0.6349	-1.4311
CP2	-0.284190	0.139157	0.0441	-2.8777
DMI	-15.855996	6.764985	0.0213	-7.6596
DMIXWT	0.018326	0.005680	0.0018	6.5181
DMIXED	3.368605	2.739516	0.2221	2.7022
EDXCP	8.899208	6.577058	0.1795	4.9923
EDXBCS	-97.758446	51.326379	0.0601	-7.3776
EDXHEAL	-79.024784	21.386707	0.0004	-9.4947
XSPRDXH	-0.005748	0.002350	0.0164	-0.5918

<u>Model Summary</u>

R^2 = .4729
Adjusted R^2 = .3411
Degrees of Freedom (Error) = 88
Mean Square Error = 25.871

[a]STD EST = Standardized estimate

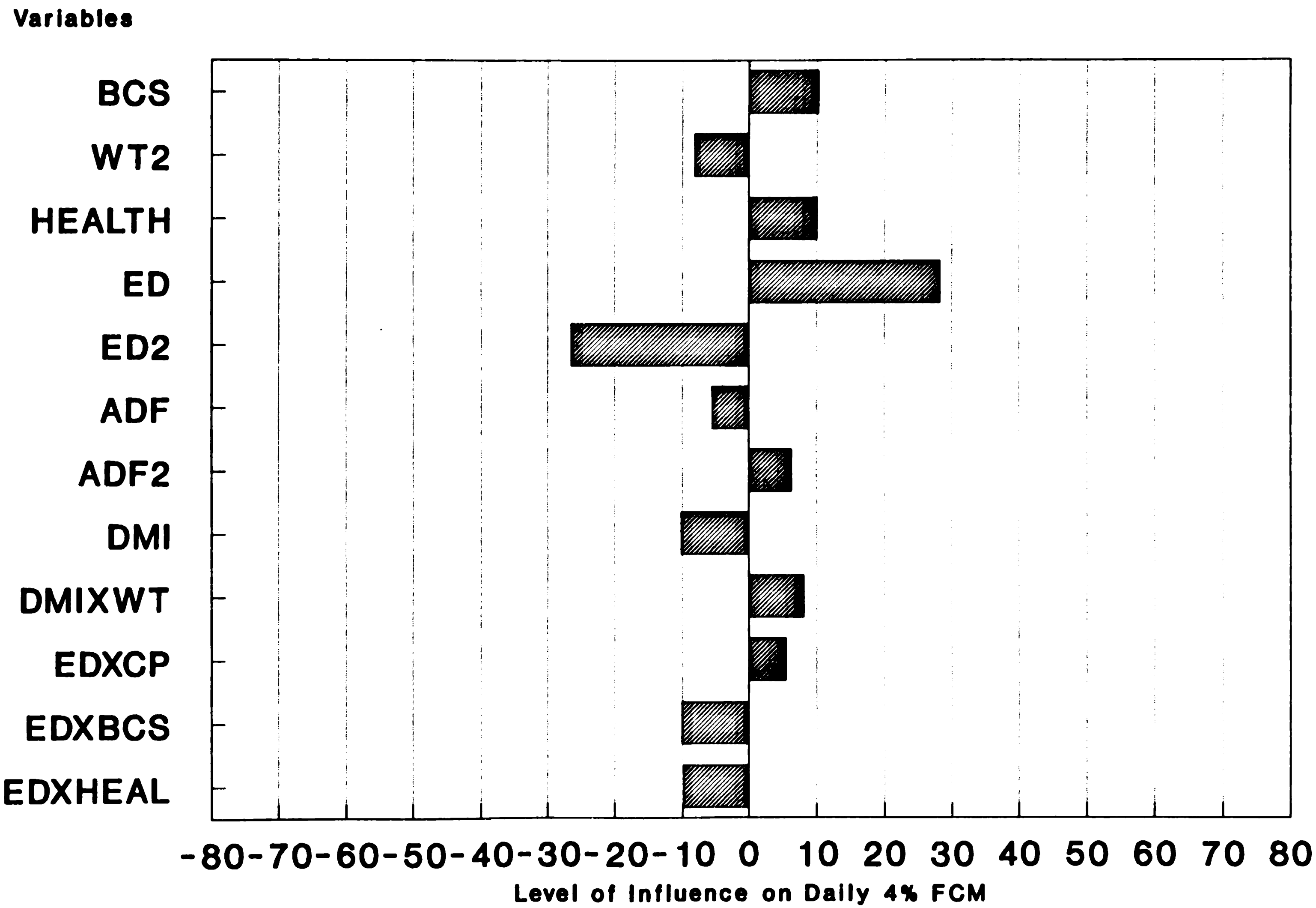

Figure 20: MULTIPAROUS ALL DATA MODEL ONE EQUATION ONE (Table 26).

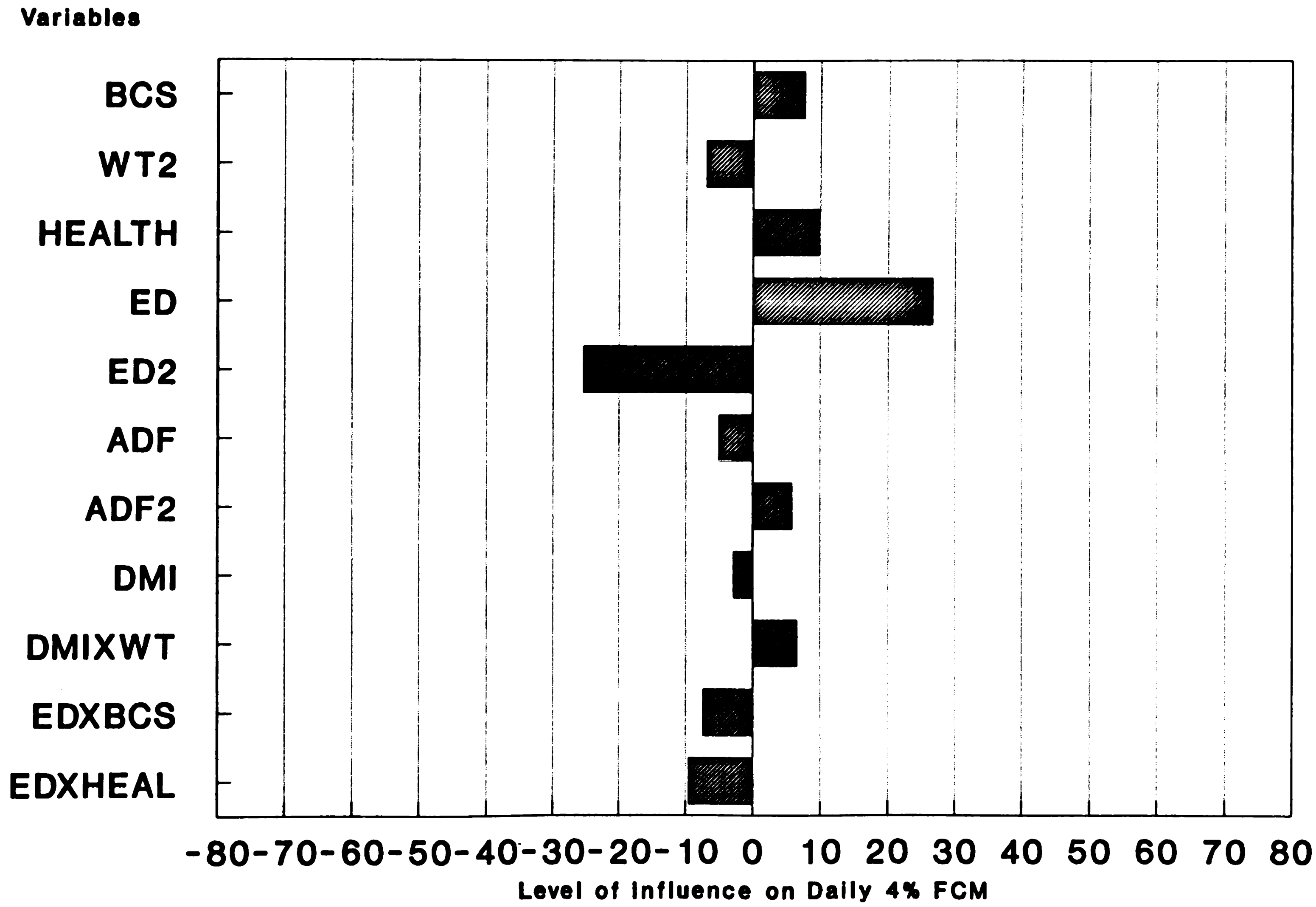

Figure 21: MULTIPAROUS ALL DATA MODEL ONE EQUATION TWO (Table 27).

pressured milk downward while BCS and HEALTH had a moderately clear association with increased production. Variables DMIXWT, EDXCP, and ADF2 had minor, positive influences on production and EDXHEAL, WT2, and ADF level were associated with lower milk.

Model 2 of MAL data regression (Table 28) had no variables of major or moderate influence on production. HEALTH, WT, and the EDXCP interaction displayed minor, positive impacts with EDXHEAL, WT2, DMI, and ED2 having negative results. These variables' low STD EST (Figure 22) help to explain the low R^2 and ADJ^2 of .4188 and .2735 respectively. However, one must be reminded that neither PTAM or SCC were possible variables for either MAL model.

Model and Data Set Discussion

Model 1 displayed the greater ability to account for production variations in all four primiparous (PC, PNG, PNS and PAL) and multiparous (MC, MNG, MNS, and MAL) data sets. This is most likely due to linear, quadratic, and interaction terms of XSNEL and XSPROTRD being significant to model 1 through their respective interactions with HEALTH, although the magnitude of their effect (STD EST) was quite small. This may be due to prepartum feeding interacting with the animal's nutritional and physiological status during the previous lactation. The ability of model 1, needing 25 terms in the MC data set, to account for a large portion of production variation (ADF R^2 of .8361)

Table 28

MULTIPAROUS ALL DATA
MODEL TWO EQUATION ONE

Variable	Parameter Estimate	Standard Error	P Value	STD[a] EST
INTERCEP	-266.073512	375.081474	0.4800	0.0000
BCS	-65.179077	34.173588	0.0597	-2.9274
BCS2	14.706114	6.578525	0.0279	3.4507
DP	-0.344705	0.256016	0.1816	-0.7376
DP2	0.002331	0.001742	0.1844	0.7236
PLL	0.013964	0.021226	0.5123	0.0721
WT	0.963104	0.477235	0.0466	6.3463
WT2	-0.001084	0.000411	0.0099	-8.2602
HEALTH	105.184803	45.046755	0.0218	7.6687
HEALTH2	-4.253510	2.931847	0.1504	-0.4163
XSPROTES	-0.003055	0.003164	0.3370	-0.1438
ED	332.310202	448.197794	0.4604	4.1127
ED2	-154.384406	137.770473	0.2655	-6.2538
ADF	-3.045078	2.570506	0.2394	-1.4122
ADF2	0.115789	0.071706	0.1099	2.0737
CP	-4.900030	10.401372	0.6387	-1.4167
CP2	-0.205989	0.143991	0.1561	-2.0859
DMI	-13.927947	7.798587	0.0776	-6.7282
DMIXWT	0.011661	0.006138	0.0607	4.1477
DMIXED	4.543145	3.101409	0.1465	3.6444
EDXCP	7.412875	6.435038	0.2525	4.1585
EDXHEAL	-60.168859	26.931498	0.0280	-7.2292
XSPESXH	-0.010183	0.006666	0.1302	-0.2824

Model Summary

R^2 = .4188
Adjusted R^2 = .2735
Degrees of Freedom (Error) = 88
Mean Square Error = 28.525

[a]STD EST = Standardized estimate

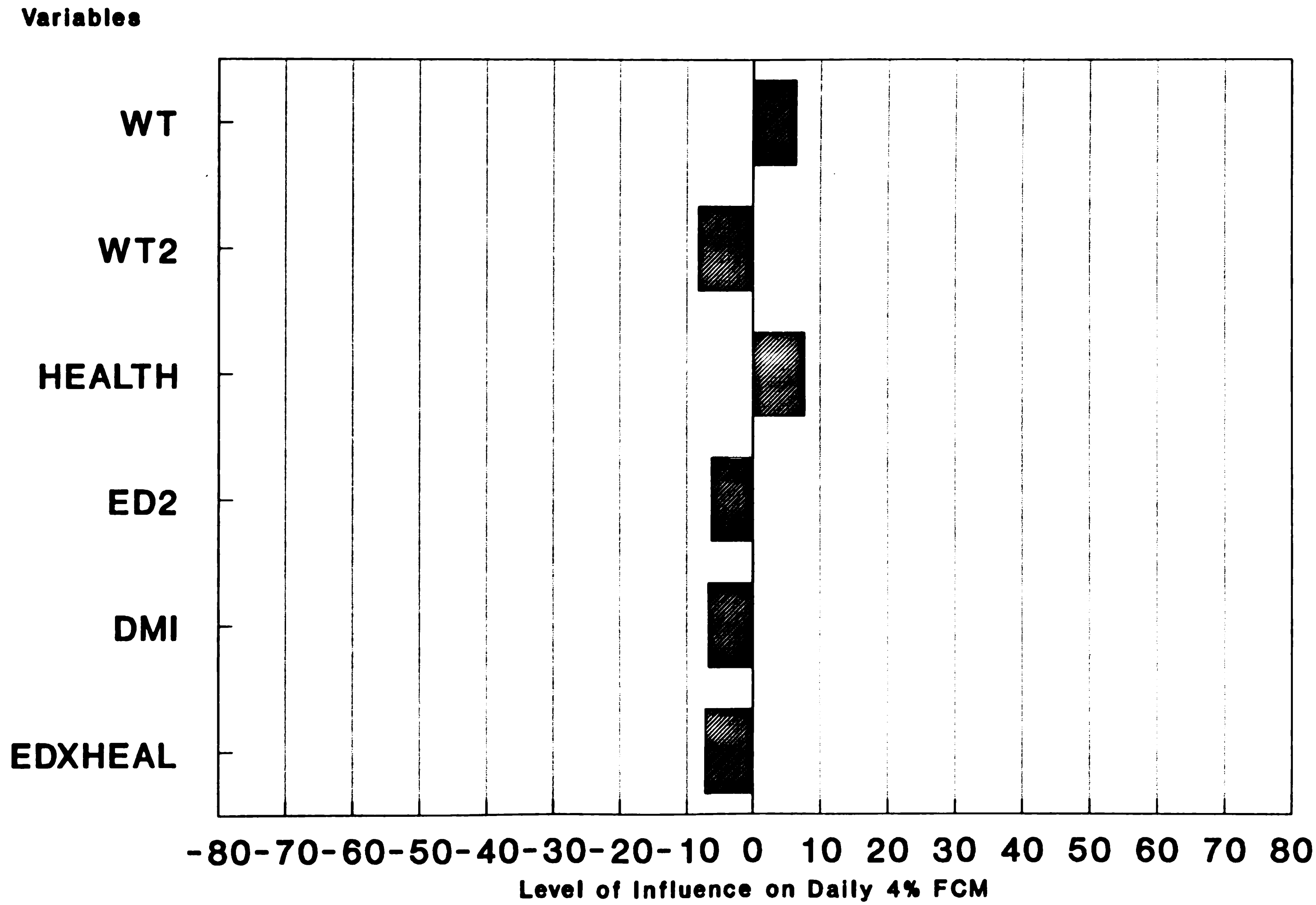

Figure 22: MULTIPAROUS ALL DATA MODEL TWO EQUATION ONE (Table 28).

with a limited data set emphasizes the importance that indeed many factors influence production.

Excluding PTAM from regressions of the PNG data set did not diminish, but enhanced, the ability of model 1 and model 2 to account for production differences. One should not conclude, however, that variations in PTAM do not cause differences in total lactation milk yield or that genetic level is not important to lifetime production levels. This is evident from exclusion of PTAM from multiparous animal regression models resulting in R^2 values being reduced by half. PTAM was significantly higher for high producing herds (Tables 3, 10, 16, and 25) and improved production potential does result from selection of parents with a higher genetic level (Betrand et al., 1985). The common practice of using natural herd sires, particularly in large herds, may be limiting production response to other management strategies.

PNS and MNS models achieved R^2 values near those of the complete data sets (PC and MC). Mastitis is known to reduce production (Jones et al., 1984; Blosser, 1979; and Fetrow et al., 1988). The inability of this study to demonstrate the effect of higher SCC reducing milk output is probably due to the limited number of animals used from each herd and the fact that any differences in SCC are more likely to be detected in multiparous animals (Morse et al., 1988).

The combining of data sets did not result in any increase in R^2 for model 1 or model 2 and was in fact lower than for any single data, but progress was made in ADJ R^2 compared to some data sets. Combining data sets gave little or no reduction in mean square error (MSE) for primiparous and increased MSE for multiparous animals. The possibility does exist that variables of importance could have been excluded from original data sets or interactions of significant influence were not included in original models.

Primiparous Discussion - variables unique to primiparous data sets

1. Withers Height

All line graphs used variable information from the regression model which included reported prepartum intakes (Model 1), except for Figure 23 which used information from the model which estimated prepartum intake (Model 2) (Table 2). The lines were generated using the following formula:

$$Y = B_o + B_1x + B_2x^2$$

where Y = predicted variable value (daily 4% FCM)

B_o = intercept

B_1 = coefficient for linear effect of variable x

B_2 = coefficient for quadratic effect of variable x

For example, in Figure 23, using Table 2 information for withers height (WH) and its quadratic term (WH2), line PC2

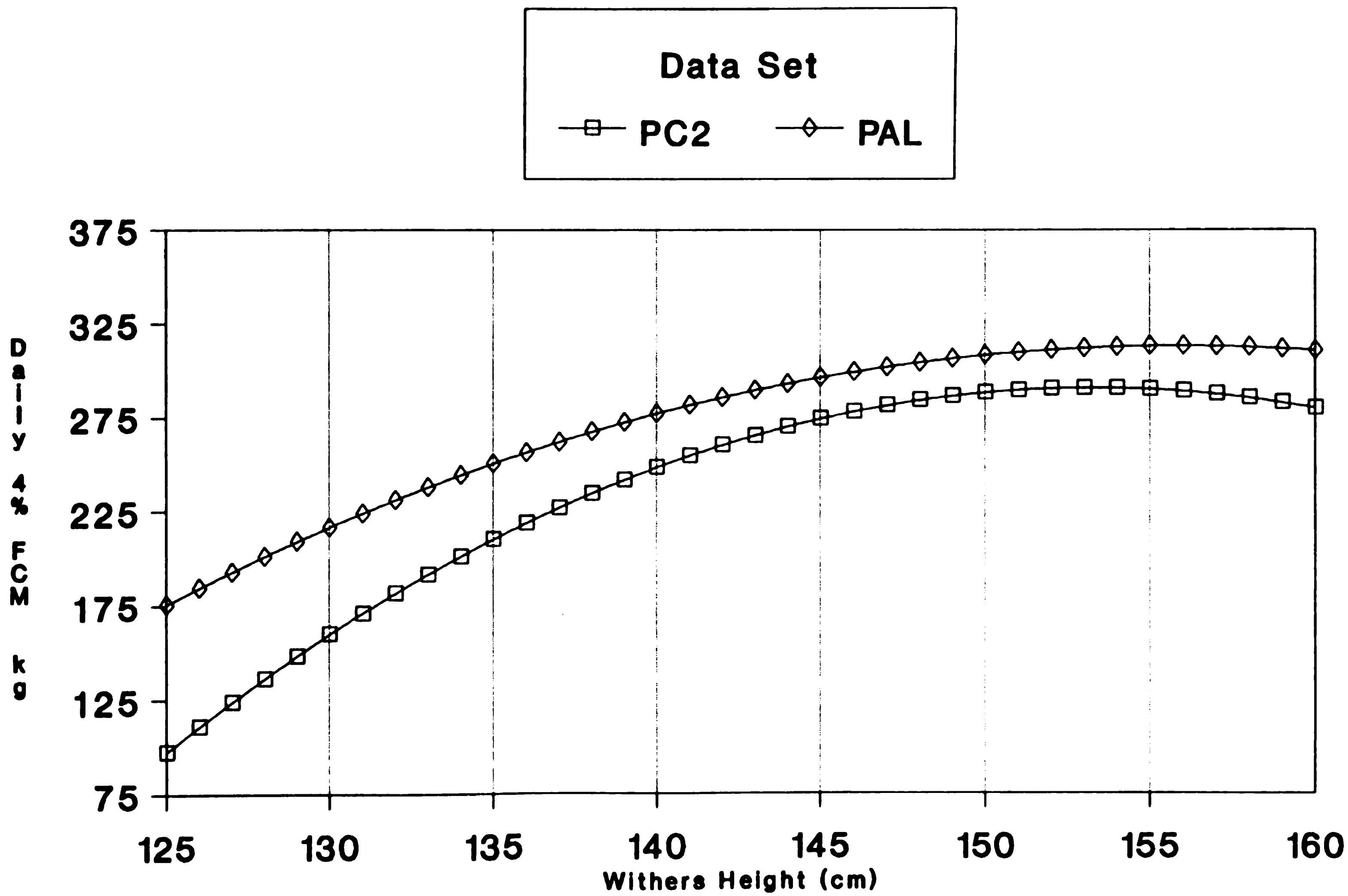

Figure 23: PRIMIPAROUS MILK BY WITHERS HEIGHT (Tables 2 & 11).

was generated using 74.187545 and -0.242013 for B_1 and B_2 respectively with "x" (WH) values spanning the data range for this study. The reader should keep in mind that Y axes are consistent in magnitude within variables but not between.

Means were significantly greater (Tables 3 and 10; $P < .10$ and $.05$ respectively) for large herds but no significant differences were found between high and low producing herds. Withers height (WH) was significantly, positively correlated to body weight (BW) in 2 data sets (Appendix Tables 12 and 20) with values of .6029 and .5890 respectively. Withers height (WH), when retained in the model, had a major, positive influence on production (Figures 2-9). Its quadratic term (WH2) had a major or moderate, negative influence (Figures 2-9). Furthermore, withers height (WH) and its quadratic term (WH2) were highly significant to the model at $P < .05$ (Tables 2,4,5,7,8,9,11,12) or $P < .10$ for the quadratic term (WH2) (Tables 8 and 9).

Daily 4% FCM increases as withers height increases but at a decreasing rate (Figures 23 and 24). Using the parameter estimates (Tables 2, 4, 7, and 11), withers height (WH) values which optimized production ranged from 148.4 to 171.2 cm (58.4 - 67.4 in), well above the current recommended measure of 134.6 cm (Raising Dairy Heifers, 1987). However, a precise estimate of withers height to

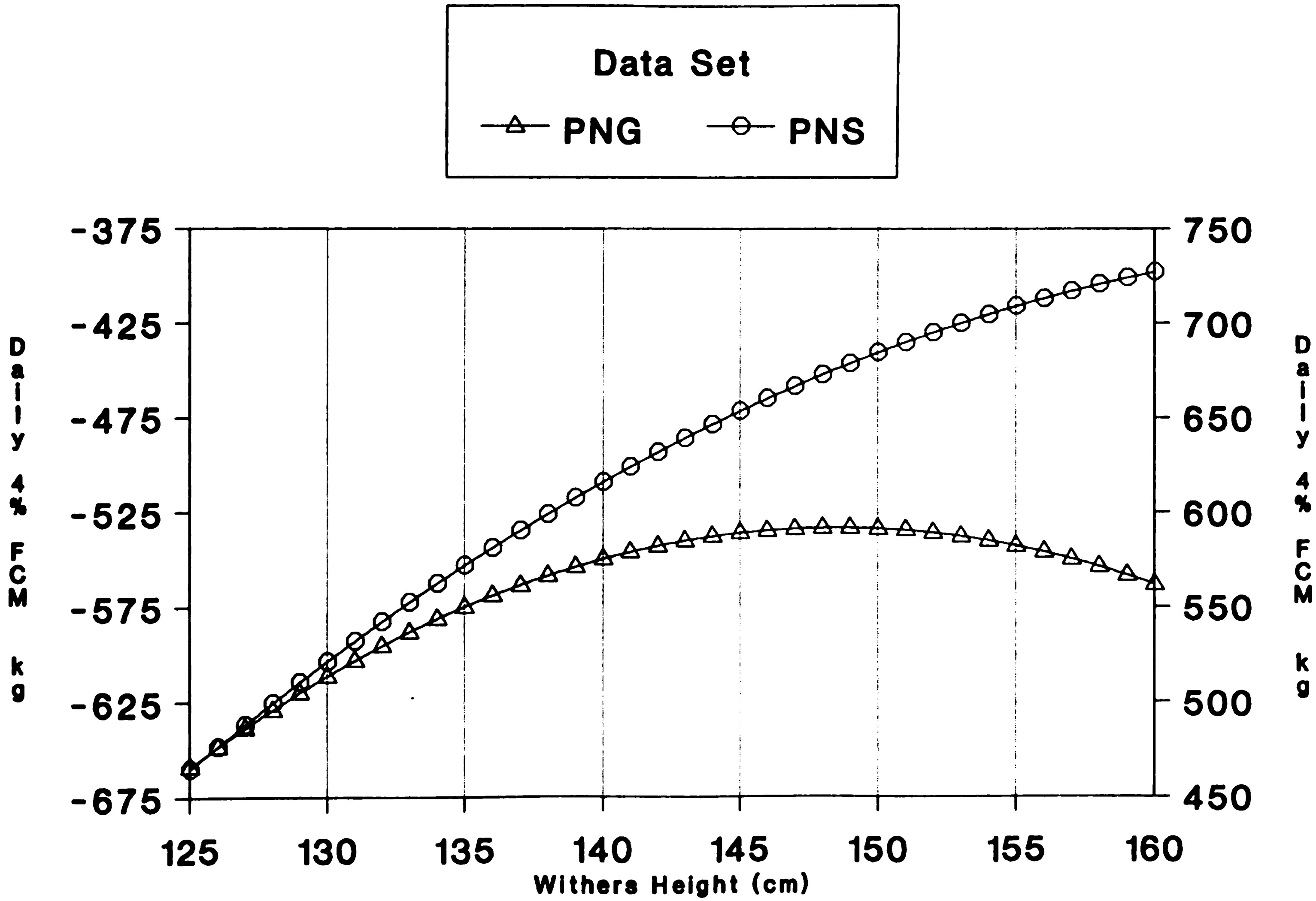

Figure 24: PRIMIPAROUS MILK BY WITHERS HEIGHT (Tables 4 & 7).

maximize production cannot be determined from this study due to a large STD DEV for the variable.

That withers height (WH) was significantly higher for small herds in the primiparous complete (PC) and no SCC (PNS) data sets and trended towards greater values for high producing herds, suggests limitations in heifer raising programs for large and low producing herds being, singly or in combination, inadequate nutrition, housing, or health care.

Much research exists supporting larger body measures of animals being positively correlated with production (Donker _et al_., 1983; Lin _et al_., 1985; and Lin _et al_., 1987). The work of Sieber _et al_. (1988), however, would support the concept that the taller animals would have enhanced producing ability but further stipulate them to have larger paunches but smaller heart girth measures.

2. _Age_

There were no measurable differences in age at first calving (AGE) for high and low producing herds. Animals in larger herds did have a tendency to initiate their first lactation at an earlier age for primiparous complete (PC) and no SCC (PNS) data sets. However, for the largest single data set, which excluded genetics (PNG), there was no difference in ages between herd size. The overall average age at calving, of approximately 26 months for each data set (Tables 3, 6, and 10), was 2.5-3.5 months older than the optimum reported by Gill and Allaire (1976).

Age at parturition (AGE) and its quadratic term (AGE2) were of minor, negative and minor, positive influence respectively on daily 4% FCM (Figures 1 and 5). Age (AGE) and its quadratic term (AGE2) were significant at $P < .05$ (Table 1) and $P < .10$ (Table 7). Figure 25 displays increasing production with age. Production is minimized in this study with age at 23.5 months (Table 1). However, it is more likely a function of body weight which at a given age is influenced by feeding management. Increases in production as reported by Miller and McGilliard (1959) and Lin et al. (1988) were for animals within the same management strategies.

Primiparous animals in large herds having lower BCS, body weight (WT), and withers height (WH) is undoubtedly related to their younger calving age (AGE). However, these results may indicate that large herds are not taking full advantage of the potential to group and feed heifers to enhance growth.

Multiparous Discussion - variables unique to multiparous data sets

1. Dry Period Length

Dry period length (DP) and its quadratic term (DP2) had minor, negative and positive influences respectively (Figures 10 and 11) on production. However, the dry period variables (DP,DP2) were significant at the $P < .05$ (Tables 13, 14, 18, 23, and 24) and P approaching .10 (Table 28).

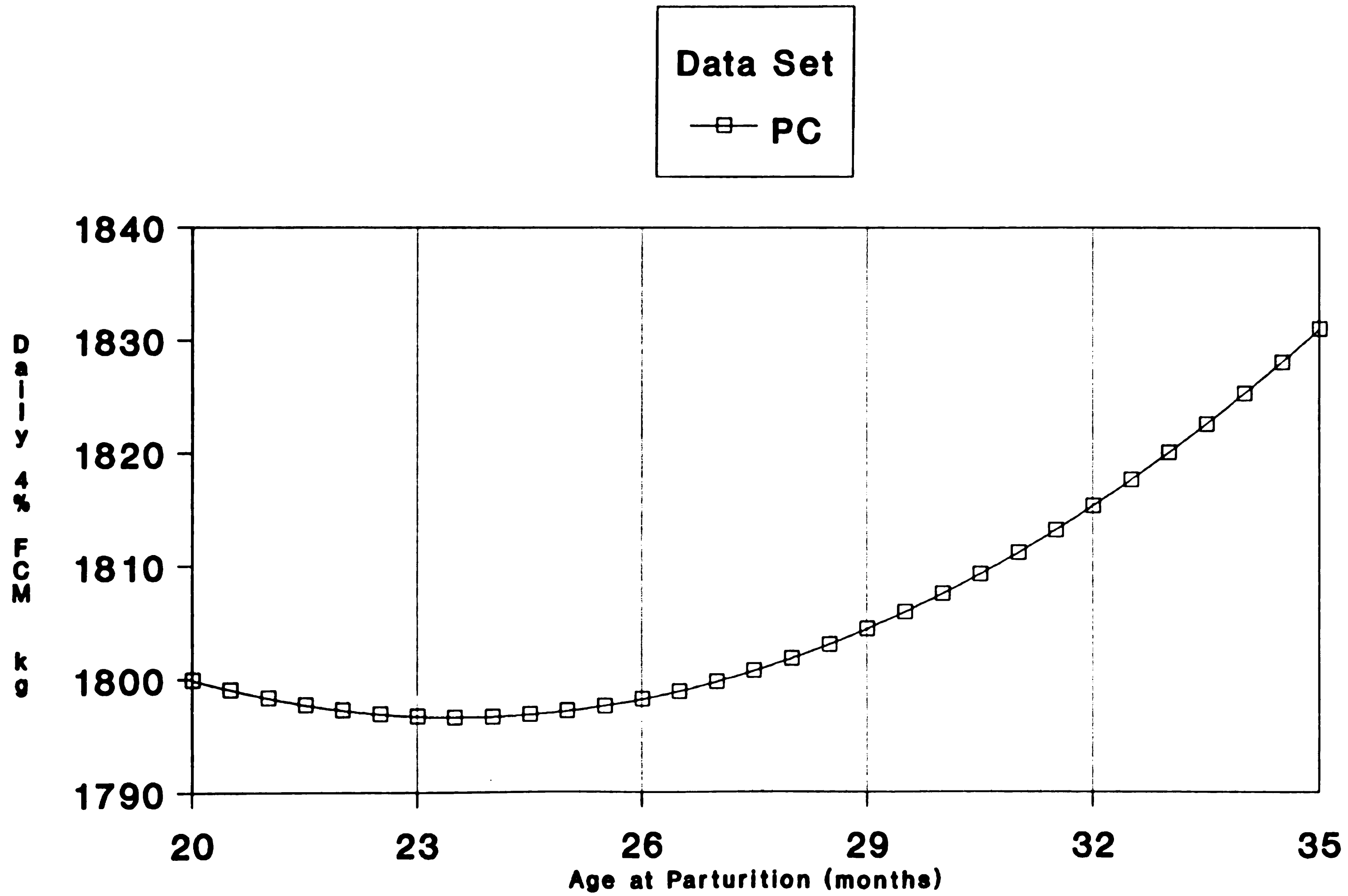

Figure 25: PRIMIPAROUS MILK BY AGE AT PARTURITION (Table 1).

In the no SCC (MNS) data set, large and high producing herds neared significance with shorter dry periods (DP) (Table 25). Production was minimized when dry periods were at 72.3 (Table 13) and 57.3 days (Table 26) but maximized at 5.69 days (Table 22). Graphs (Figures 26 and 27) clearly demonstrated the inconsistency of influence for dry period on production.

Overall means (Tables 16, 21, and 25) for dry period length (DP) showed values near the recommended 60 days (Funk <u>et al</u>., 1987; Schaeffer and Henderson, 1972; and Keown and Everett, 1986). High producing herds in the complete data set (MC) tended to have shorter dry periods (DP) as did large and high herds in the data set excluding SCC (MNS). Some long dry periods of given herds were a result of nonexistent or inadequate breeding records to aid decisions of a dry off date.

2. <u>Previous Lactation Length</u>

Previous lactation length (PLL) and its quadratic term (PLL2) had minor, negative and positive influences (Figures 15 and 16). Previous lactation length (PLL) was significant at $P < .05$ (Table 28), $P < .10$ (Tables 26 and 27), and approached significance for the linear (PLL) and quadratic (PLL2) terms (Tables 19 and 20). There were no significant differences by herd size or production level in previous lactation length (PLL). Production was minimized when the previous lactation was 335.8 days long (Table 17) and is portrayed in Figure 28. Low producing herds in

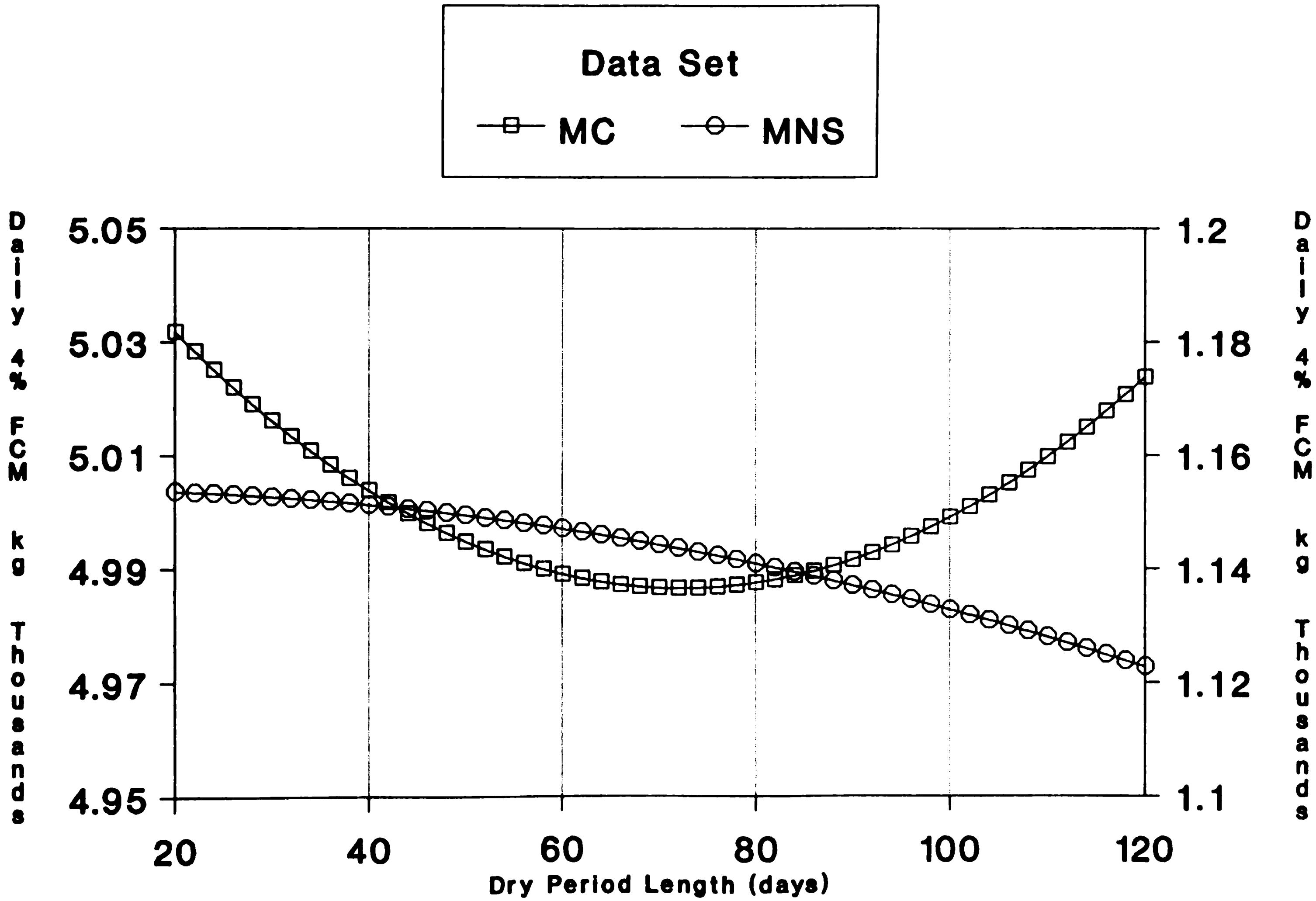

Figure 26: MULTIPAROUS MILK BY DRY PERIOD LENGTH (Tables 13 & 22).

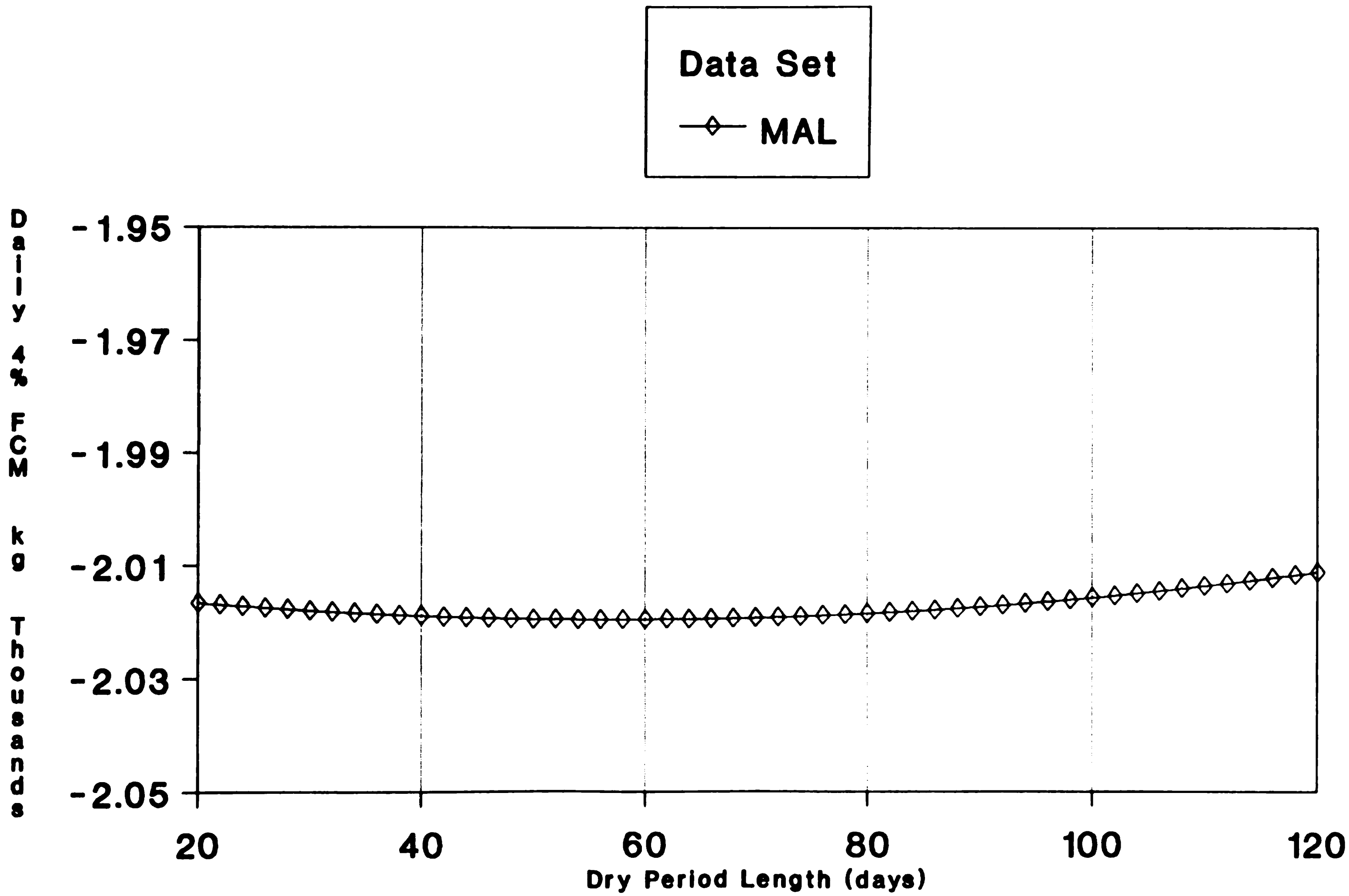

Figure 27: MULTIPAROUS MILK BY DRY PERIOD LENGTH (Table 26).

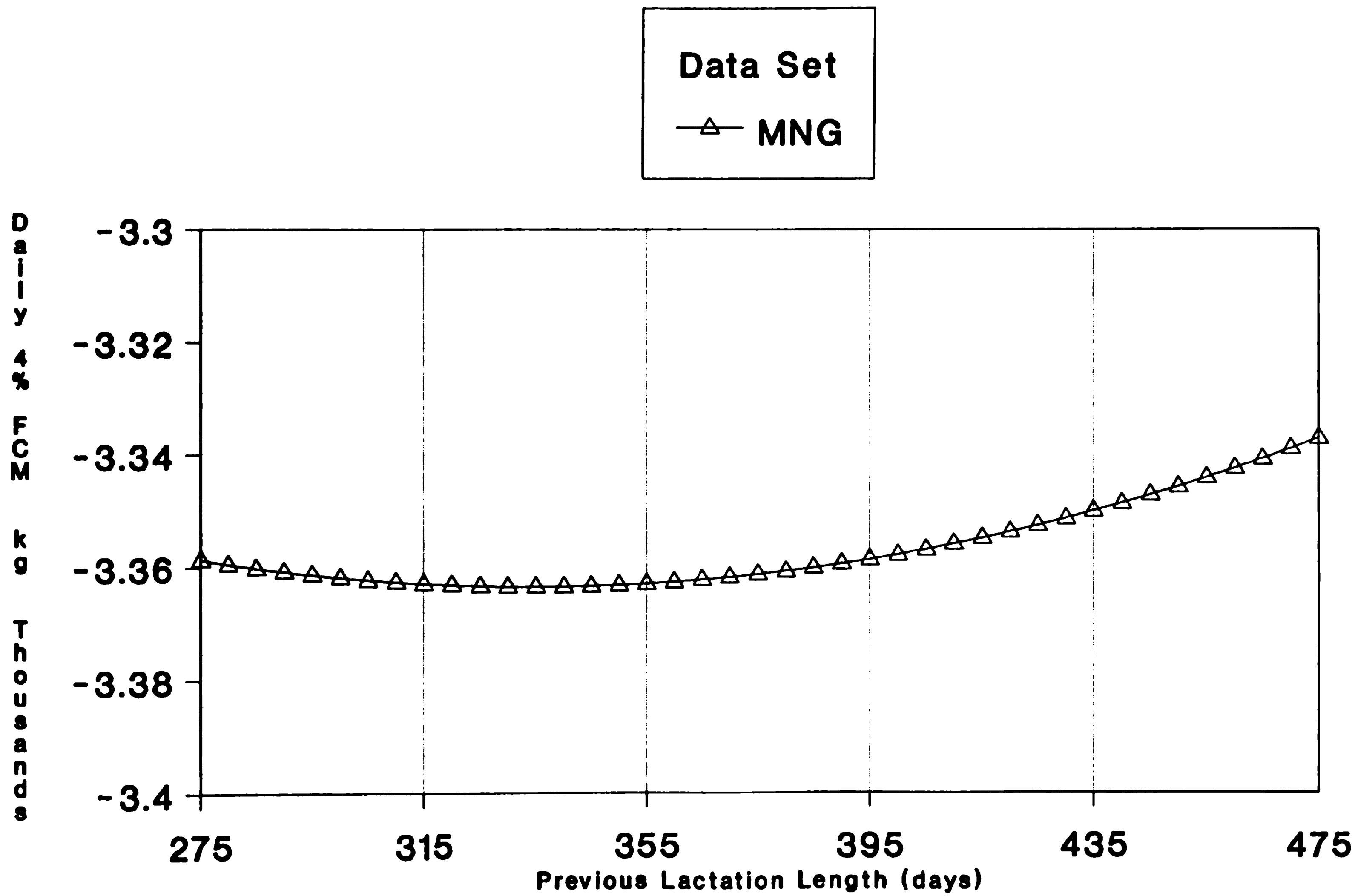

Figure 28: MULTIPAROUS MILK BY PREVIOUS LACTATION LENGTH (Table 17).

the data set excluding genetics (MNG) tended to have longer previous lactation lengths (PLL) than high herds, suggesting poor reproductive management for these animals in the previous lactation. Summing the overall dry periods (DP) and previous lactation lengths (PLL) mean values (Tables 16, 21, and 25) would suggest most herds were within the target of a 13 month CI (Holman, 1984; Schmidt, 1989). However, the large standard deviation values indicate long CI should be a concern for some herds. The tendency for larger herds to have a longer previous lactation length (PLL) might suggest management problems in heat detection and/or reproductive health.

General Discussion

1. Production

A highly significant, 6 kg advantage for multiparous animals was found for 4% FCM level in high herds in all data sets (MC, MNG, and MNS) (Tables 16, 21, and 25). Primiparous animals mean differences were smaller (2.5 kg) but still of significance for data sets excluding genetics (PNG) (Table 6) and excluding SCC (PNS) (Table 10) and approached significance for the complete data set (PC) (Table 3). No production differences were found between large and small herds.

2. Genetic Level

Neither sire genetic level for milk (PTAM) nor its quadratic term (PTAM2) had a great amount of influence on production. While genetic level (PTAM) only approached significance for primiparous animals in two models (Tables 1 and 7) and multiparous animals in three (Tables 22, 23, and 24) its quadratic term (PTAM2) was highly significant ($P < .05$) in several (Tables 13, 14, 22, 23, and 24). Genetic level (PTAM) was significantly ($P < .10$) greater for primiparous (Tables 3 and 10) and multiparous (Tables 16 and 25) animals in high producing herds. The shapes of Figures 29 and 30 demonstrate some herds with low genetic potential (PTAM) indeed have greater production than others with greater potential. Indeed management can achieve a certain level of production but only up to genetic potential. Sire genetic level (PTAM) did interact with health score (HEALTH) to influence production negatively and positively respectively for primiparous (Figure 31) and multiparous (Figure 32) animals as the variables increased. This interaction (PTXHEAL) was significant for primiparous animals at $P < .10$ (Table 7) and at $P < .05$ (Tables 13 and 22) for multiparous animals. The effect of the genetic level and health interaction may be more related to nutrition than production level.

3. Animal Measures

Body Condition

Larger herds had respective significantly lower BCS of $P < .10$ and .05 in parity groups which excluded genetics (PNG and MNG) (Tables 6 and 21). BCS was positively correlated (.57-.60) with prepartum protein intake

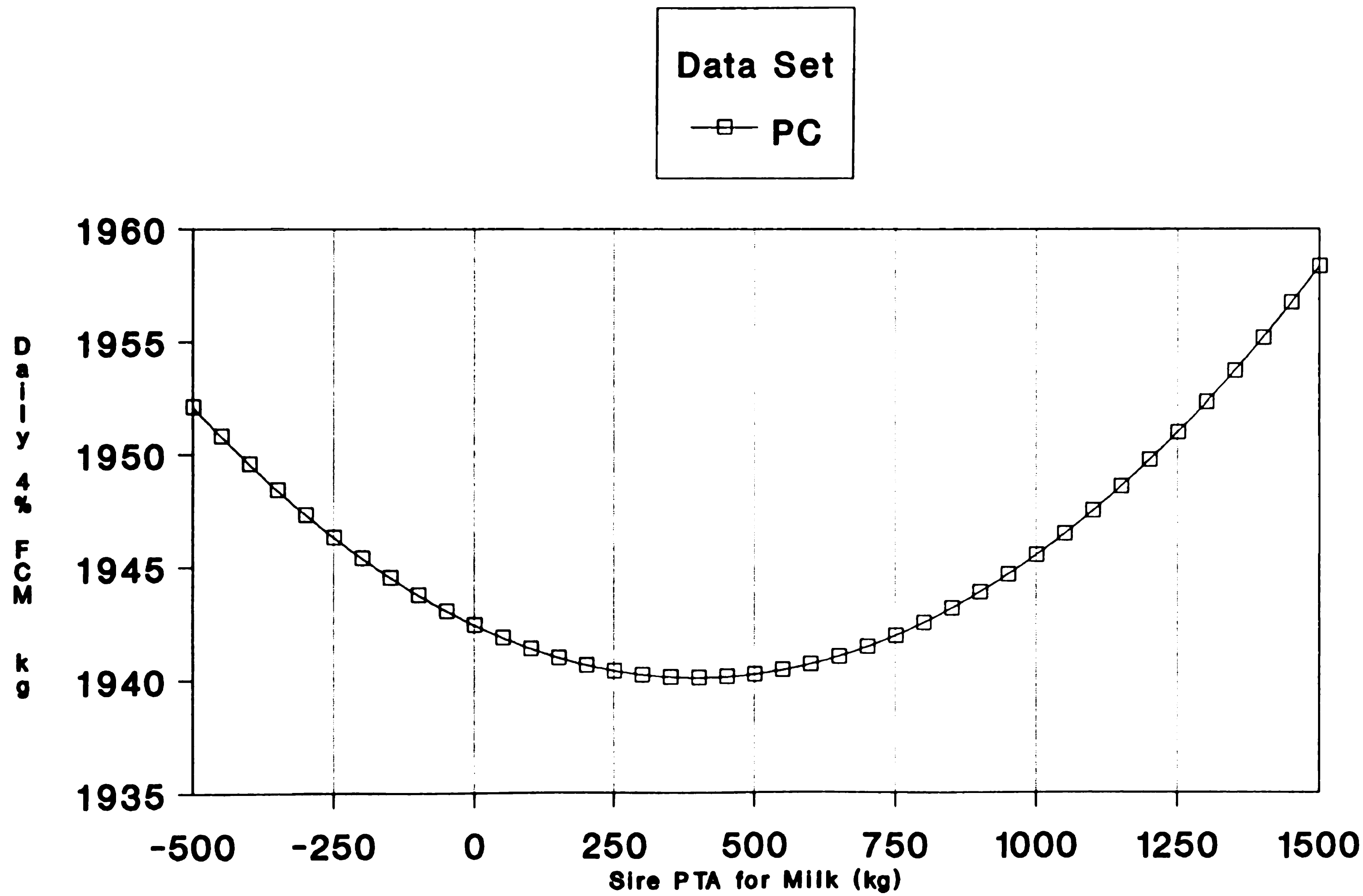

Figure 29: PRIMIPAROUS MILK BY SIRE PTA FOR MILK (Table 1).

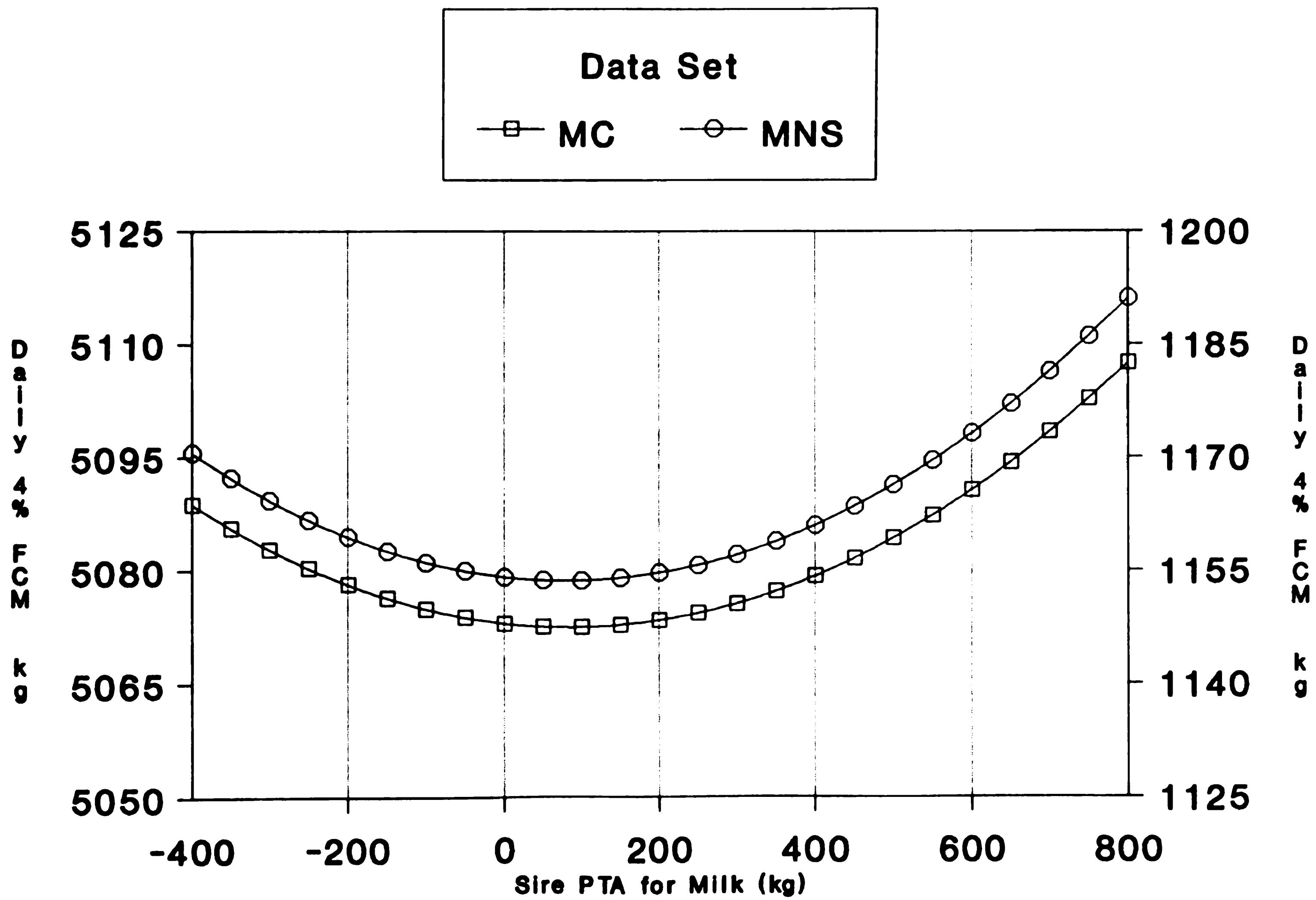

Figure 30: MULTIPAROUS BY SIRE PTA FOR MILK (Tables 13 & 22).

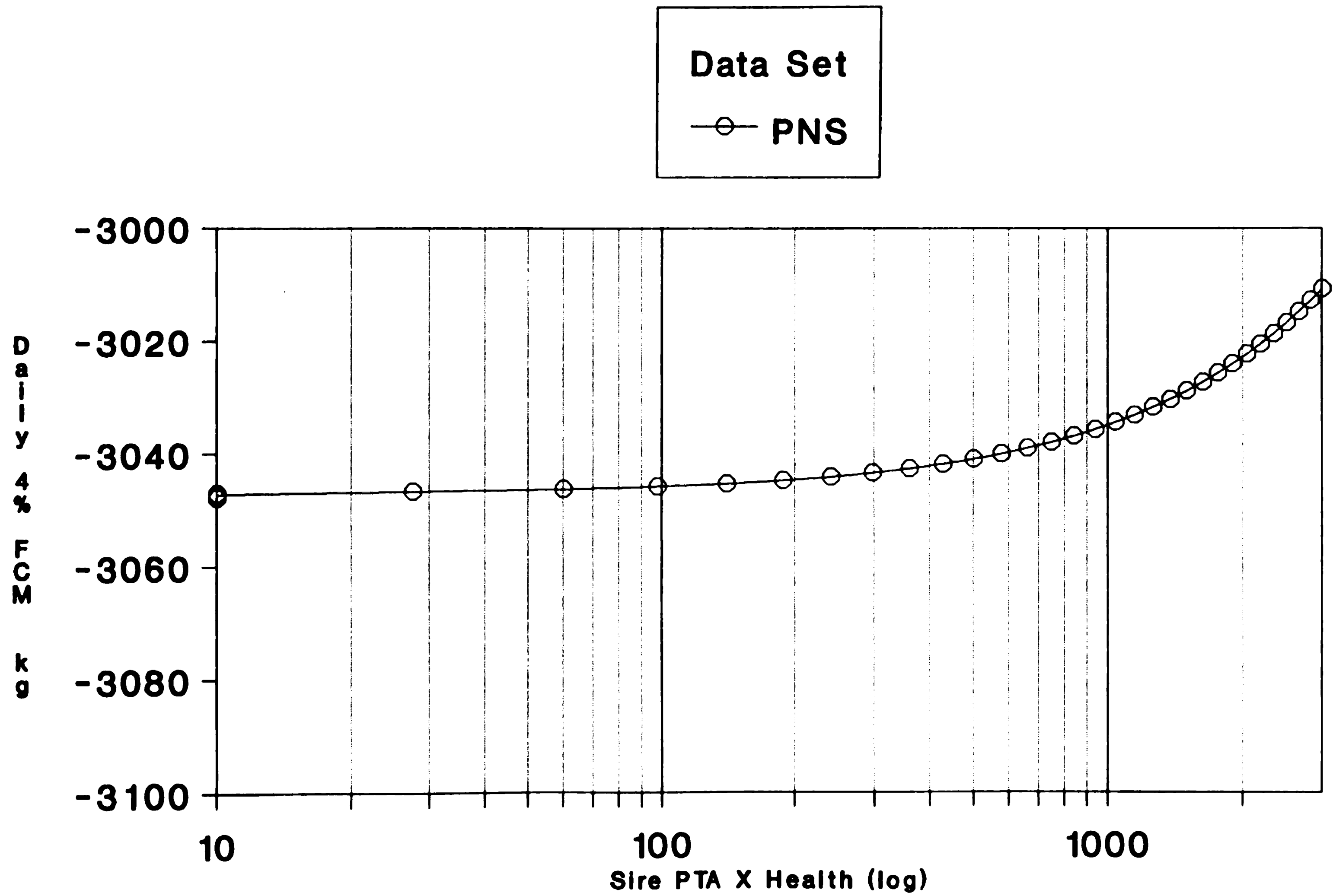

Figure 31: PRIMIPAROUS MILK BY SIRE PTA AND HEALTH (Table 7).

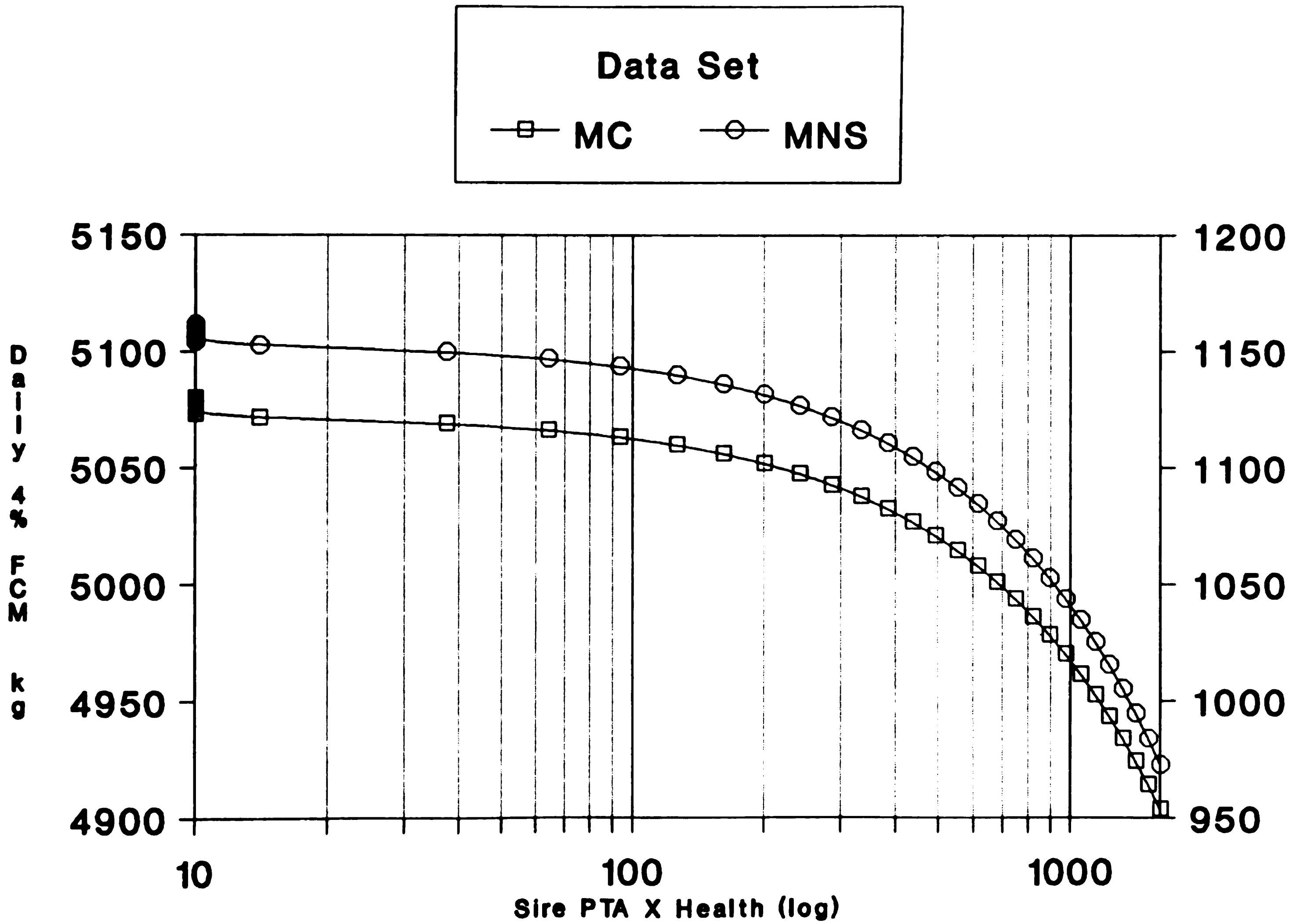

Figure 32: PRIMIPAROUS MILK BY SIRE PTA AND HEALTH (Tables 13 & 22).

(XSPROTRD) but only for multiparous animals (Appendix Tables 16, 21, and 25).

Body condition score (BCS) always influenced production negatively for primiparous animals but at major (Figure 1), moderate (Figure 5), and minor (Figure 7 and 8) levels. For multiparous models, influence was major (Figure 14) and moderately, negative (Figure 17), as well as moderately (Figures 13 and 20) and minorly, positive (Figure 21). The quadratic term (BCS2) influenced production positively but at a minor level (Figure 1). BCS was significant to primiparous and multiparous models at P < .05 (Tables 1, 8, 11, 12, 13, 18, 23, 24, and 26), P < .10 (Tables 3, 7, 22, 27, and 28) and approached significance in others (Tables 2, 14, and 17). The quadratic term (BCS2) was significant (P < .05) in one model each for primiparous and multiparous animals (Tables 1 and 28 respectively) and approached significance for one other model for each (Tables 4 and 20). Figures 33-35 display the negative influence of greater BCS on production in three of four models plotted.

Lower BCS scores were associated with increased production which parallels reports from Coppock (1985) of early lactation animals using body reserves to meet energy needs of high production. These results are not consistent with those of Garnsworthy and Jones (1987) which suggest higher BCS animals produce more. However, the higher BCS reported by low producing herds must be kept in the

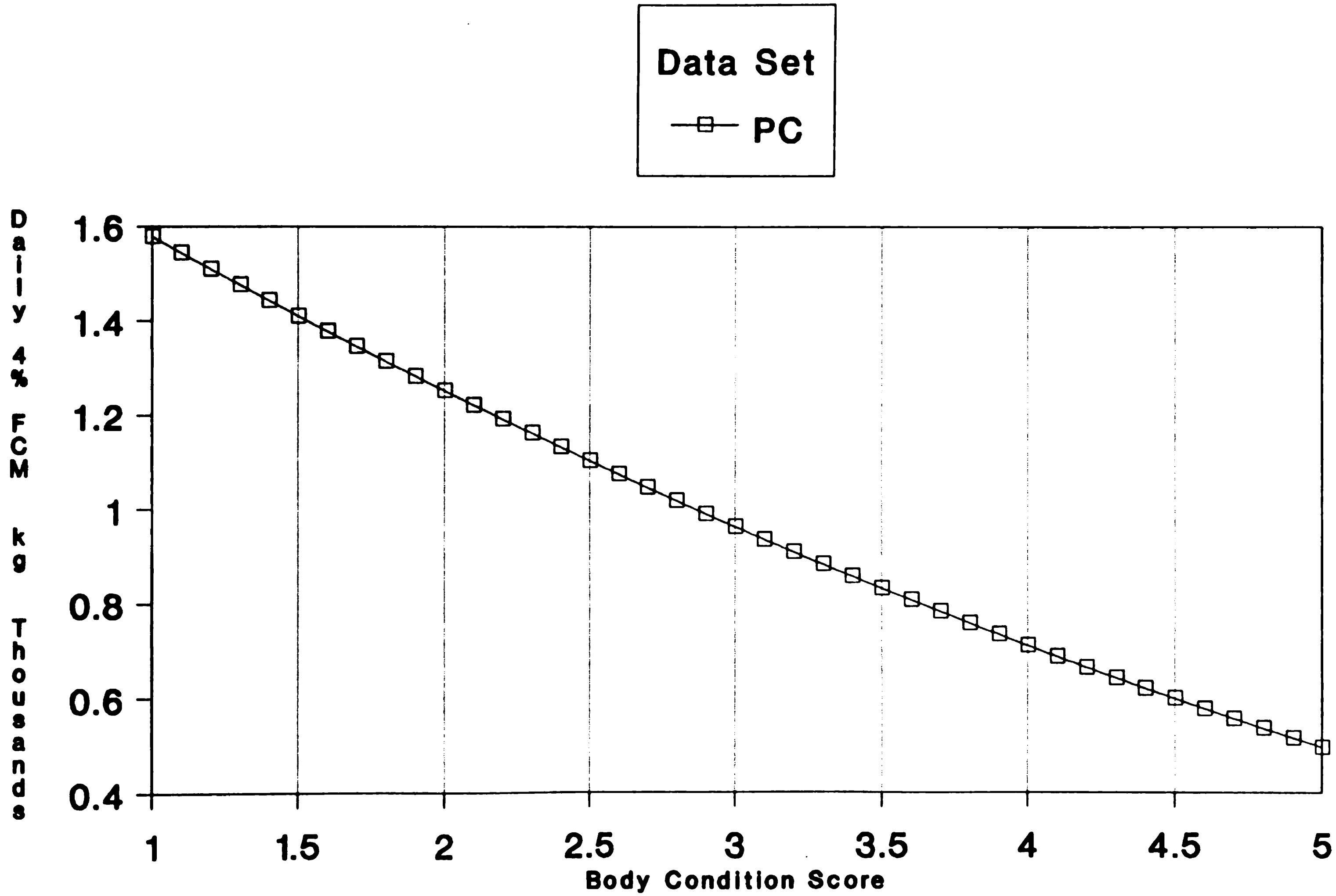

Figure 33: PRIMIPAROUS MILK BY BODY CONDITION SCORE (Table 1).

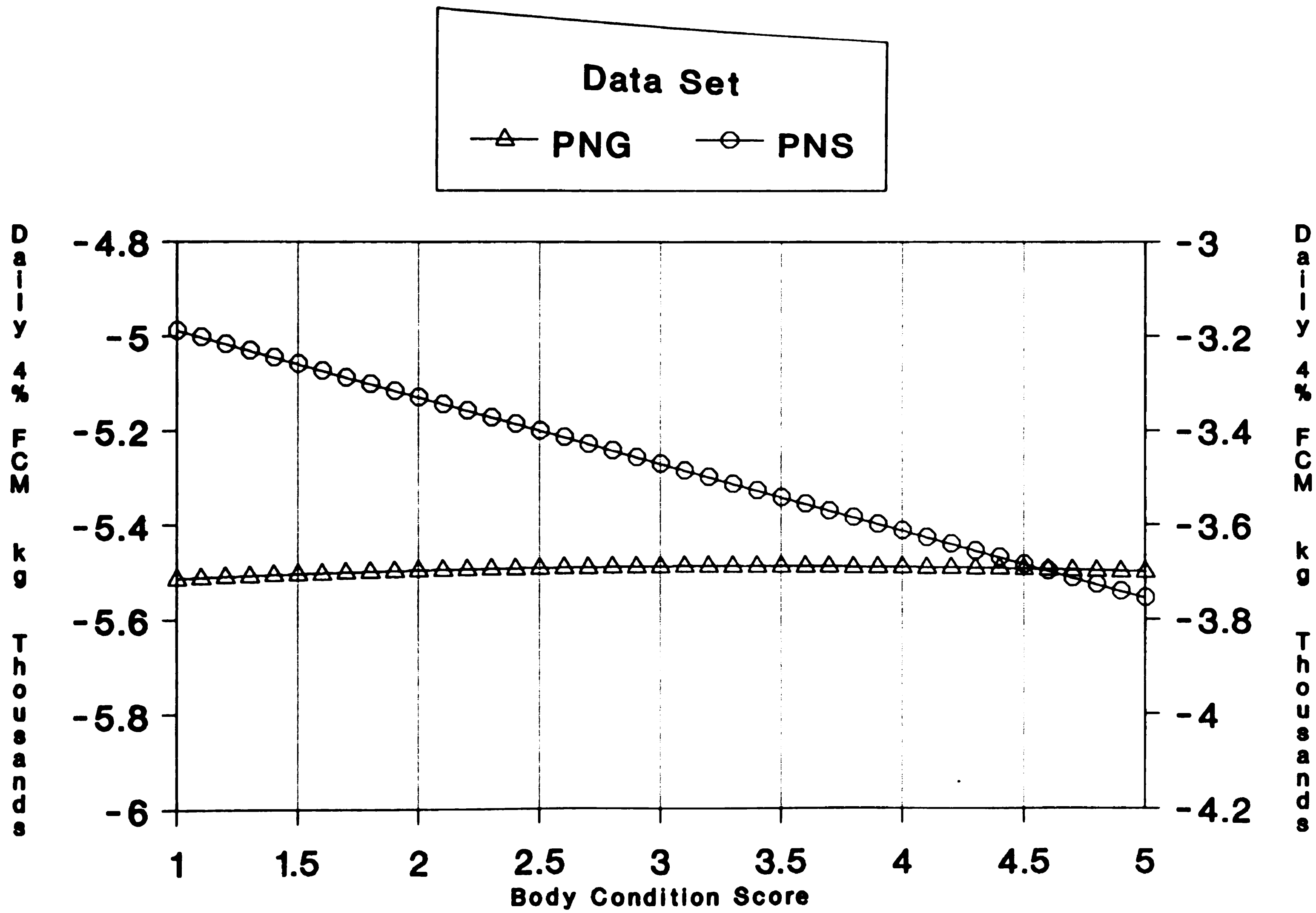

Figure 34: PRIMIPAROUS MILK BY BODY CONDITION SCORE (Tables 4 & 7).

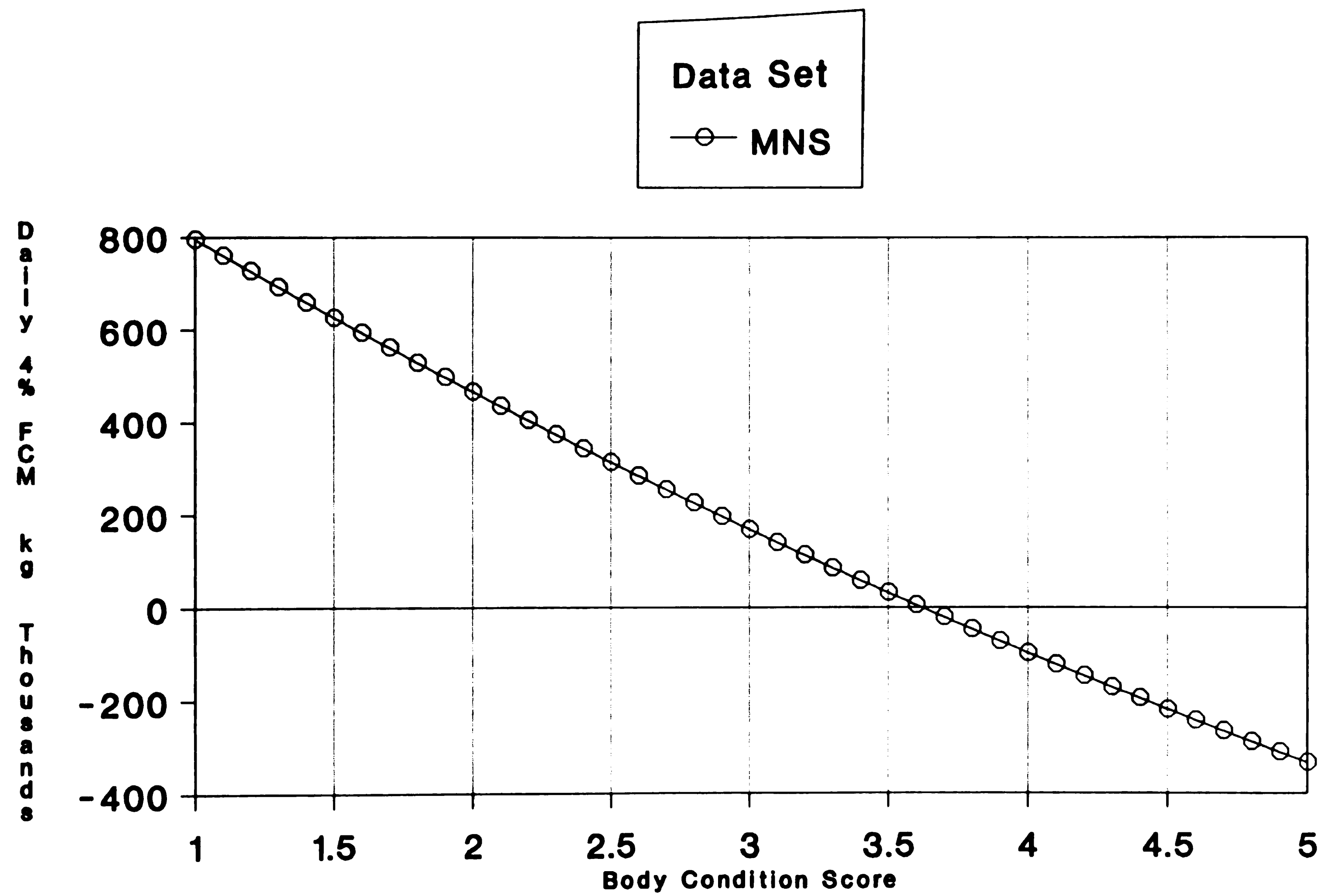

Figure 35: MULTIPAROUS MILK BY BODY CONDITION SCORE (Table 22).

perspective that these animals did not need to remove as much energy from body stores to support their lower level of production (Ruvuna et al., 1986; and Upham et al., 1989). Furthermore, BCS was measured in this study after parturition, not prepartum. Certainly BCS is of importance to production as shown by Patton (1989) and Bayley and Heizer (1952). Producers should therefore manage animal body condition to maximize lactational milk yield.

Body Weight

Body weight (WT) and its quadratic term (WH2) each had minor (Figure 5) and moderate, negative (Figure 1) influences on production but only in these two models. Multiparous animals had production positively influenced by body weight (WT) at moderate (Figures 17, 19, and 22) and minor (Figures 11 and 22) levels while the quadratic term (WT2) influenced production negatively at moderate (Figures 10, 11, 17, 18, and 19), and minor (Figures 12, 20, 21, and 22) levels. Body weight (WT) was significant to primiparous models at $P < .05$ (Tables 5, 7, 8, 9, 11, and 12) and its quadratic term (WT2) in one model (Table 1). The significance of body weight varied for multiparous models with $P < .05$ (Tables 22, 23, 24, and 28), $P < .10$ (Tables 18 and 26), and approaching significance (Table 27). The quadratic term (WT2) for multiparous was significant at $P < .05$ in several models (Tables 13, 14, 22, 23, 24, 26, 27, and 28). Figures 36-38 illustrate the

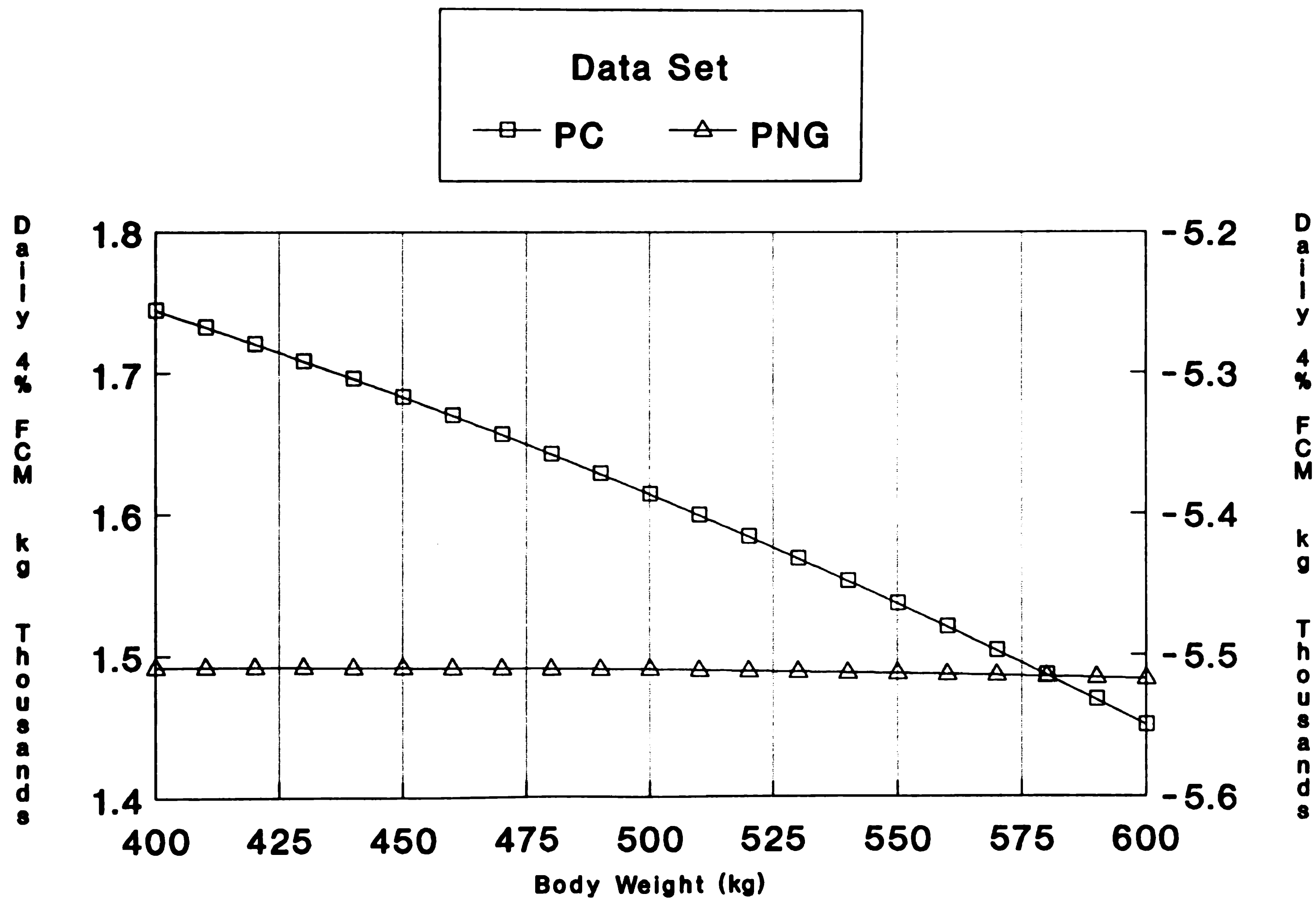

Figure 36: PRIMIPAROUS MILK BY BODY WEIGHT (Tables 1 & 4).

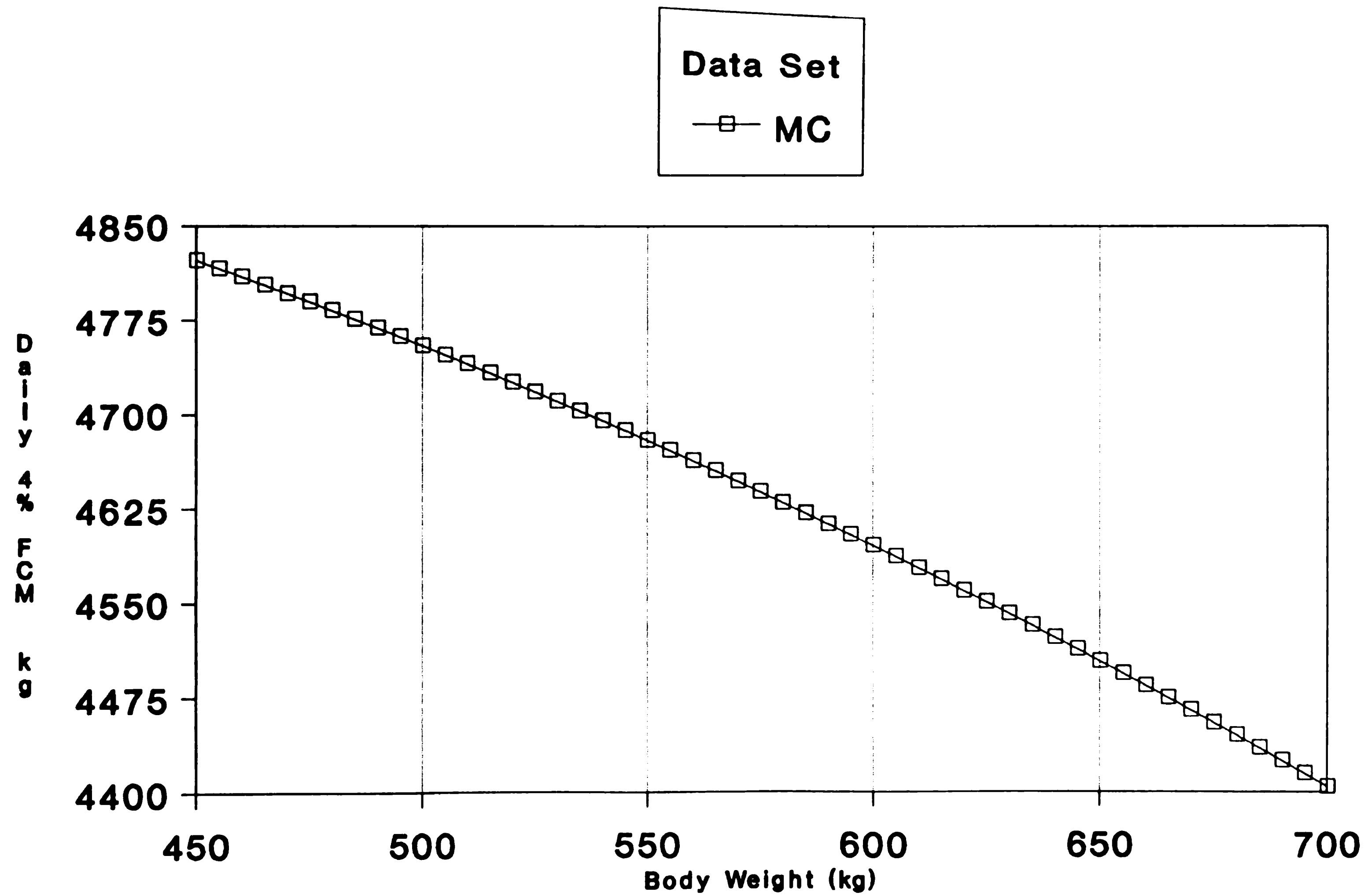

Figure 37: MULTIPAROUS MILK BY BODY WEIGHT (Table 13).

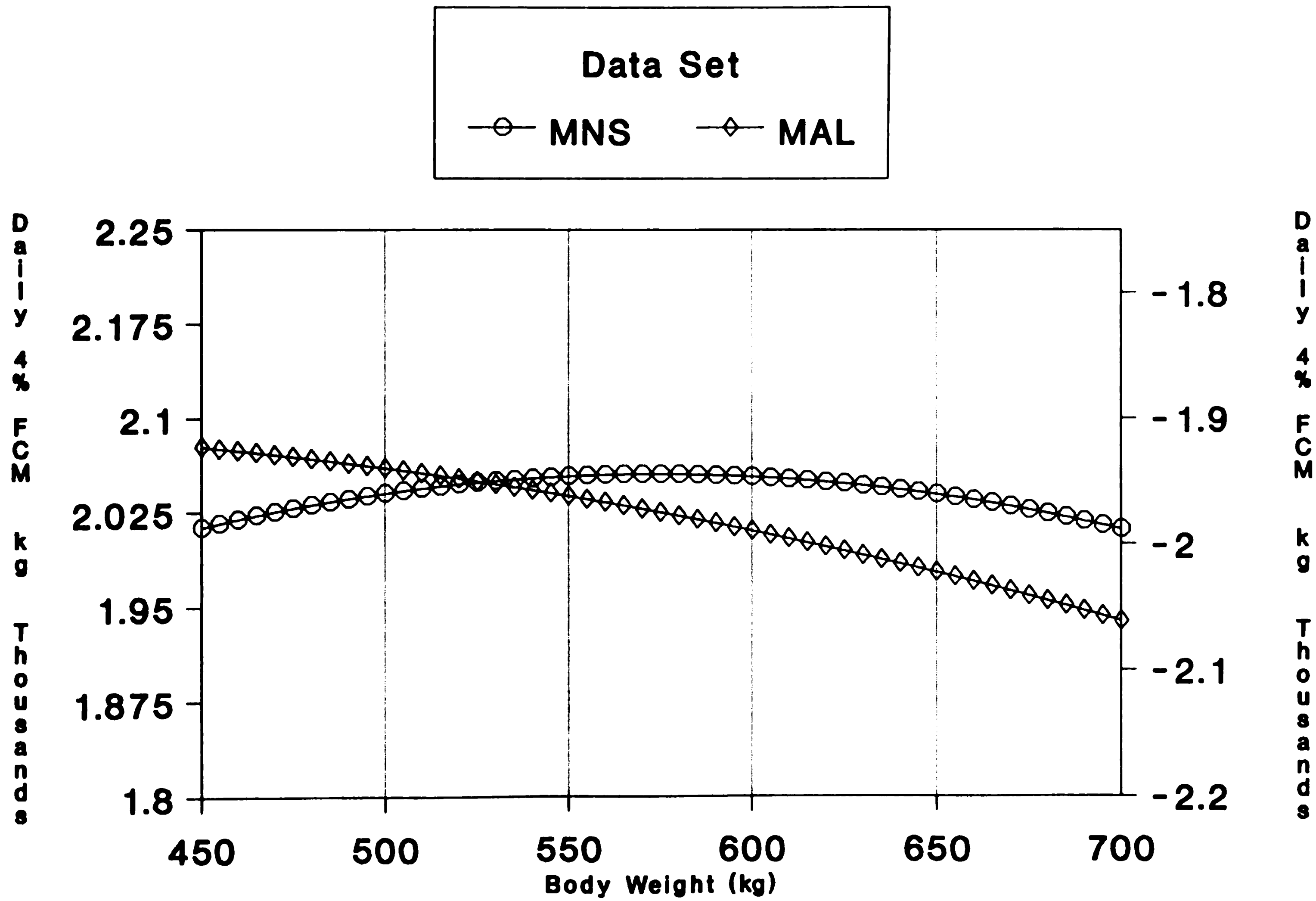

Figure 38: MULTIPAROUS MILK BY BODY WEIGHT (Tables 22 & 26).

negative influence body weight (WT) had on production in this study. However, the multiparous data set which excluded SCC (MNS) appeared to have a level which maximized production at 573.0 kg (Table 22). Body weight (WT) and BCS were positively correlated (.51-.57) for the three primiparous data sets (PC, PNG, and PNS) (Appendix Tables 5, 12, and 20) and for the complete, multiparous (MC) data sets (.50) (Appendix Table 29). The reader should also recall that withers height (WH) was positively correlated with primiparous body weight (WT).

Although body weight (WT) was not significantly different between herd sizes or production levels for multiparous animals, a tendency for high herds to have greater body weight (WT) was apparent for for primiparous animals. Even with this possible advantage in body weight (WT), high producing herds averages did not reach the optimum range of 544-567 kg suggested by Keown and Everett (1986) for primiparous animals. There were however, correlations of .57, .75, and .84 for age at first calving (AGE) and body weight (WT) for primiparous animals for the complete (PC), excluding genetics (PNG), and excluding SCC (PNS) data sets respectively.

4. <u>Health and Prepartum Nutrition</u>

<u>Health</u>

High herds in the complete, primiparous (PC) and excluding genetics (PNG) data sets approached and had significantly ($P < .10$) lower health scores (HEALTH)

(Tables 3 and 10). Multiparous animals in large herds in the complete (MC) data set had significantly ($P < .05$) higher health scores (HEALTH) (Table 16).

Health score (HEALTH) had only a minor, negative association to one primiparous model (Figure 9). Multiparous models had negative, major (Figures 10 and 11) and moderate (Figure 12) as well as positive, moderate (Figures 15 and 20) and minor (Figures 13, 16, 21, and 22) associations with production. Primiparous health score (HEALTH) was significant at $P < .05$ in several models (Tables 2, 4, 11, and 12) while its quadratic term (HEALTH2) was significant at $P < .10$ (Tables 11 and 12) and approached significance (Tables 1 and 4). Multiparous animal's production was significantly affected by health score (HEALTH) at $P < .05$ (Tables 13, 14, 15, 22, 23, 26, 27, and 28) and approached significance in other models (Tables 17, 19, and 20). The quadratic term was significant at $P < .05$ (Table 23), $P < .10$ (Table 25) and approached significance (Table 28). The plots of health score variables (Figures 39-41) show the inconsistent association of health problems with production. Higher health scores were associated with lower production in one data set (MC) but the others had more health problems with increased production.

Frequency of health problems differed between primiparous and multiparous animals. No differences were found for primiparous animals when considering herd size.

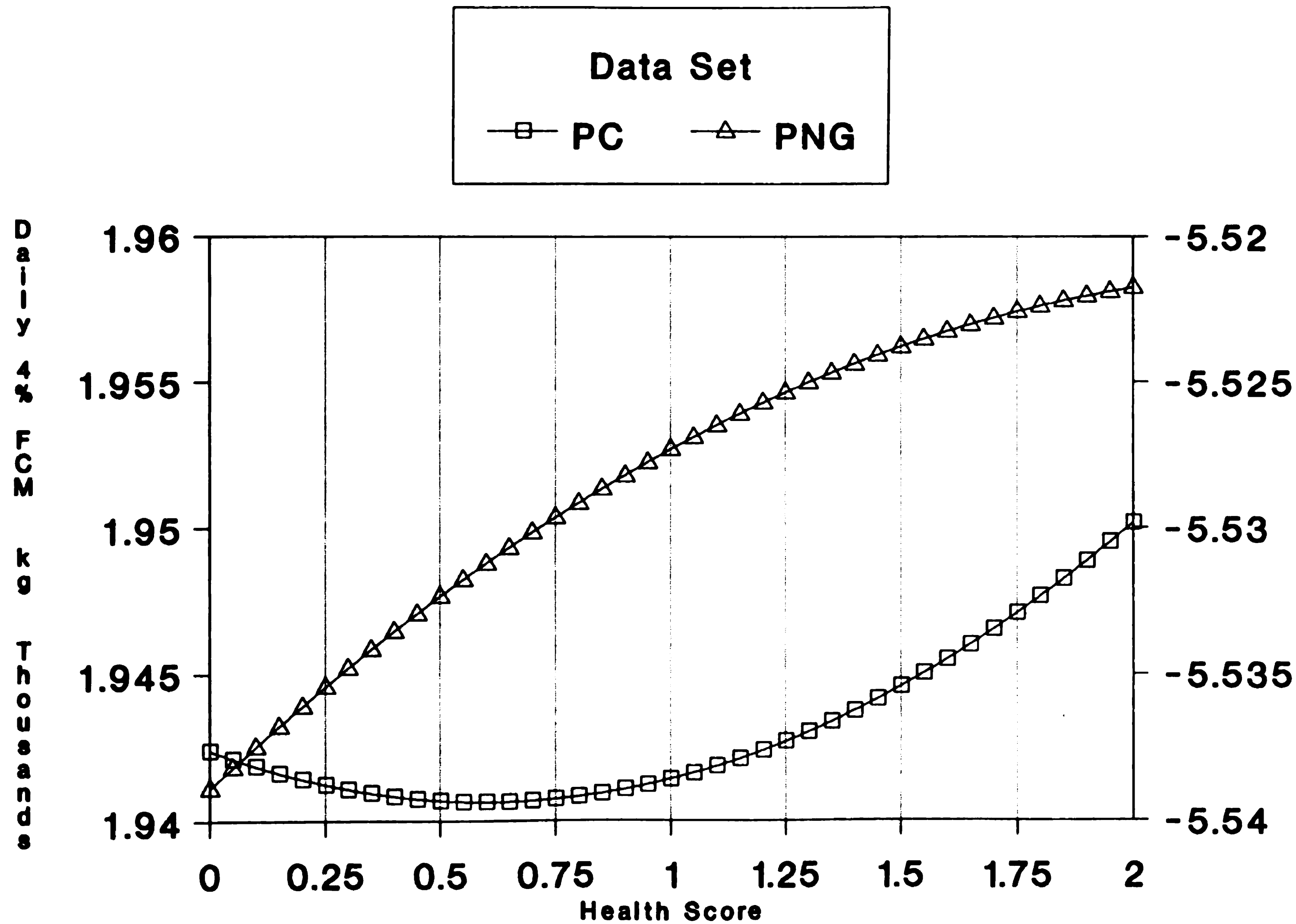

Figure 39: PRIMIPAROUS MILK BY HEALTH SCORE (Tables 1 & 4).

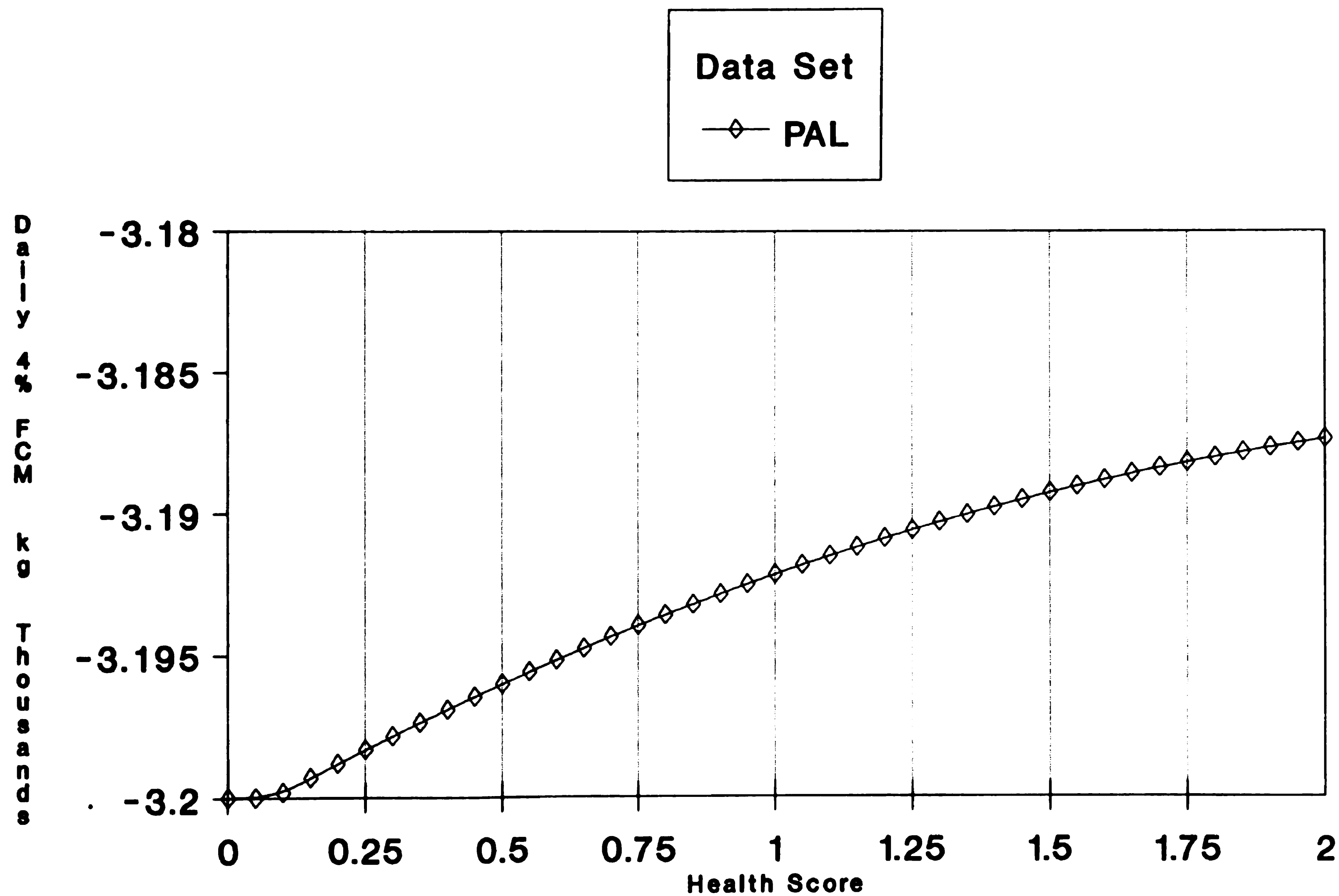

Figure 40: PRIMIPAROUS MILK BY HEALTH SCORE (Table 11).

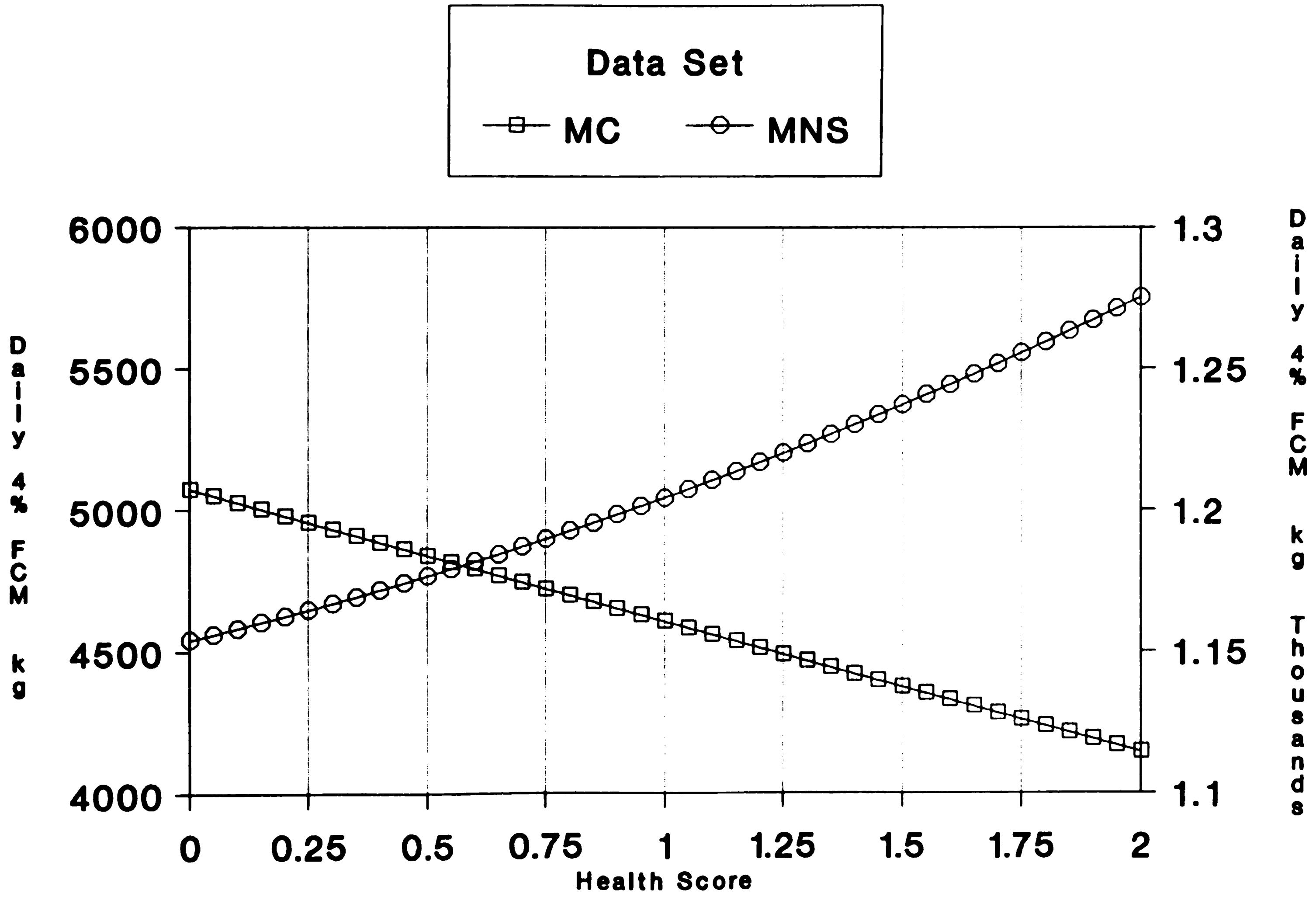

Figure 41: MULTIPAROUS MILK BY HEALTH SCORE (Tables 13 & 22).

Although incidence of health problems (HEALTH) did not exert a major influence (small STD EST) on production, a significant advantage was found for high producing herds which had fewer reported primiparous health problems. This suggests better overall heifer raising programs for high herds.

The major, negative impact that health problems (HEALTH) had on FCM in MC model 1 reveals its detrimental affects. However, the association of health score (HEALTH) (positive or negative) with production depended on the multiparous data set involved. Differences in this association could be related to the nature of determining the STD EST which allows only HEALTH to vary when it needs to be considered with prepartum feeding variables (XSNEL and XSPROTRD) and in certain data sets genetic level (PTAM). When the genetic level by health score (PTXHEAL) interaction did appear in a model it was highly significant ($P < .15$) but its magnitude of impact on production was relatively small (STD EST < 6) . A study by Betrand _et al_. (1985) confirms that animals with higher genetic levels have increased health costs. Large herds had a significantly higher health score (HEALTH) for multiparous animals (Table 16) but high and low producing herds did not differ in any data set. This supports research indicating increased health problems with older animals (Thompson _et al_., 1983; Shanks _et al_., 1982) but contradicts reports by Shanks _et al_. (1978 and 1981) and Hansen _et al_. (1979) that health problems increase with production. Health problems can be minimized through proper management.

The major health problems appeared to be ketosis and metritis (Appendix Tables 1 and 2). Health records for individual animals confirmed the interrelation of health disorders (Erb and Martin, 1980a; Erb and Martin, 1980b; Erb et al., 1981a; Erb et al., 1981b; Grohn et al., 1989; Curtis et al., 1985).

Prepartum Nutrition

Primiparous animals in large herds were fed significantly less ($P < .05$) energy prepartum (XSNEL) in the data set which excluded genetics (PNG) (Table 6) and approached significance in the other two data sets (PC and PNS) (Tables 3 and 10). As expected prepartum energy (XSNEL) and prepartum protein (XSPROTRD) were positively correlated with primiparous values greater than .86 (Appendix Tables 5, 12, and 20) and multiparous values greater than .83 (Appendix Tables 29, 36, and 43).

Prepartum energy intake's quadratic term (XSNEL2) had a minor, positive influence in only one model (Figure 1). Prepartum energy intake (XSNEL) was significant (P < . .05) to three primiparous (Tables 1, 4, and 7) and two multiparous (Tables 13, 14, and 26) models. The significance level for two other multiparous model was P < .10 (Tables 22 and 27). The quadratic term (XSNEL2) was significant at $P < .05$ for primiparous (Tables 1, 7, and 11) and for multiparous (Tables 13 and 14) models and approached significance in other multiparous models (Tables 26 and 27). The generated graphs (Figures 42-45)) demonstrate differences between primiparous and multiparous animals response to extra energy prepartum with primiparous animals responding favorably and multiparous unfavorably. However, the it should be noted that DMI was not measured prepartum and that the values are nearly equal to 15 kg of corn on a dry matter basis. These results could reflect differences in prepartum heifers and prepartum multiparous animals energy needs. Furthermore, NRC may be underestimating primiparous and multiparous animals energy demand, especially during the immediate prepartum period.

Prepartum protein, like prepartum energy, was significantly different or approached significance for primiparous animals in large herds (Tables 3, 6, and 10) while for multiparous significance was reached ($P < .10$) (Table 21) or approached (Table 16). Correlations of prepartum protein with BCS (.57-.60), as noted earlier may indicate an interaction of the two variables, however it was not measured in this study. Prepartum protein (XSPROTRD) did not influence production in either primiparous or multiparous models to any relevant extent. Prepartum protein was however, significant ($P < .05$) to one primiparous model (Table 4), three multiparous models (Tables 17, 18, and 22), significant at $P < .10$ for one multiparous model (Table 27), and approached significance in one primiparous (Table 11) and one multiparous (Table

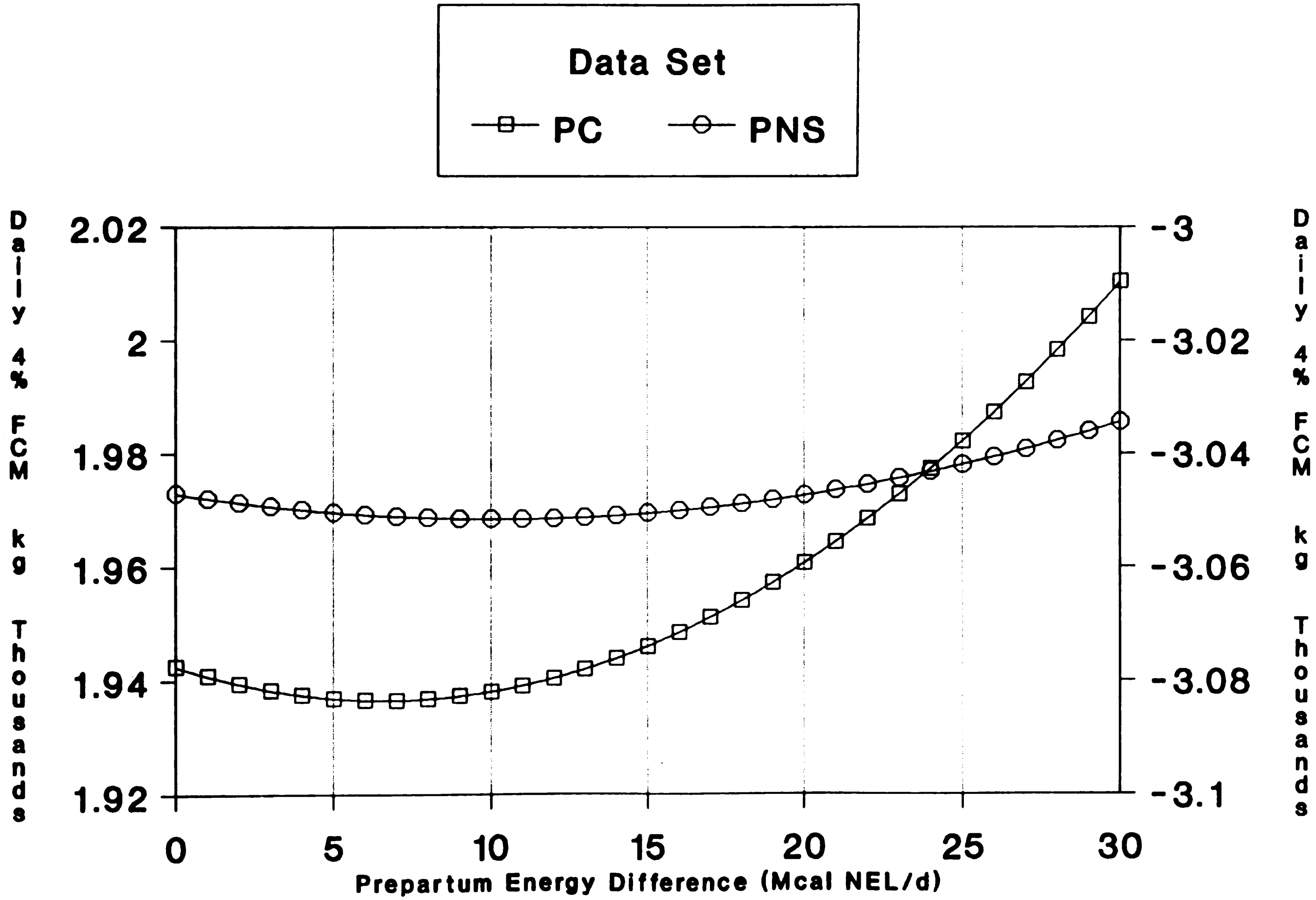

Figure 42: PRIMIPAROUS MILK BY PREPARTUM ENERGY DIFFERENCE (Tables 1 & 7).

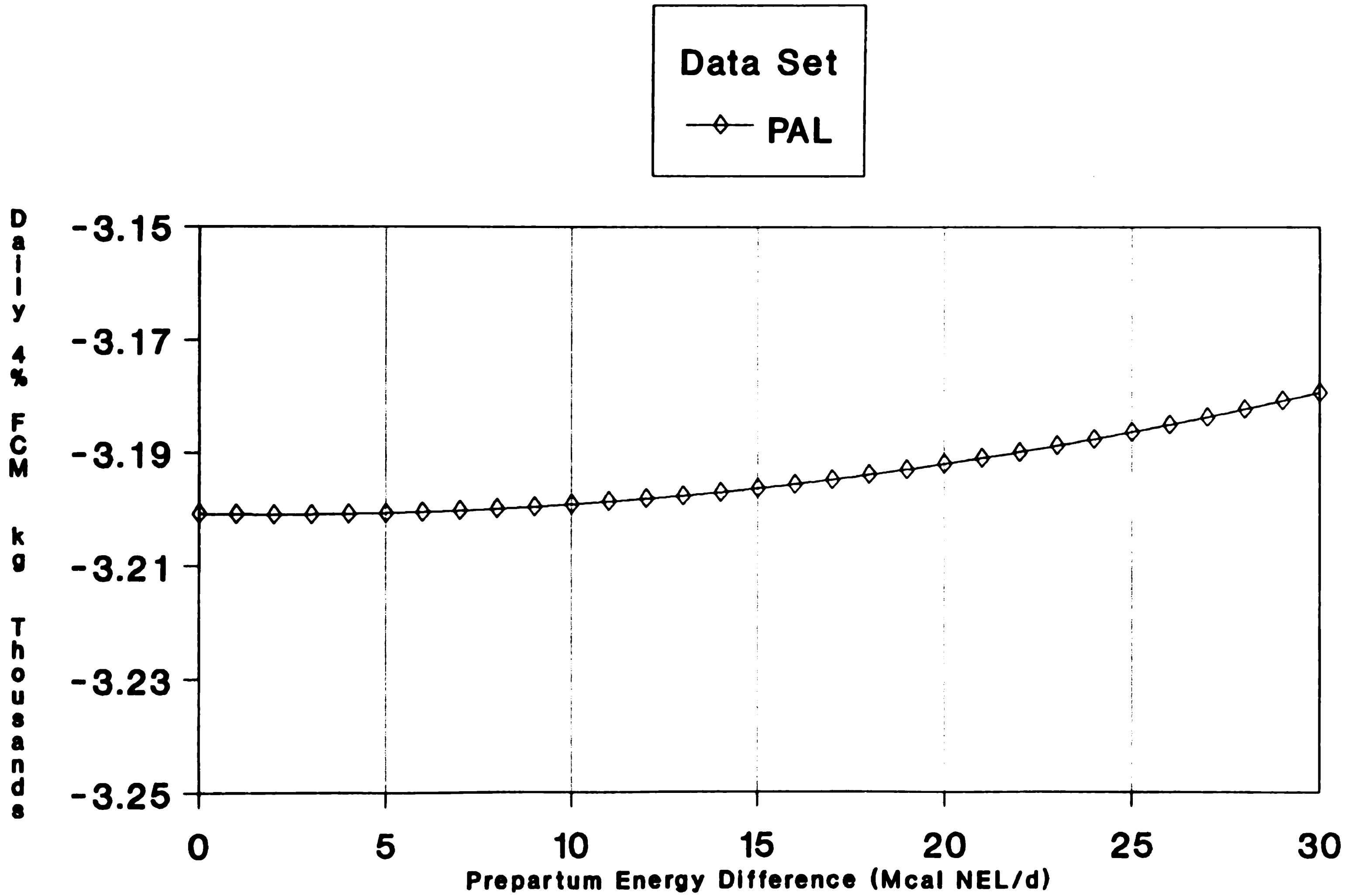

Figure 43: PRIMIPAROUS MILK BY PREPARTUM ENERGY DIFFERENCE (Table 11).

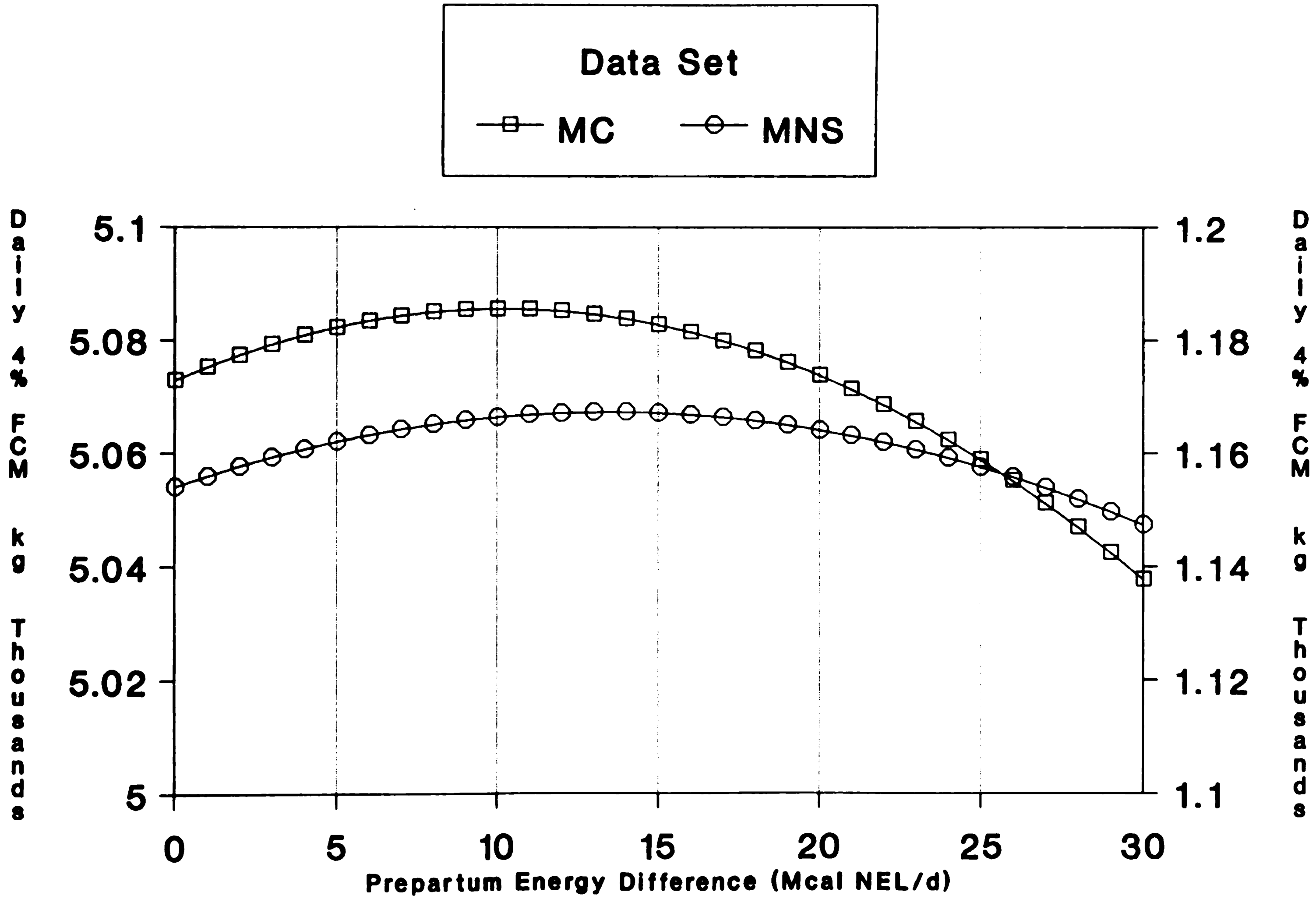

Figure 44: MULTIPAROUS MILK BY PREPARTUM ENERGY DIFFERENCE (Tables 13 & 22).

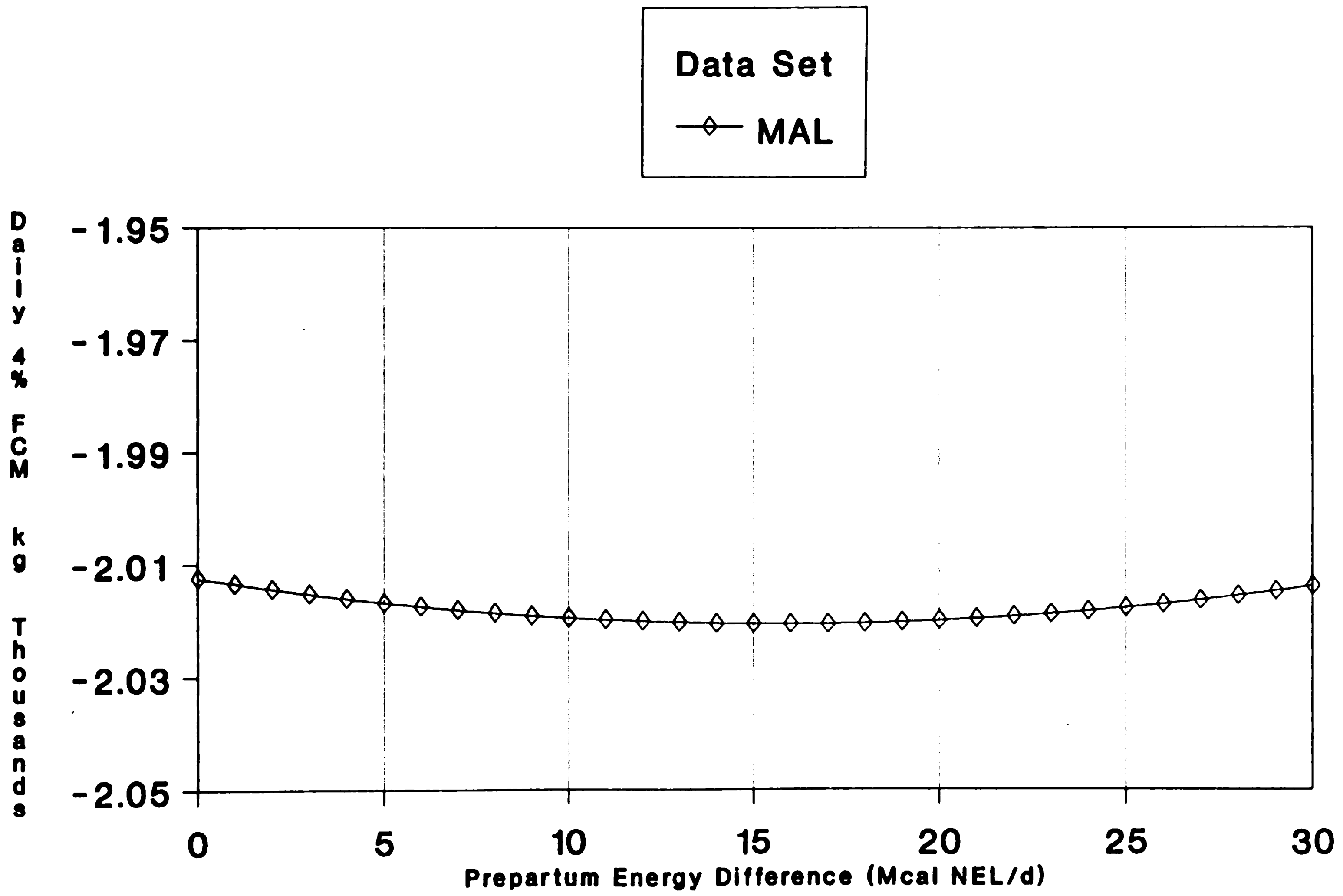

Figure 45: MULTIPAROUS MILK BY PREPARTUM ENERGY DIFFERENCE (Table 26).

26) model. The prepartum protein quadratic term (XSPTRD2) was highly significant (P < .05) for several multiparous models (Tables 17, 18, 26, and 27) and approached significance for one primiparous model (Table 11). Figures 46-48 show differences in production responses between primiparous and multiparous animals, with primiparous animals responding negatively and multiparous positively, to excess prepartum protein. Once again this suggests managing prepartum heifers differently than other prepartum animals. Furthermore, when prepartum protein levels are calculated which maximize production (Tables 17, 22, and 26) resulting values from 762-5455 additional g of protein would be beneficial could indicate inadequate protein guidelines for multiparous animals. All but 1 high producing herd did house there prepartum animals separate from the lactating animals.

Health and Prepartum Nutrition Interaction

The prepartum energy and health score interaction (XSNELXH) did not have any measurable impact on production in this study but was significant (P < .05) to several primiparous models (Tables 1, 2, 4, and 11). The low STD EST of this interaction may be due to health score (HEALTH) interactions with other variables not included, such as DMI, to influence individual animal milk yield. The interaction (Figures 49-51) again shows differences between primiparous and multiparous animals. As prepartum energy and health problems interact they have a detrimental effect

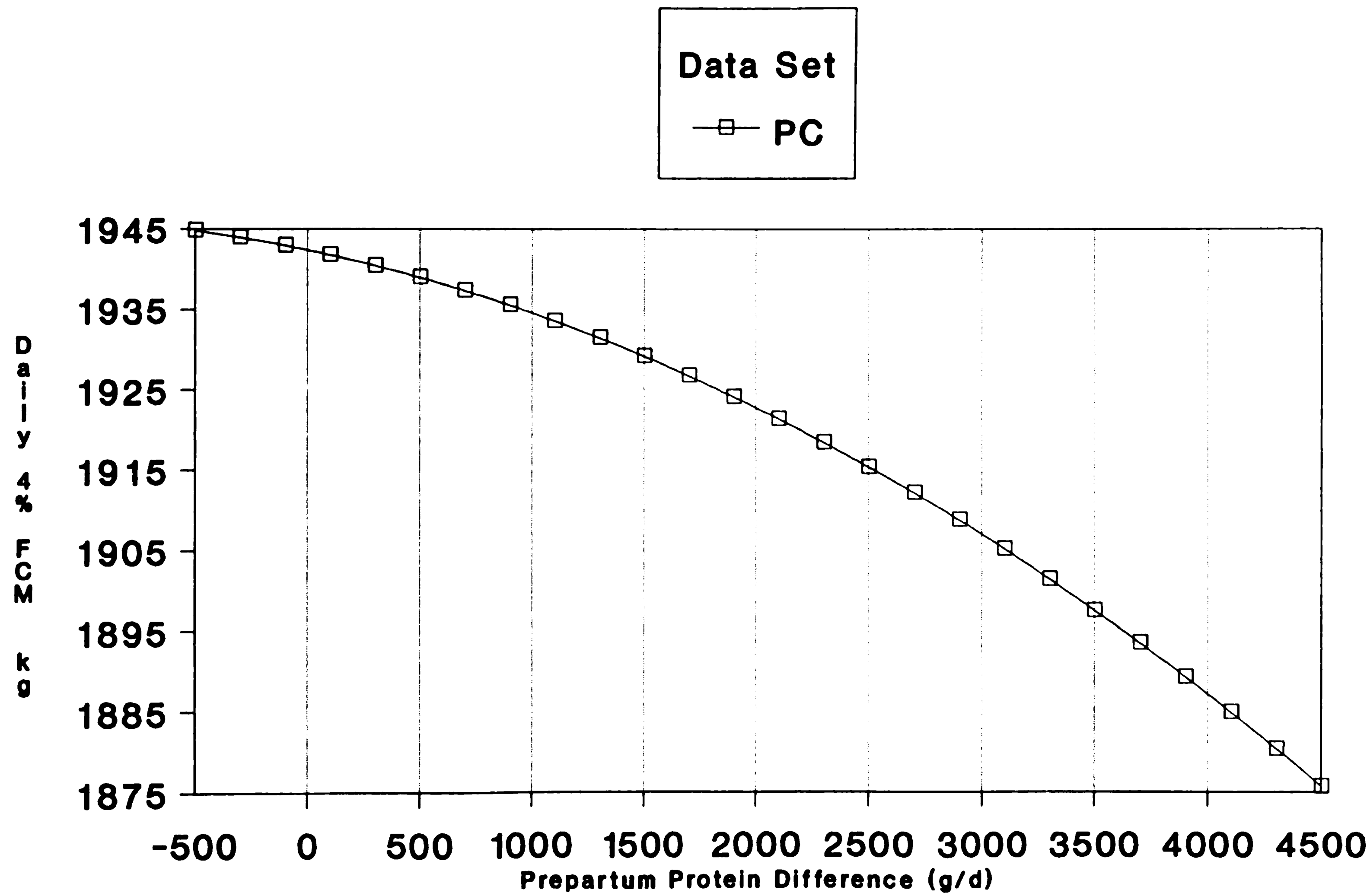

Figure 46: PRIMIPAROUS MILK BY PREPARTUM PROTEIN DIFFERENCE (Table 1).

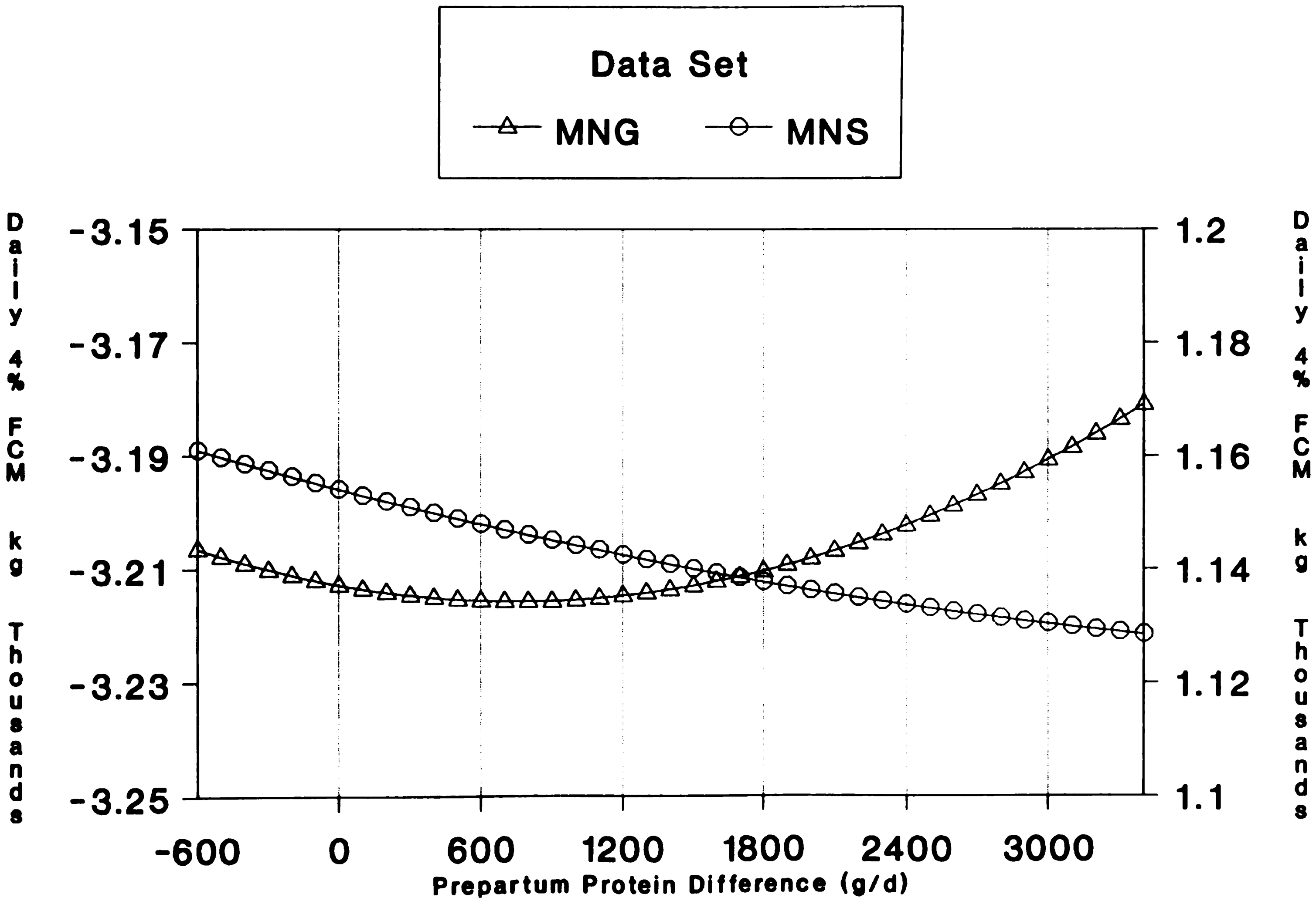

Figure 47: MULTIPAROUS MILK BY PREPARTUM PROTEIN DIFFERENCE (Tables 17 & 22).

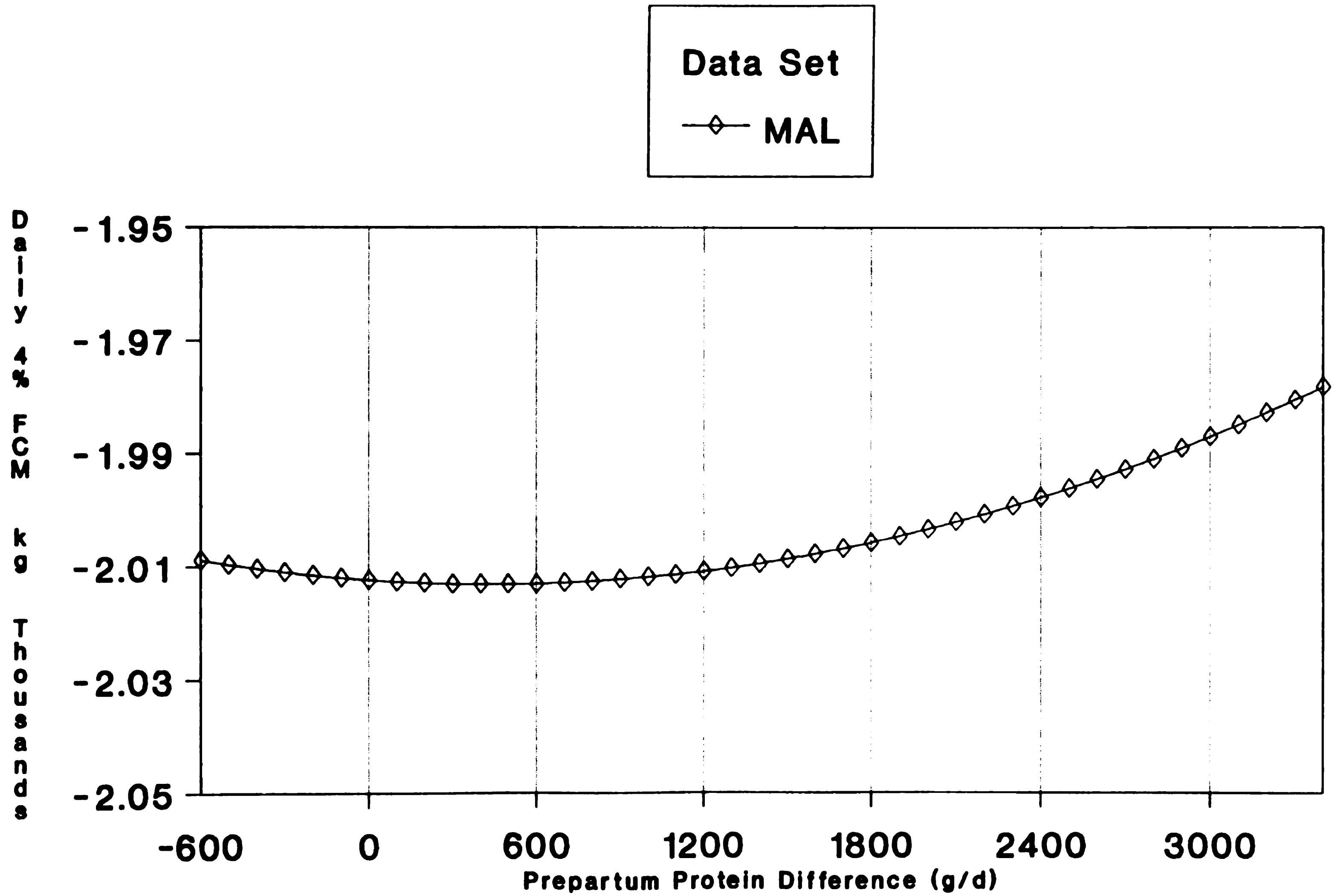

Figure 48: MULTIPAROUS MILK BY PREPARTUM PROTEIN DIFFERENCE (Table 26).

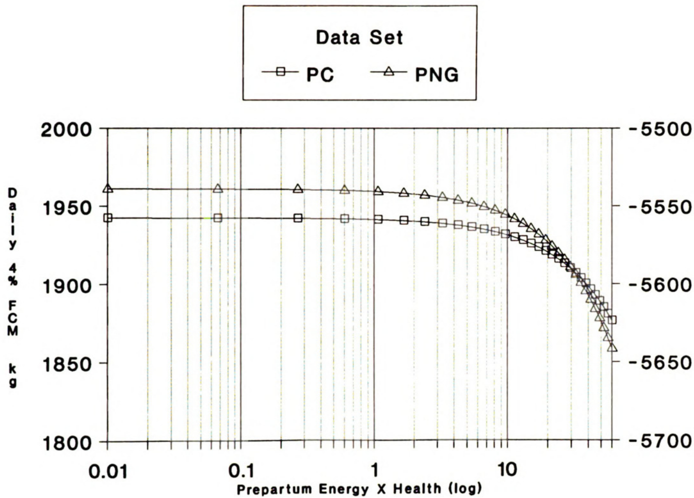

Figure 49: PRIMIPAROUS MILK BY PREPARTUM ENERGY AND HEALTH (Table 1 & 4).

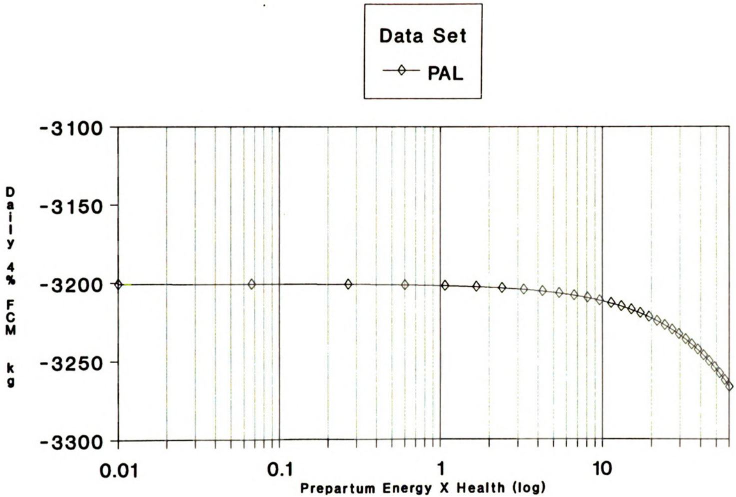

Figure 50: PRIMIPAROUS MILK BY PREPARTUM ENERGY AND HEALTH (Table 11).

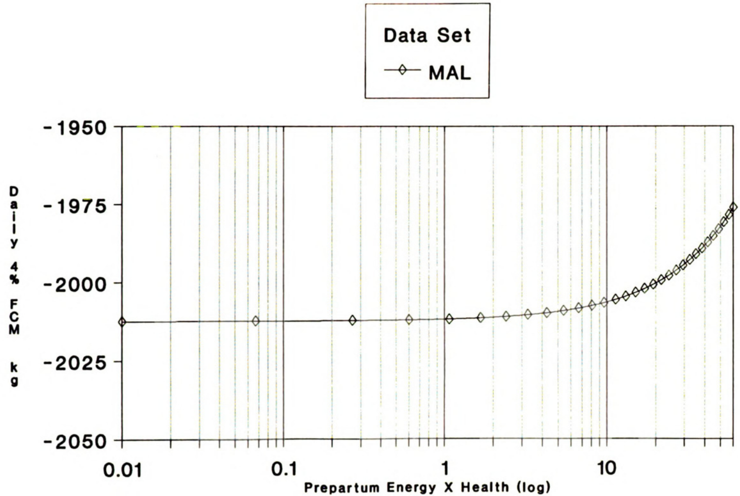

Figure 51: MULTIPAROUS MILK BY PREPARTUM ENERGY AND HEALTH (Table 26).

on production for primiparous animals and the opposite for multiparous.

Prepartum protein and health score interact (XSPRDXH) at a significant level ($P < .05$) in one primiparous (Table 4) and two multiparous (Tables 26 and 27) models. Once again the response of production differs with parity (Figures 52-54); primiparous animals increasing as protein and health score increased, multiparous animals, the reverse. Prepartum energy appears more important for primiparous animals while protein appears important for multiparous.

Higher prepartum protein intakes did not cause increased health problems as reported by Nocek et al. (1983). In fact large herds had lower prepartum protein (XSPROTRD) intakes but more health problems (HEALTH) (Table 16). Interpreting health data requires one to keep in mind that, although producers were strongly urged to record all health problems, they may not have done so. Furthermore, the prepartum ration information reflects reported amounts for only 1 week prior to parturition, not the entire dry period. It appears that larger herds monitor prepartum feeding more closely than do smaller herds, which in this study paid dividends of reducing health disorders for primiparous but not multiparous animals. Large herds appear able to feed prepartum animals closer to requirements, however, this did not benefit subsequent lactation health problems. An inference from this is that

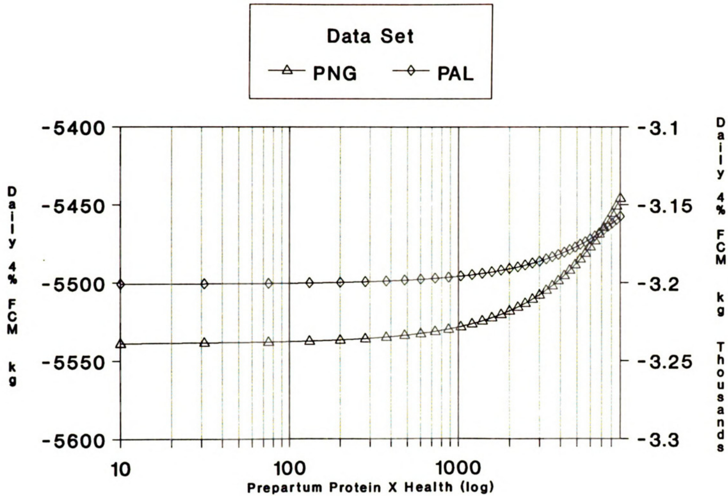

Figure 52: PRIMIPAROUS MILK BY PREPARTUM PROTEIN AND HEALTH (Tables 4 & 11).

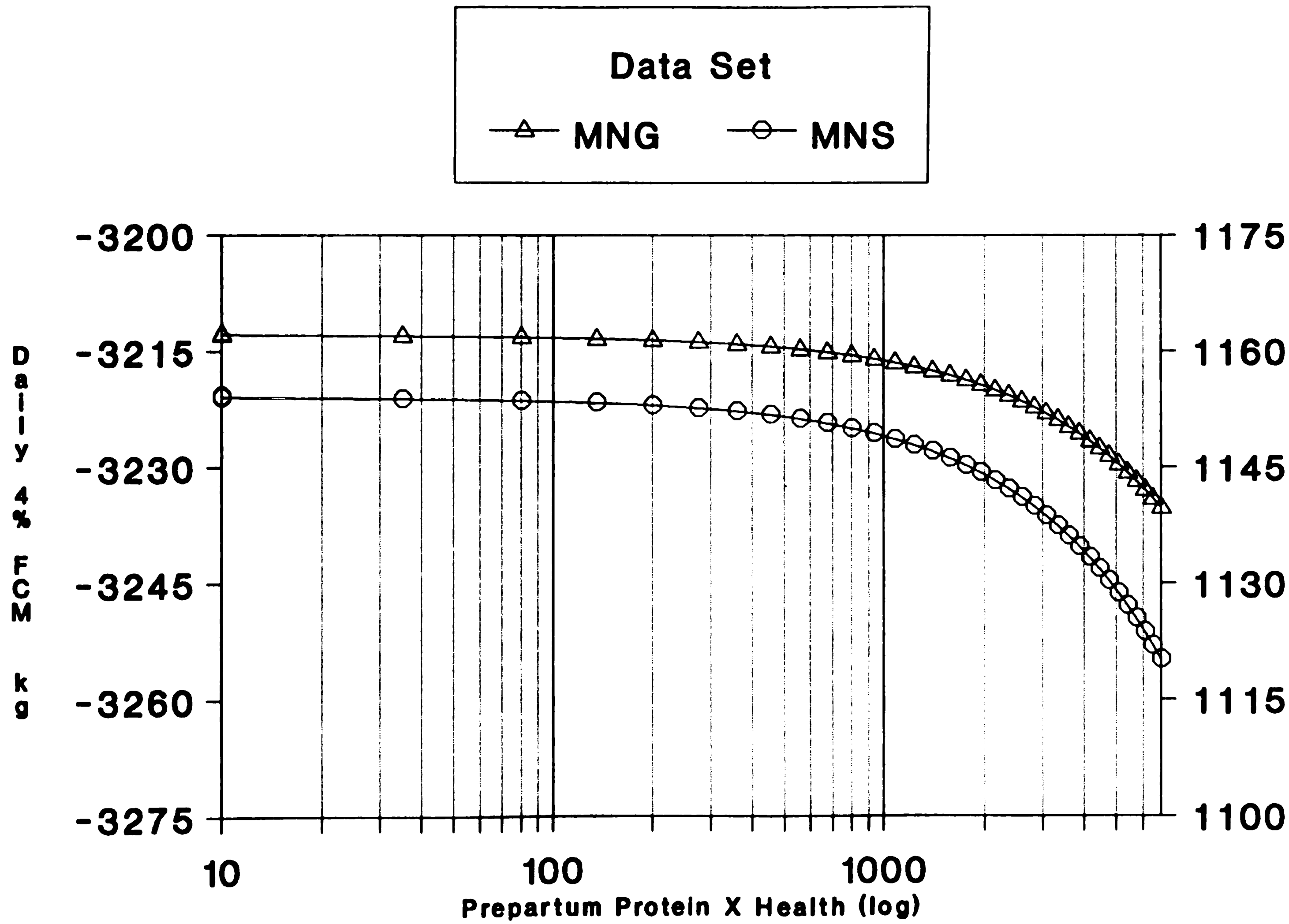

Figure 53: MULTIPAROUS MILK BY PREPARTUM PROTEIN AND HEALTH (Tables 17 & 22).

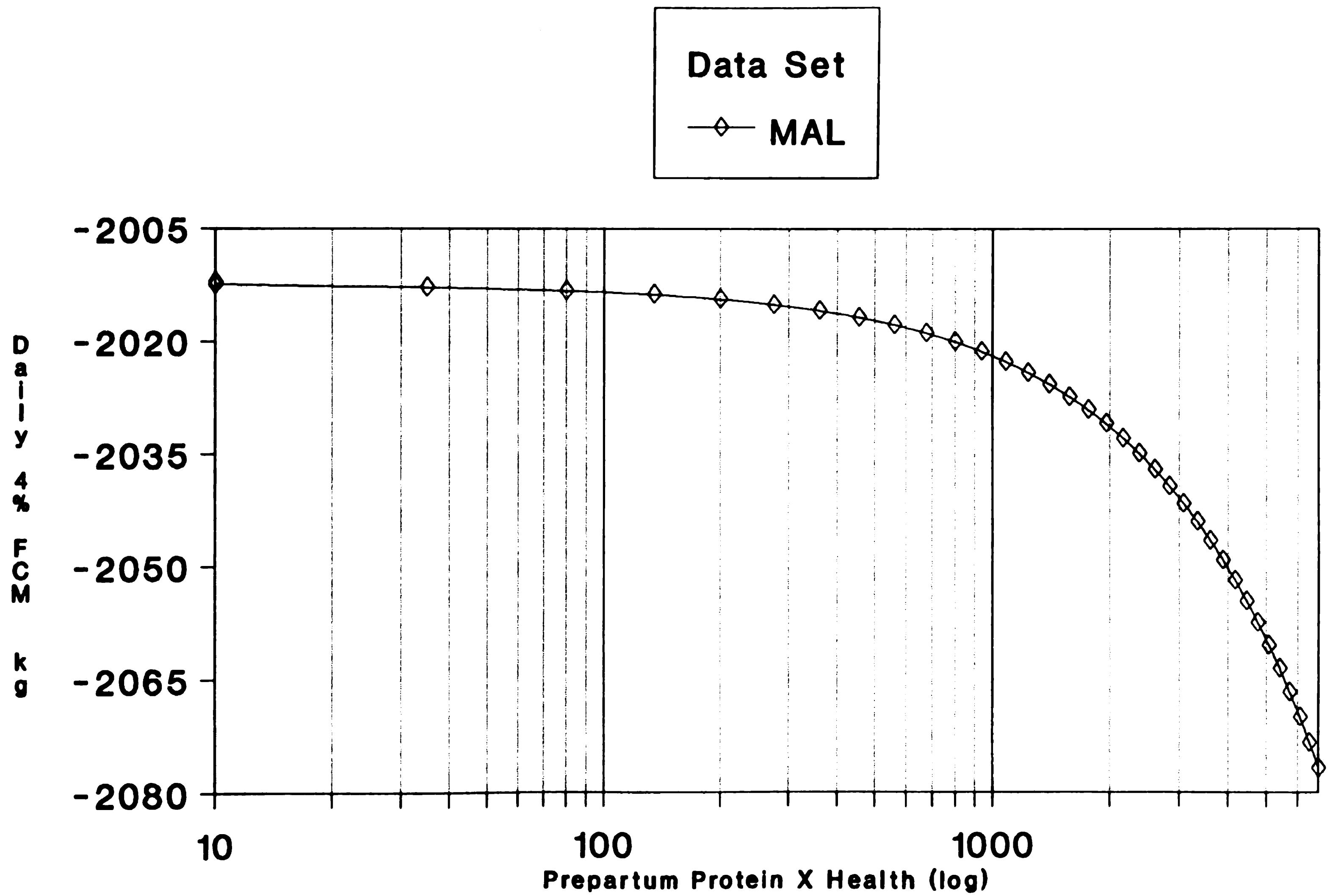

Figure 54: MULTIPAROUS MILK BY PREPARTUM PROTEIN AND HEALTH (Table 26).

smaller herds may be better able to detect and minimize health problems. Smaller herds could exploit this advantage of being able to give more individualized attention and gain benefits in addition to reduced health problems.

Feeding extremely excessive nutrients throughout the dry period is not advantageous, for economic as well as for animal health reasons. Benefits may result, however, from feeding additional nutrients immediately prepartum to meet the increasing nutrient needs for fetal growth and initiation of lactation and enhancing adjustment to lactating rations. If an advantage is gained for primiparous animals due to prepartum nutrition management then progress could be made in this area for multiparous animals.

5. Postpartum Nutrition

General Considerations

Using information from Appendix Table 54, means were compared for lactating animal group size, feedings/day, and bunk space/animal (Table 29). There was a significant difference ($P < .05$) between large and small herds for each variable but only feedings/day was significantly different ($P < .10$) between production groups, with high producing herds feeding more often (Table 29). Eight (8) herds (total of 43) fed primiparous animals separately, 6 of which were high producing herds. Tie-stall housing was found in 4 high producing herds. Six (6) small herds fed

Table 29

FEEDING MANAGEMENT - MEANS

Variable	Herd Category	N[a]	Mean	STD DEV[b]	Least Square Mean	P Value
Animals/ group	Large	21	121.24	63.16	121.63	0.0004
	Small	22	61.73	31.21	61.73	
	High	22	88.27	48.60	88.27	0.6598
	Low	21	93.43	66.48	95.09	
	Overall	43	90.79	57.38		
Feedings/ day	Large	21	2.86	0.854	2.85	0.0189
	Small	22	2.32	0.568	2.32	
	High	22	2.77	0.752	2.77	0.0902
	Low	21	2.38	0.740	2.40	
	Overall	43	2.58	0.763		
Bunk space/ animal (cm)	Large	21	42.30	14.20	42.15	0.0258
	Small	22	59.80	31.34	59.80	
	High	22	54.03	32.03	54.03	0.4279
	Low	21	48.35	17.39	47.93	
	Overall	43	51.26	25.80		

[a]N = Number of herds
[b]STD DEV = Standard deviation

feeds separately, 3 each in the high and low producing groups. Grain was offered in addition to the TMR by 22 herds, either while milking and/or by computer feeder. Fourteen (14) of these herds were in the high production group. It is very unlikely that feeding primiparous animals separately influenced production differences greatly, even though 6 high herds used the management practice as opposed to only 3 low producing herds.

Dry Matter Intake

There were no significant differences in DMI between herd sizes and production levels. This may be due to DMI having a larger STD DEV for low herds (Tables 3, 6, 10, 16, 21, and 25).

Dry matter intake (DMI) is difficult to interpret for primiparous animals as its direction of influence goes from major, (Figure 1), to minor, negative (Figure 4) and from moderate, (Figure 8) to major, positive (Figures 2, 3, 5, 6, 7, and 9). However, for multiparous the influence is always negative and at minor (Figures 21 and 22), moderate (Figure 20), and major (Figures 10, 11, and 12) levels. The quadratic term (DMI2) had minor (Figures 5, 6, 7, and 8) and moderate (Figure 3) influences for primiparous animals and moderate, negative (Figures 10 and 11) for multiparous. DMI was significant ($P < .05$) for primiparous models (Tables 1, 2, 4, 7, 11, and 12) and multiparous models (Tables 13, 14, 17, 18, 26, and 27) and at $P < .10$ for primiparous (Tables 8 and 9) and multiparous (Table 28) models. The quadratic term (DMI2) was significant at P < .05 for primiparous (Tables 4, 7, 8, and 11) and multiparous (Tables 13 and 14), significant at P < .10 (Table 9) and approaching significance (Table 12) for two primiparous models respectively. Figures 55-57 illustrate the differences in production response between parities with 3 of 4 data sets showing positive associations of DMI with production for primiparous and the multiparous example negative.

For primiparous animals, low producing herds reported higher DMI as a percent of BW than did high herds. Additionally negative associations of DMI with production could mean that lower producing herds did not accurately measure and report amounts of ration ingredients fed. All herds, however, reported greater percentage of BW intakes for primiparous animals, which is not probable (DePeters et al., 1985).

Herd owners don't give primiparous animals due consideration. Improvement in ration evaluation strategies would be of benefit to these animals, as suggested by Jones et al. (1978) and Patton et al. (1989).

Dry Matter Intake and Body Weight Interaction

The DMI and body weight interaction (DMIXWT) always had a positive association with production regardless of parity (Figures 1, 4, 5, 6, 7, 9, 10, 11, 12, 20, and 21). Furthermore, its significance level was high (P < .05) for most models regardless of parity (Tables 1, 5, 7, 8, 9, 11,

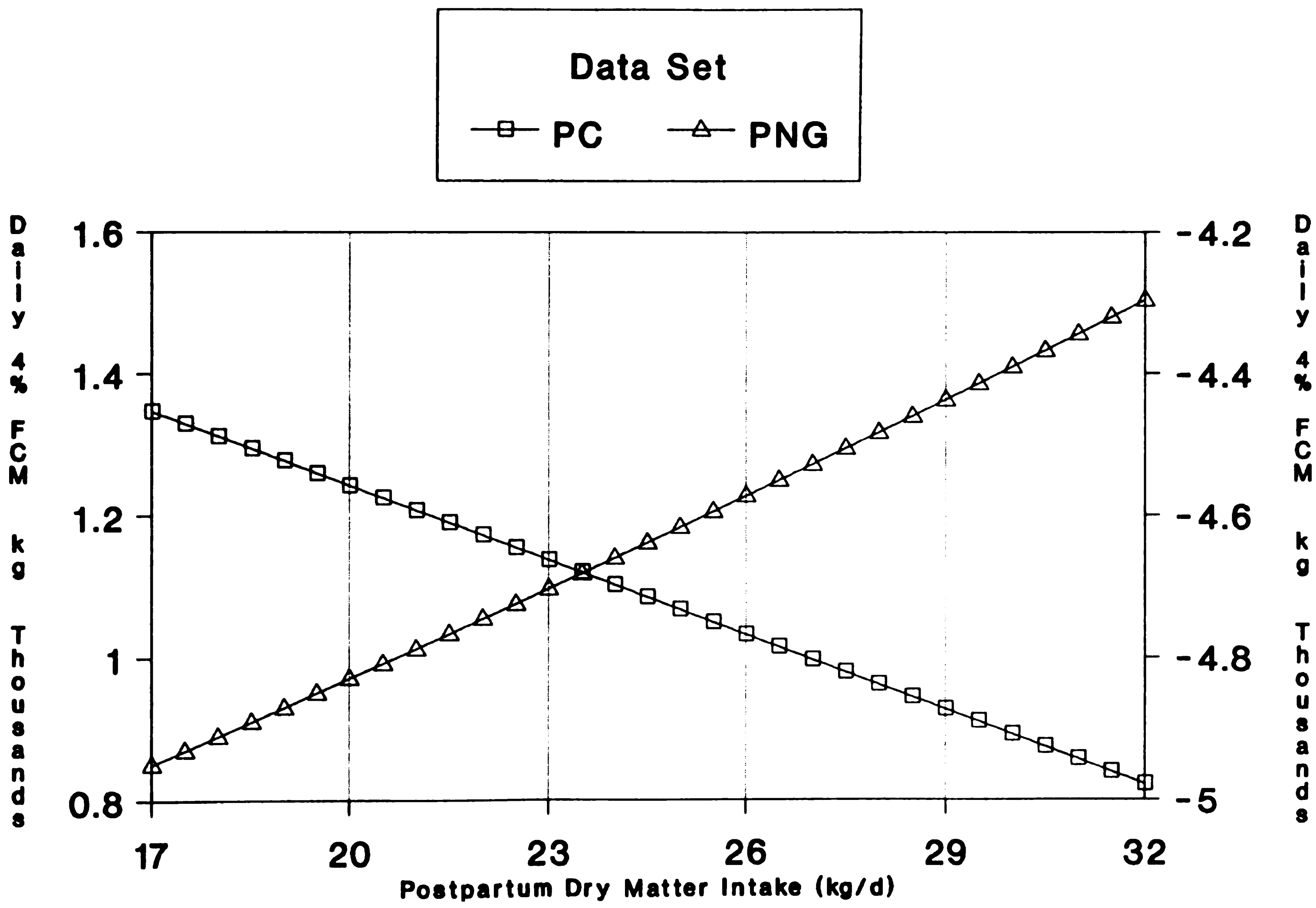

Figure 55: PRIMIPAROUS MILK BY POSTPARTUM DRY MATTER INTAKE (Tables 1 & 4).

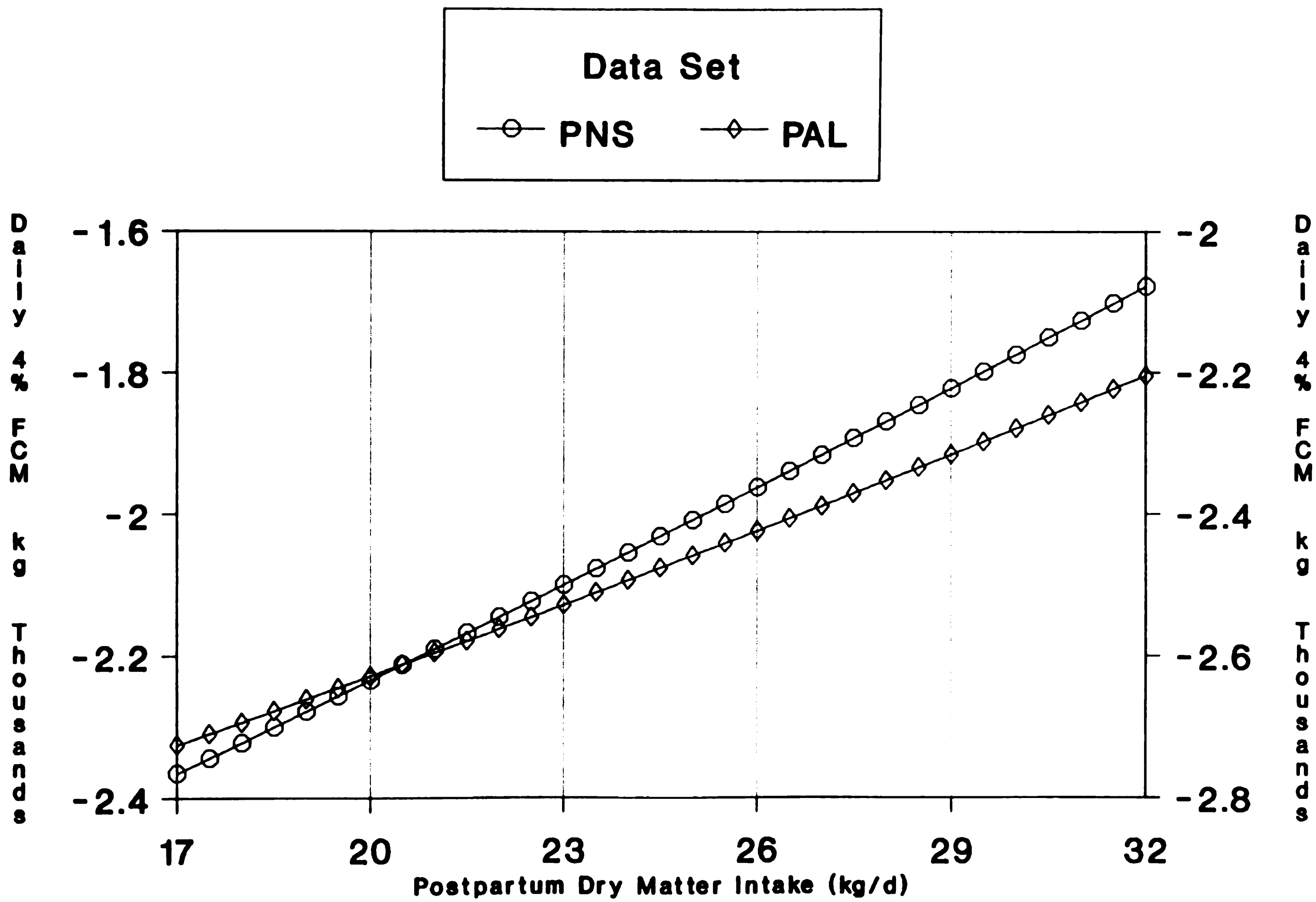

Figure 56: PRIMIPAROUS MILK BY POSTPARTUM DRY MATTER INTAKE (Tables 7 & 11).

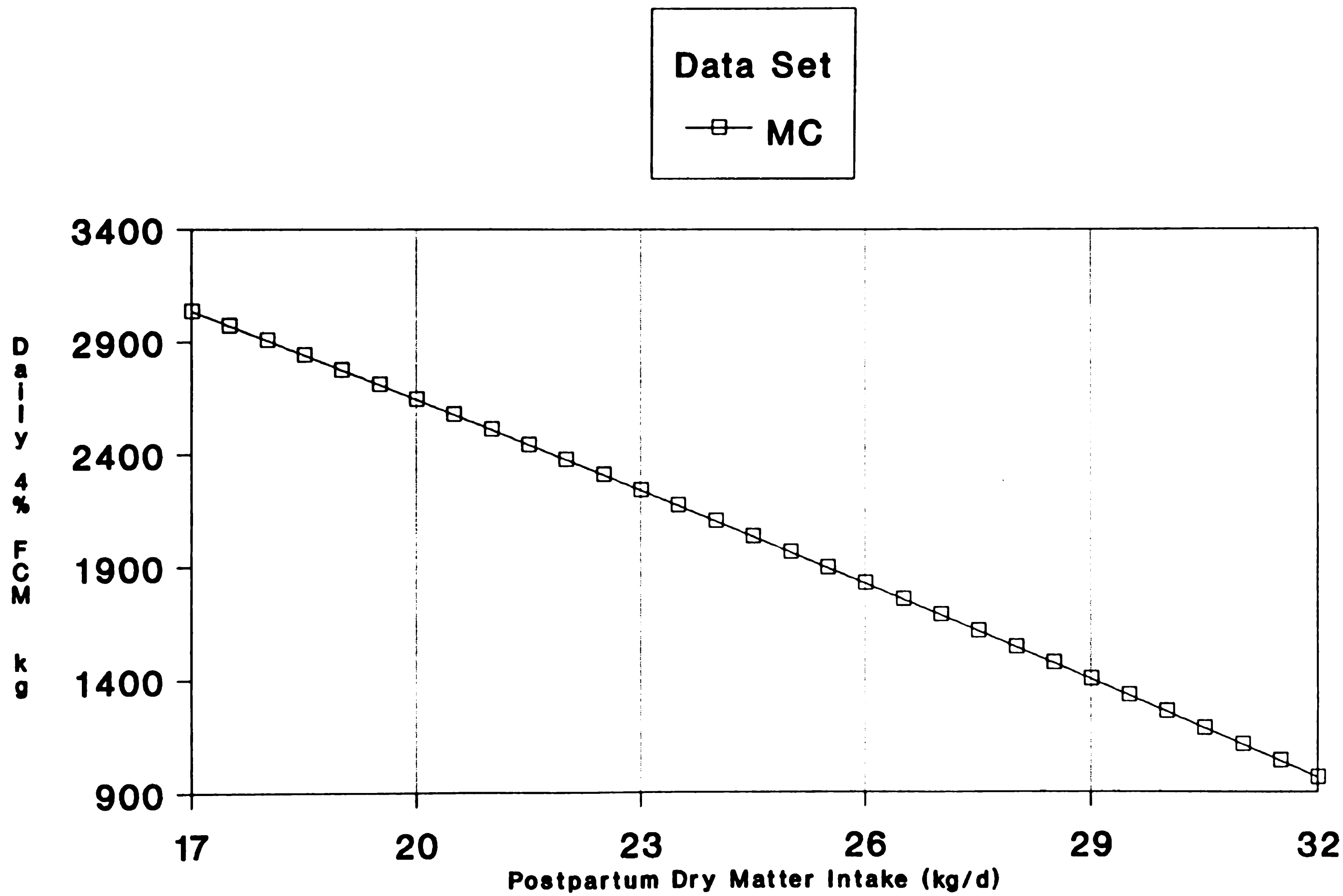

Figure 57: MULTIPAROUS MILK BY POSTPARTUM DRY MATTER INTAKE (Table 13).

12, 13, 14, 15, 26, and 27) with and additional model having a significance level of $P < .10$ (Table 28). Figures 58-60 allow visual determination of body weight and DMI interacting positively on production in all models except a primiparous data set (Figure 58). This negative association of the interaction with production is probably due to DMI values being "reported" and not measured and further that low producing herds may not be as accurate in determining their herd's DMI, especially primiparous animals.

The DMI by body weight (DMIXWT) interaction's positive association with production cannot be attributed to body weight differences for multiparous animals as no body weight (WT) difference existed (Tables 16, 21, and 25). The positive connection for this interaction with production in primiparous animals may be body weight (WT) difference but as stated earlier DMI is a reported value, not actual.

Dry Matter Intake and Withers Height Interaction

The magnitude of the DMI by withers height (DMIXWH) interaction necessitated that the variables be considered jointly. The negative influence on daily 4% FCM by the DMI by withers height (DMIXWH) interaction must be viewed with caution as DMI is "reported" and not an actual measure for any individual or group of animals. The DMI and withers height interaction (DMIXWH) for primiparous animals revealed a major, negative association with production

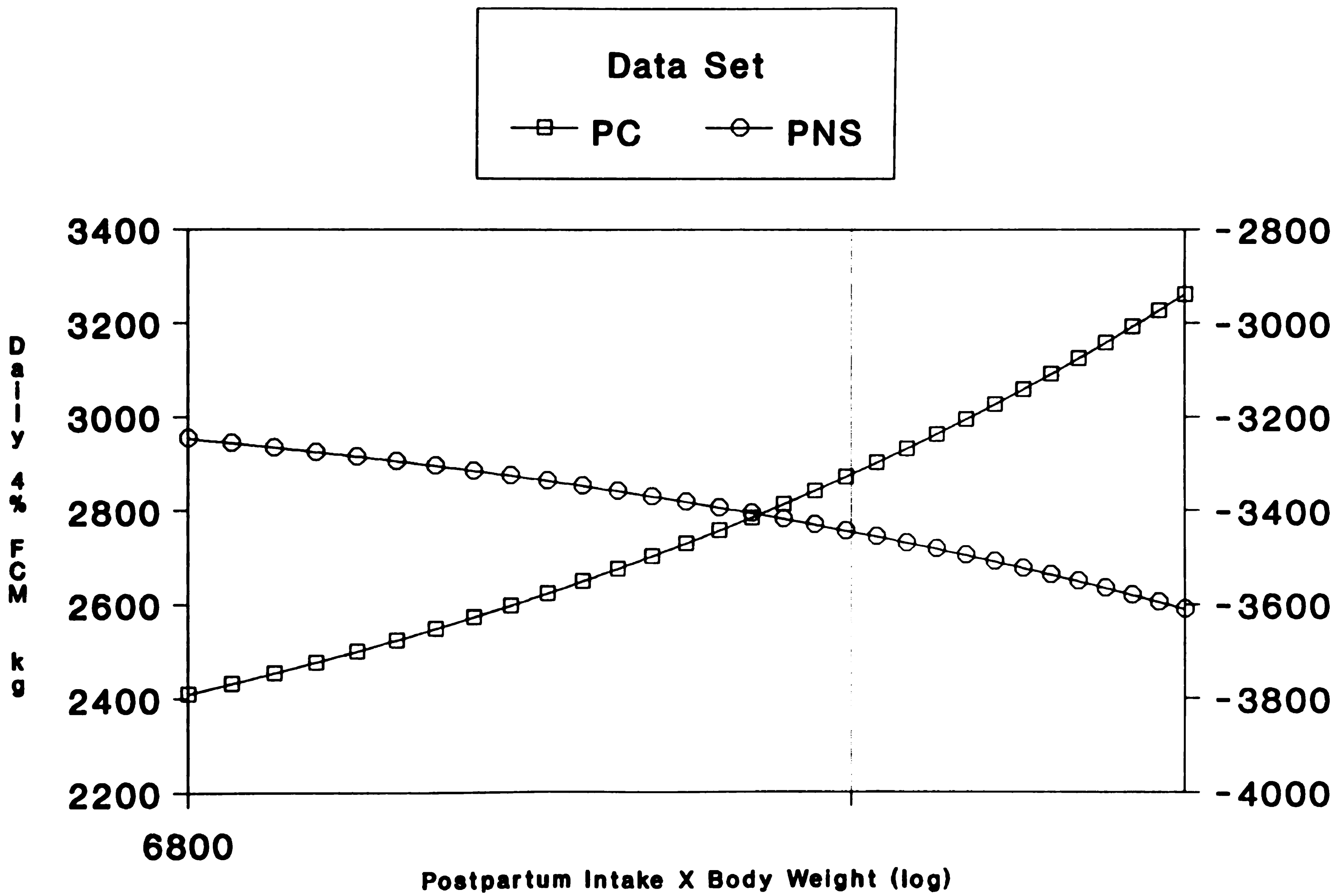

Figure 58: PRIMIPAROUS MILK BY POSTPARTUM INTAKE AND BODY WEIGHT (Tables 1 & 7).

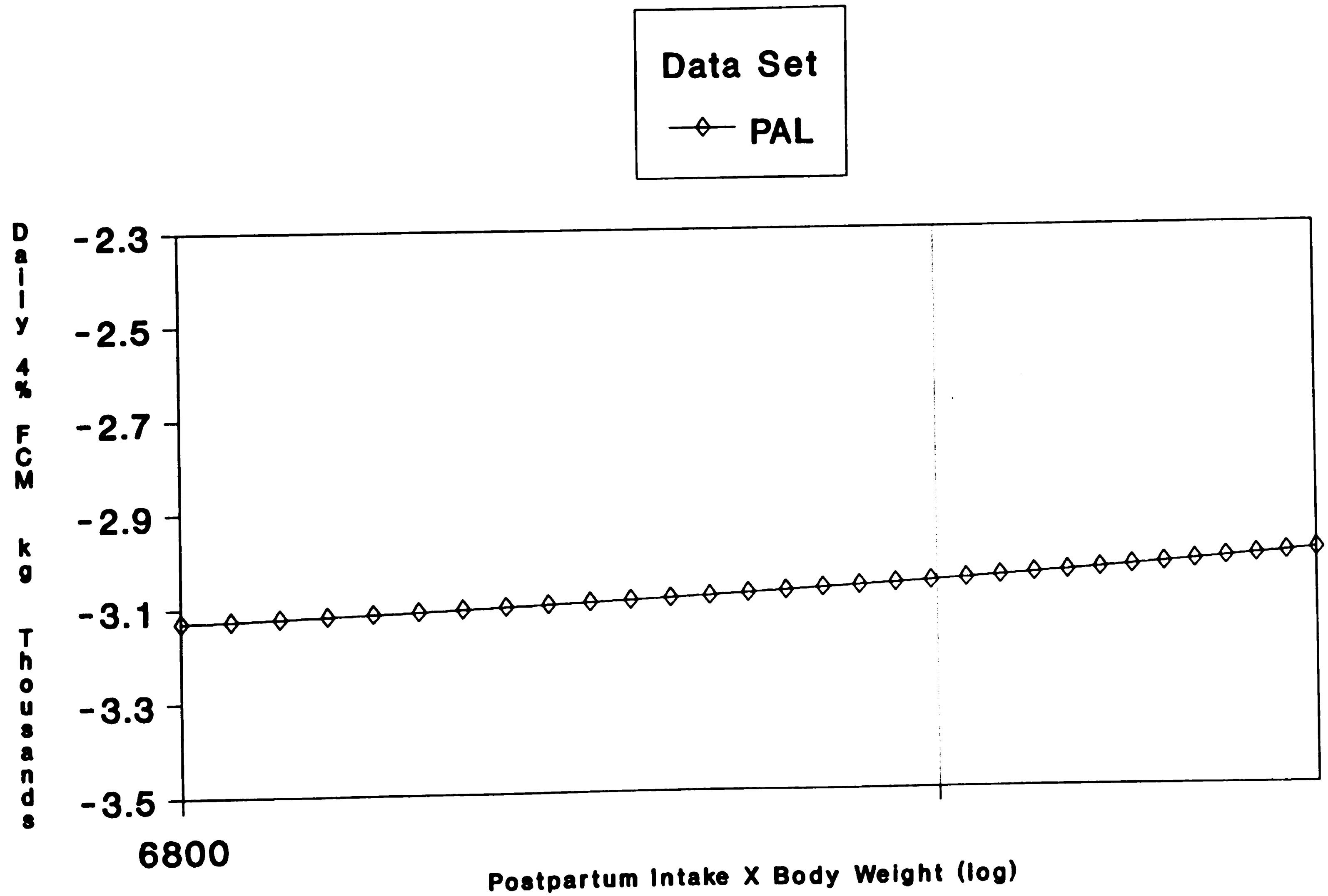

Figure 59: PRIMIPAROUS MILK BY POSTPARTUM INTAKE AND BODY (Table 11).

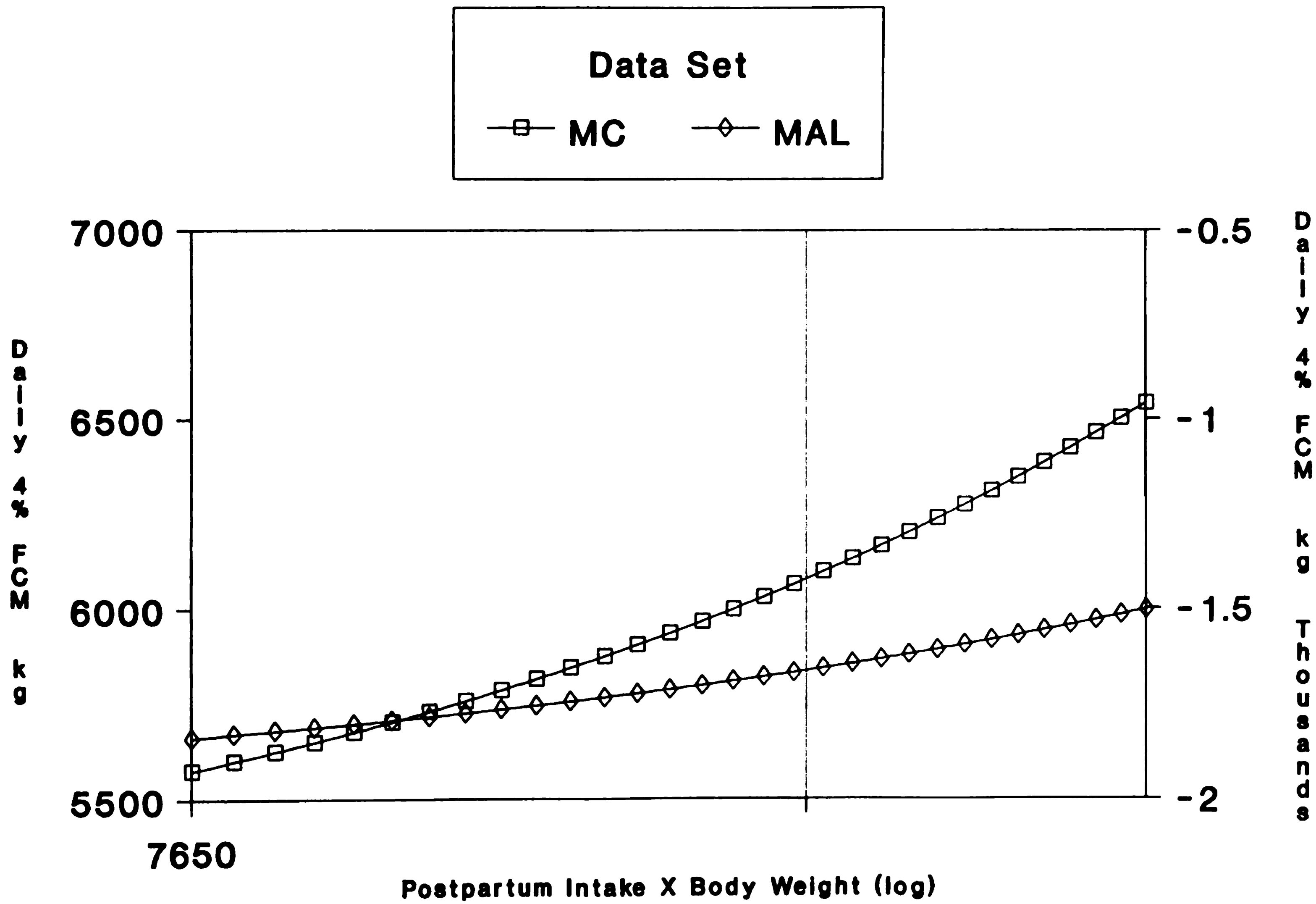

Figure 60: MULTIPAROUS MILK BY POSTPARTUM INTAKE AND BODY WEIGHT (Tables 13 & 26).

(Figures 2, 3, 5, 6, 7, 8, and 9) and had a significance level of P < .05 (Tables 2, 4, 7, 8, 9, 11, and 12). The negative direction of the interactions influence (Figures 61 and 62) may be explained by the fact that DMI is "reported".

Dry Matter Intake and Energy Density Interaction

The DMI and energy density interaction (DMIXED) had a negative association, at moderate and minor levels, on production for primiparous animals (Figures 2, 3, 5, 6, 7, 8, and 9) while for multiparous animals the effect was positive and major (Tables 10, 11, and 12). In addition the level of significance to the models was significant at P < .05 (Tables 2, 4, 7, 8, 9, 11, 12, 13, 14, and 15) and at P < .10 for two additional multiparous models (Tables 26 and 28). These results are displayed in Figures 63-65 and again show differences between parities. Due to DMI being reported and that few herds housed primiparous animals separately, the information is more likely to reflect reality for multiparous animals. The negative influence of the DMI by energy density (DMIXED) interaction for primiparous animals may indeed support the suggestion from Steele (1980) and Wangesness and Muller (1981) of an optimal ED of 1.67 Mcal/kg. However, multiparous data set regressions detected positive associations of energy density (ED) with FCM. Furthermore, the decrease in production as DMI and energy density increase may be an

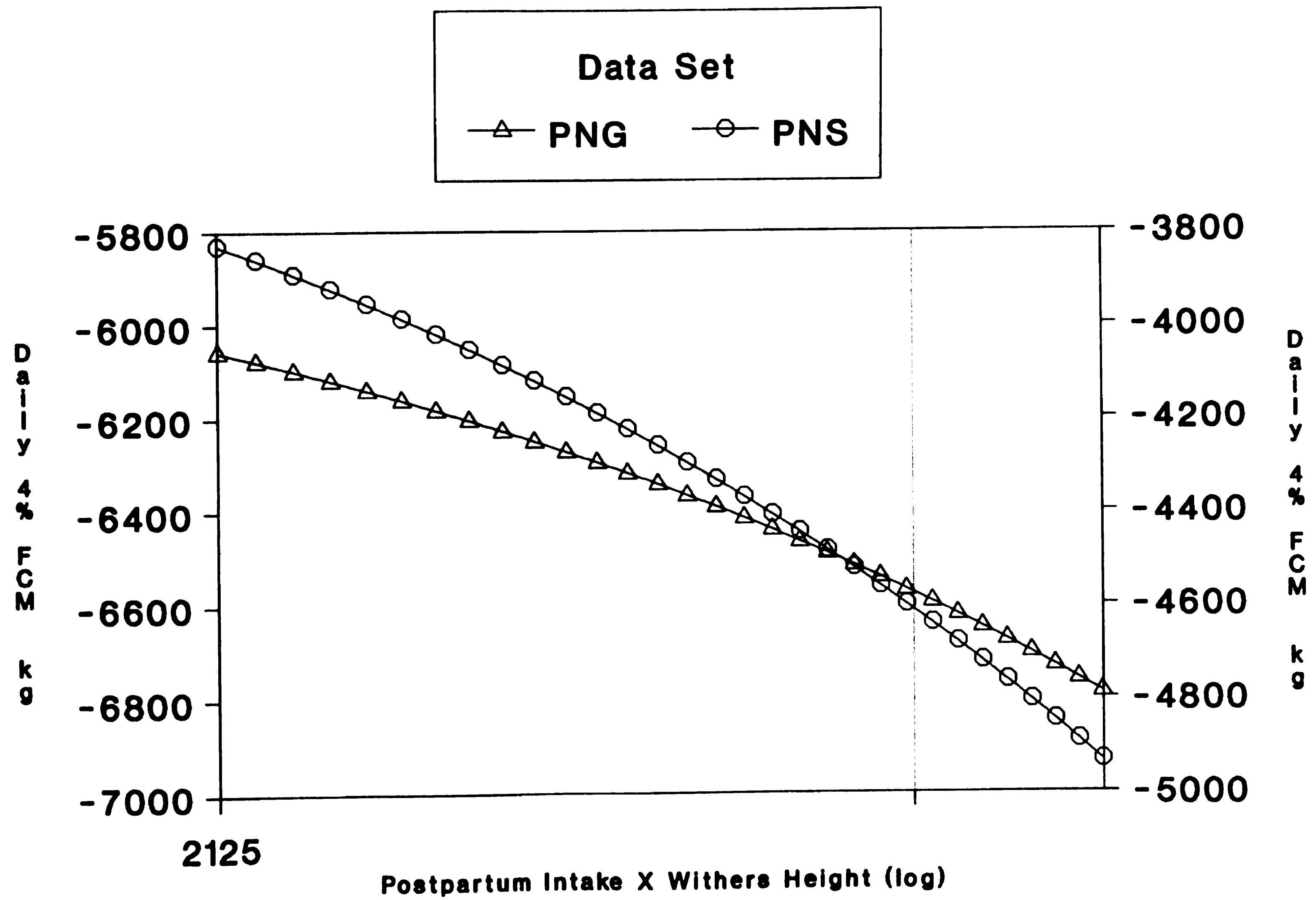

Figure 61: PRIMIPAROUS MILK BY POSTPARTUM INTAKE AND WITHERS HEIGHT (Tables 4 & 7).

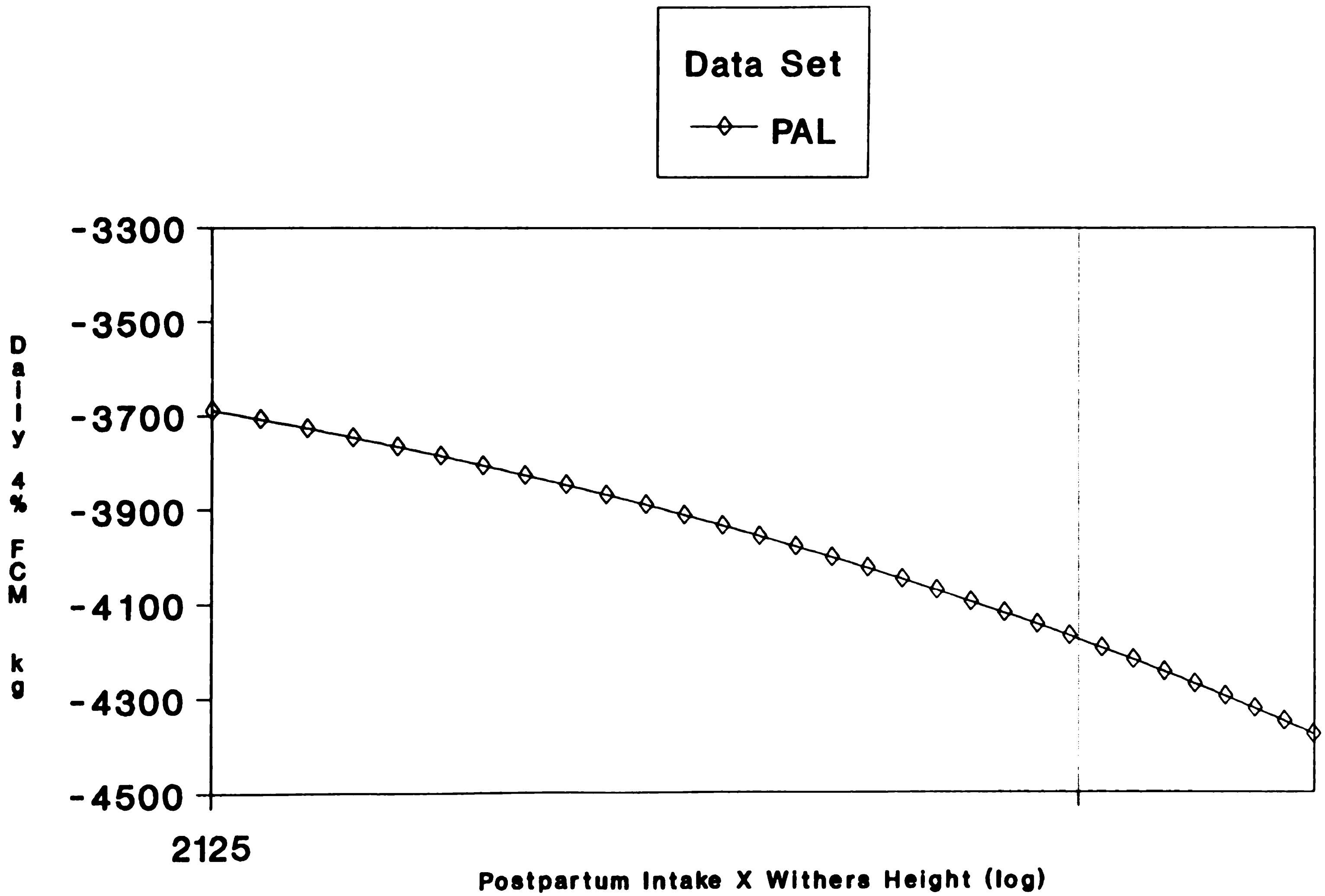

Figure 62: PRIMIPAROUS MILK BY POSTPARTUM INTAKE AND WITHERS HEIGHT (Table 11).

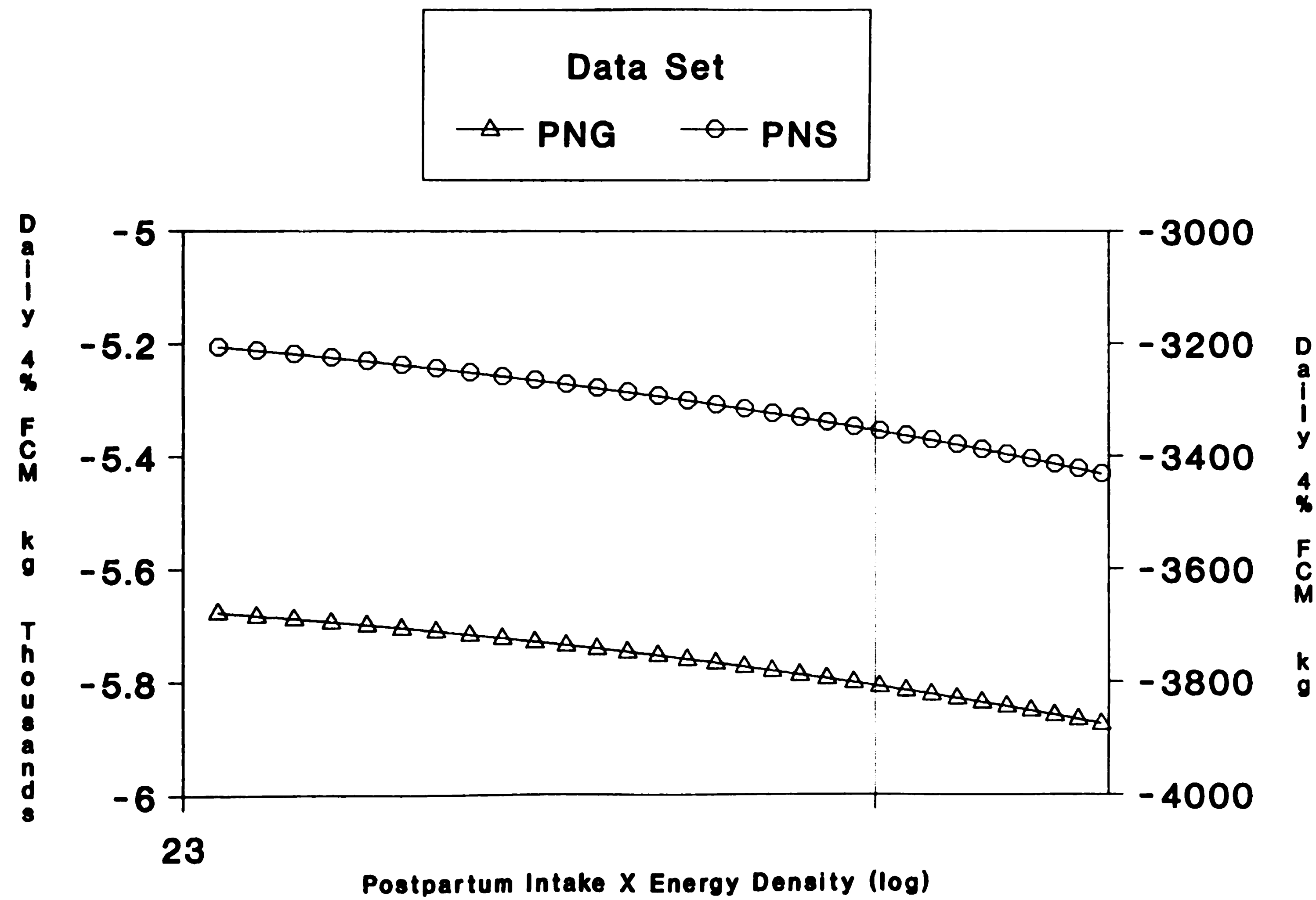

Figure 63: PRIMIPAROUS MILK BY POSTPARTUM INTAKE AND ENERGY DENSITY (Tables 4 & 7).

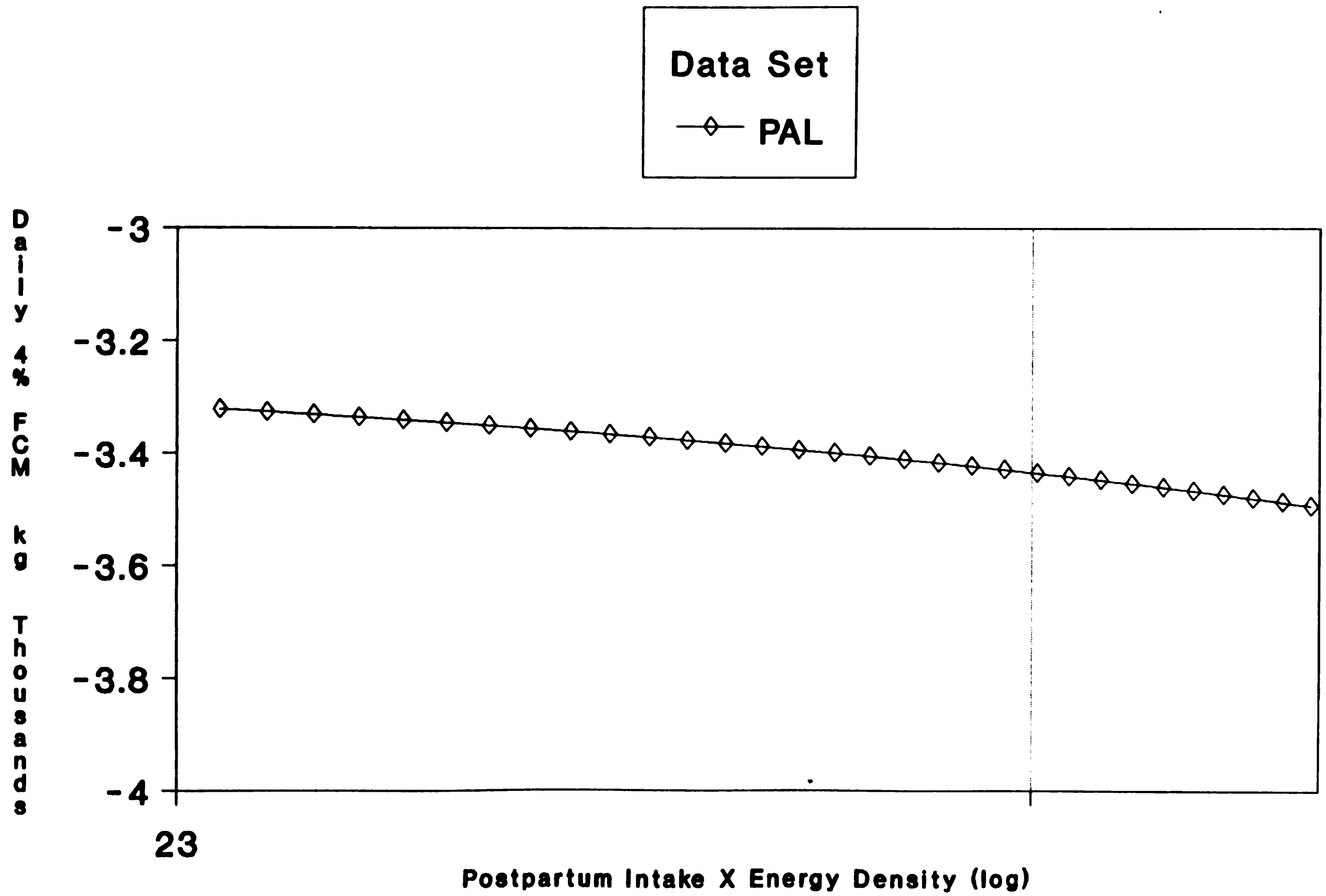

Figure 64: PRIMIPAROUS MILK BY POSTPARTUM INTAKE AND ENERGY DENSITY (Table 11).

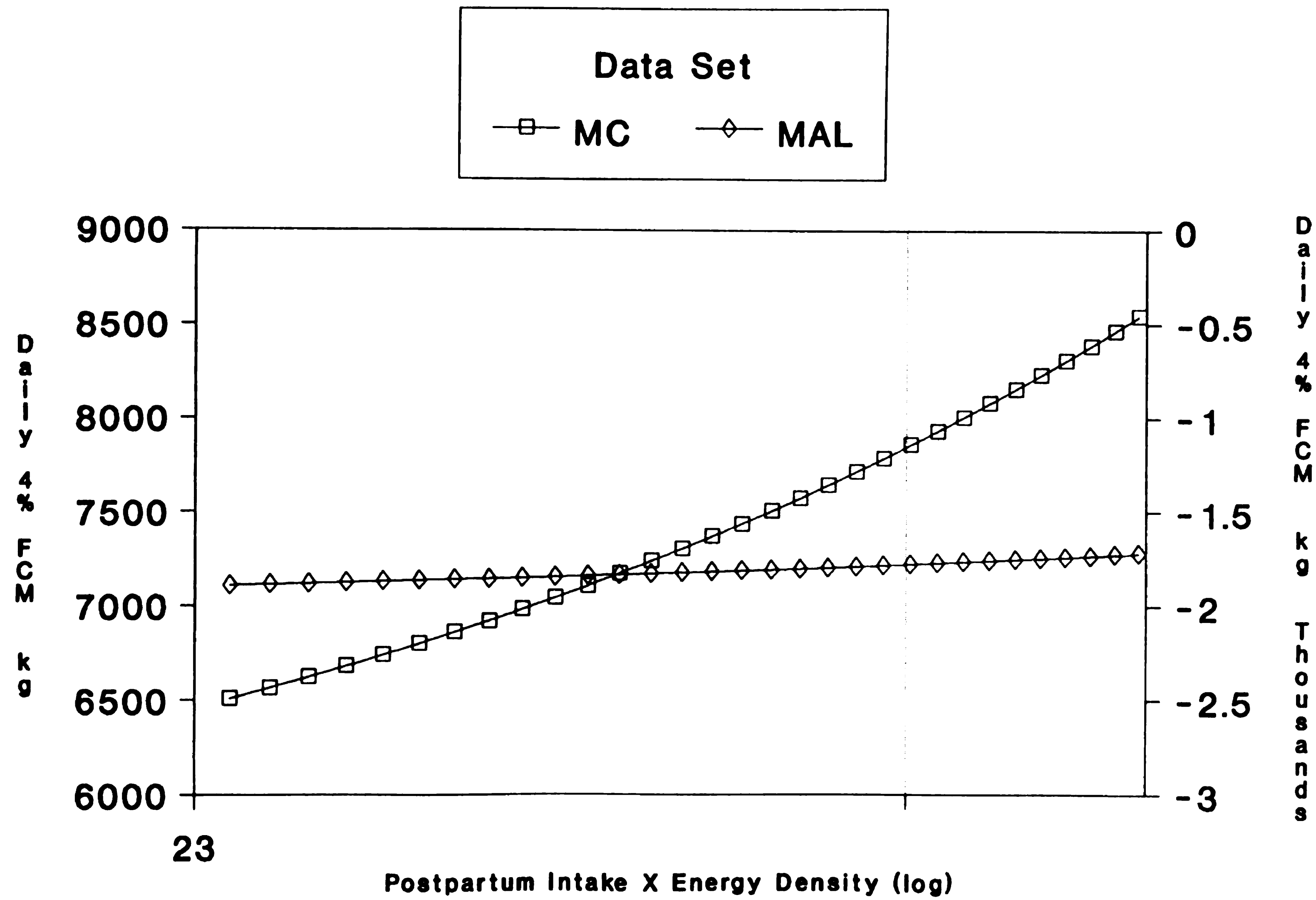

Figure 65: MULTIPAROUS MILK BY POSTPARTUM AND ENERGY DENSITY (Tables 13 & 26).

energy density effect but is probably an inaccurate DMI as the energy density maximum is not unrealistic.

Energy Density

Large herds fed a significantly more energy dense ration for primiparous animal rations (Tables 3 and 6, $P < .10$; Table 10, $P < .05$) while the multiparous animals rations were significantly higher in energy in one data set (Table 25) and approached significance in the other two (Tables 16 and 21). There were no energy differences determined between high and low herds, probably due to the large (> .09) STD DEV for low herds (Tables 3, 6, 10, 16, 21, and 25).

The postpartum energy density (ED) appeared in primiparous models having negative (Figures 1 and 2) and positive (Figure 3) influences. Energy density influenced more multiparous models but still in negative (Figures 10, 11, 17, 19, and 22) and positive (Figures 13, 14, 15, 16, 20, and 21) manors. The energy density quadratic term (ED2) positive (Figures 1, 2, and 9) (Figures 10, 11, 17, and 19) and negative (Figure 4) (Figures 13, 14, 15, 16, 20, 21, and 22) for primiparous and multiparous animals respectively. The linear variable (ED) was significant at $P < .05$ for primiparous (Tables 1 and 4) and multiparous (Tables 13, 14, 17, 18, 22, 23, 26, and 27) models and at $P < .10$ for primiparous (Tables 11 and 12) and multiparous (Table 20) models. The quadratic term (ED2) was highly significant ($P < .05$) for multiparous animal models (Tables

13, 14, 17, 18, 22, 26, and 27), significant at P < .10 for two primiparous models (Tables 1 and 12) and one multiparous model (Table 20), and approached significance for one primiparous model (Table 11). The magnitude, significance level, and number of models the energy density terms (ED and ED2) illustrate its importance to production particularly for multiparous animals. Figures 66-69 did not clearly identify an optimal level for postpartum ration energy density but do demonstrate that response to energy is not consistent even within parities. As expected, energy density (ED) was negatively correlated (> .83) with ADF for primiparous (Appendix Tables 5, 12, and 20) and multiparous (Appendix Tables 29, 36, and 43) animals. The multiparous complete (MC) data set demonstrated a negative correlation (-.5344) between energy density (ED) and body weight (WT) (Appendix Table 29).

<u>Acid Detergent Fiber</u>

Acid detergent fiber levels (ADF) had positive, (Figures 1, 3, 7, and 8) and negative, (Figures 13, 14, 20, and 21) minor influences on production. The quadratic term (ADF2) was consistently negative for primiparous (Figures 1, 3, 6, 7, and 8) and positive for multiparous (Figures 13, 14, 20, and 21) animals both again at minor levels. The linear (ADF) and quadratic (ADF2) terms were always significant at the P < .10 level (Tables 2, 13, 15, 23, and 28) or at the P < .05 level (Tables 1, 2, 4, 7, 8, 9, 11, 12, 13, 15, 17, 18, 22, 23, 26, and 27). Apparently

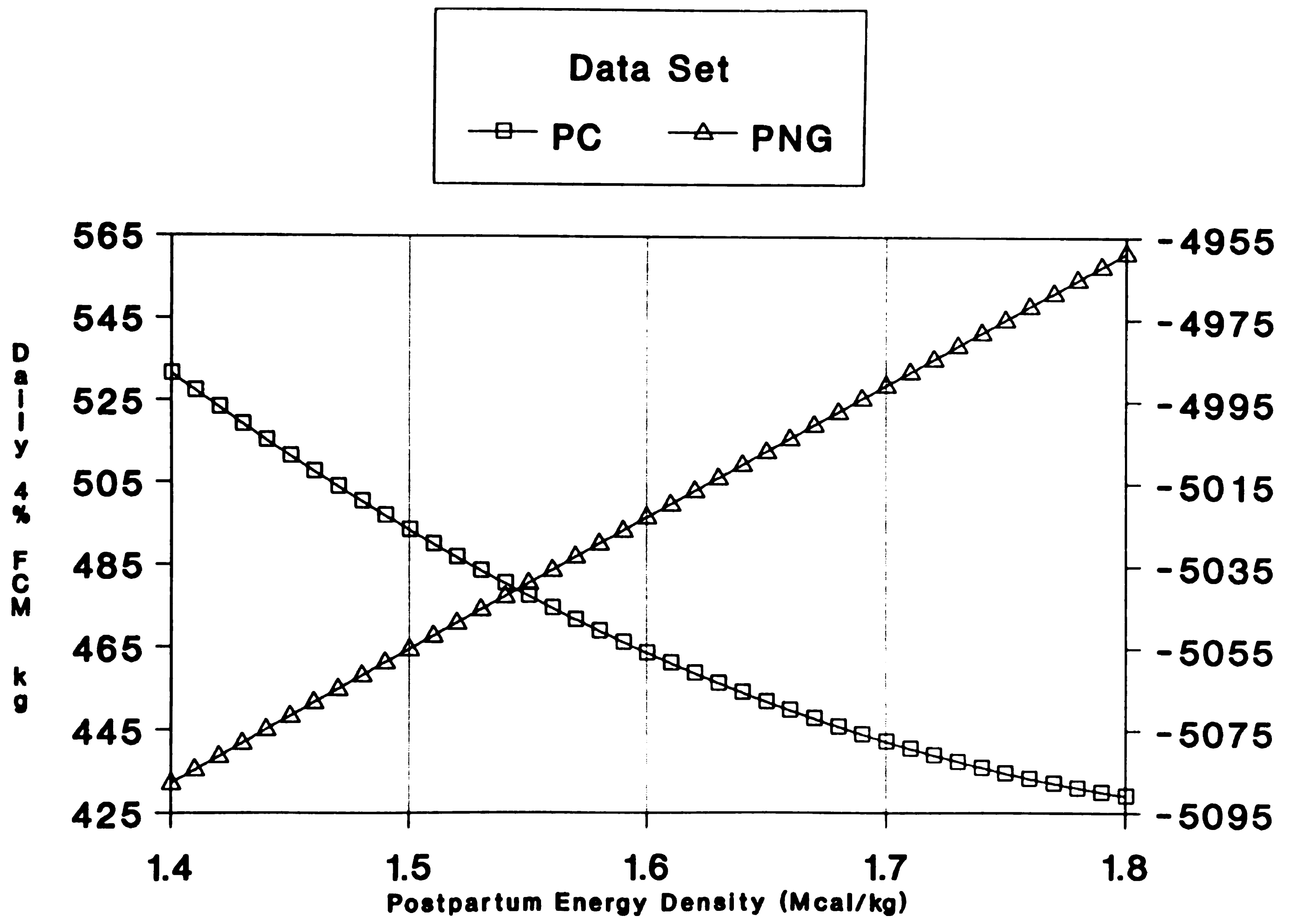

Figure 66: PRIMIPAROUS MILK BY POSTPARTUM ENERGY DENSITY (Tables 1 & 4).

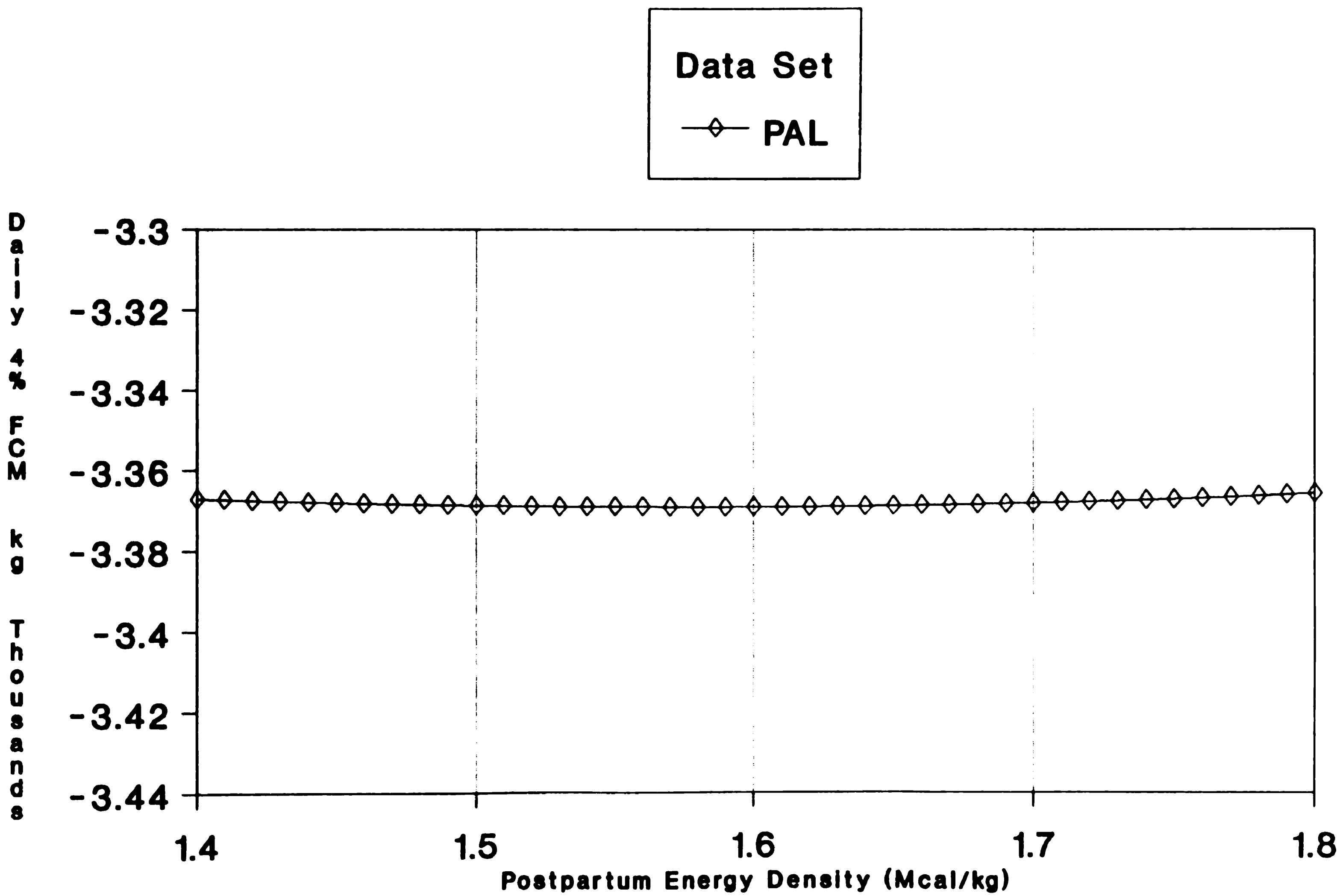

Figure 67: PRIMIPAROUS MILK BY POSTPARTUM ENERGY DENSITY (Table 11).

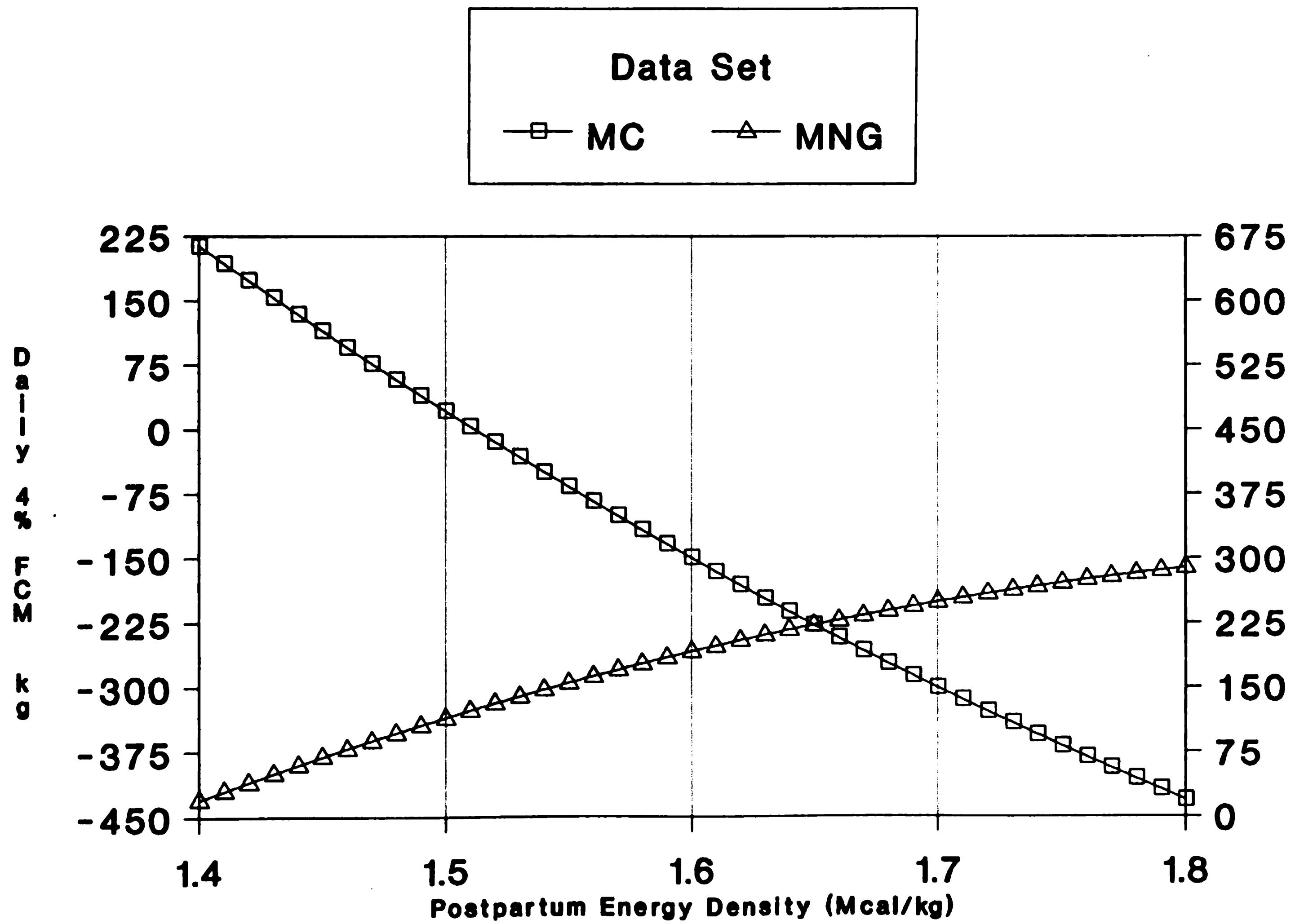

Figure 68: MULTIPAROUS MILK BY POSTPARTUM ENERGY DENSITY (Tables 13 & 17).

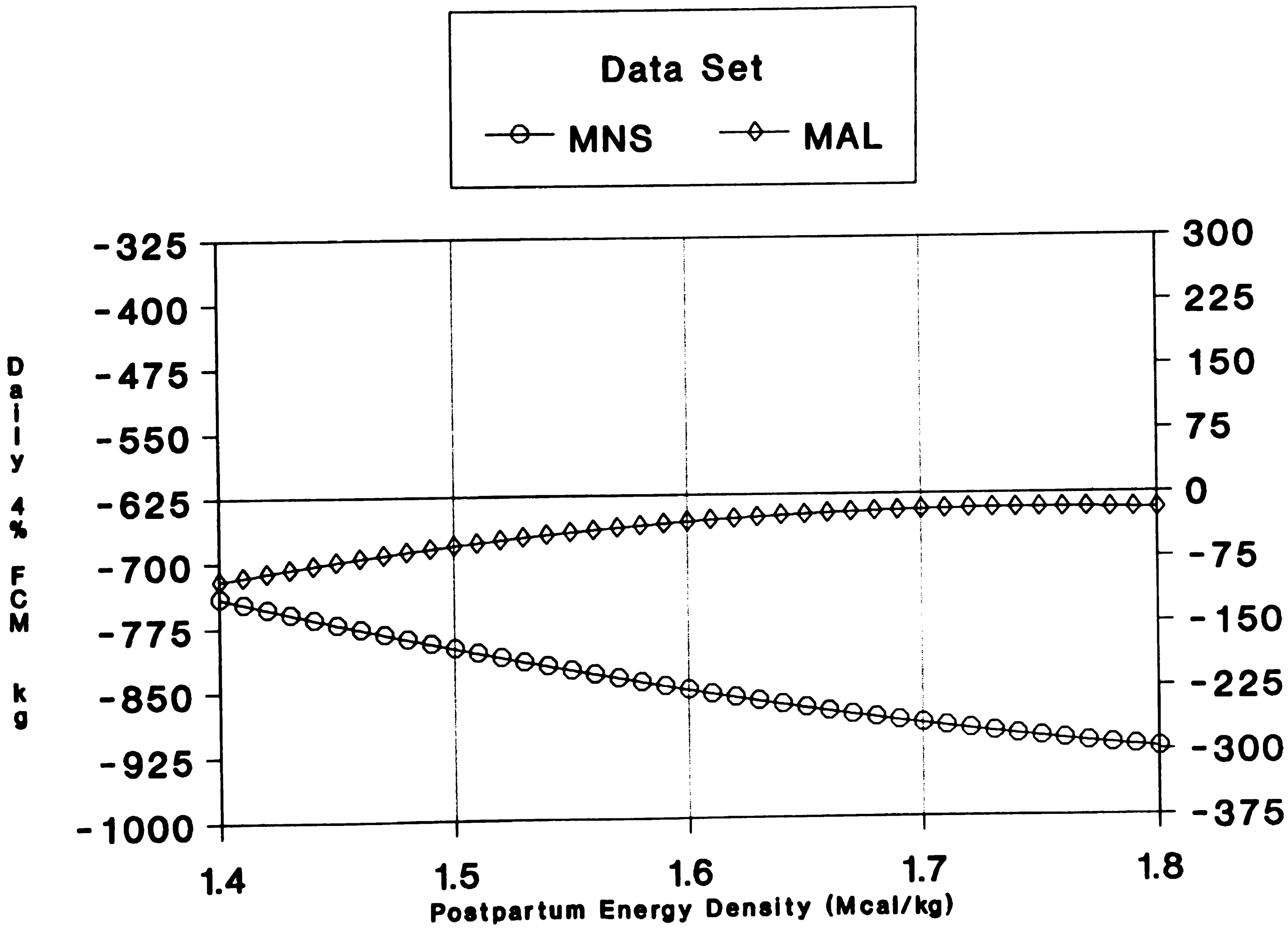

Figure 69: MULTIPAROUS MILK BY POSTPARTUM ENERGY DENSITY (Tables 22 & 26).

primiparous animals have production maximized in the ADF range of 17.4 to 21.7 % (Tables 1, 4, 7, and 11) (Figures 70 and 71) while multiparous animals production is minimized at 12.1 to 17.9 % (Tables 13, 17, and 26) (Figures 72 and 73). A significant correlation was found between ADF and body weight (WT) in the complete, multiparous (MC) data set (Appendix Table 29) and with energy density (ED) as mentioned previously (Appendix Tables 5, 12, 20, 29, 36, and 43).

Apparently the multiparous animals are much more efficient fiber fermentors as they respond favorably to a higher level of ADF. The primiparous animals may be limited fermentors due to a smaller ADF intake level and therefore a smaller fiber mat. One could further conclude that primiparous animals need a more highly digestible fiber and more closely monitored carbohydrate levels.

Although the magnitude was minor their consistent directions of influence support recommendations of minimum fiber levels needed to maintain proper fermentation and therefore FCM yield (Lofgren and Warner, 1970). Patton (1989) would suggest that the early lactation homeorhesis, discussed by Bauman and Currie (1980), overwhelms the fiber control on intake.

A further limitation to production of having ration ADF levels too high, is a reduction in energy intake borne out by the high, negative correlations (approximately -.85) of ADF and energy density (ED) and supported by research

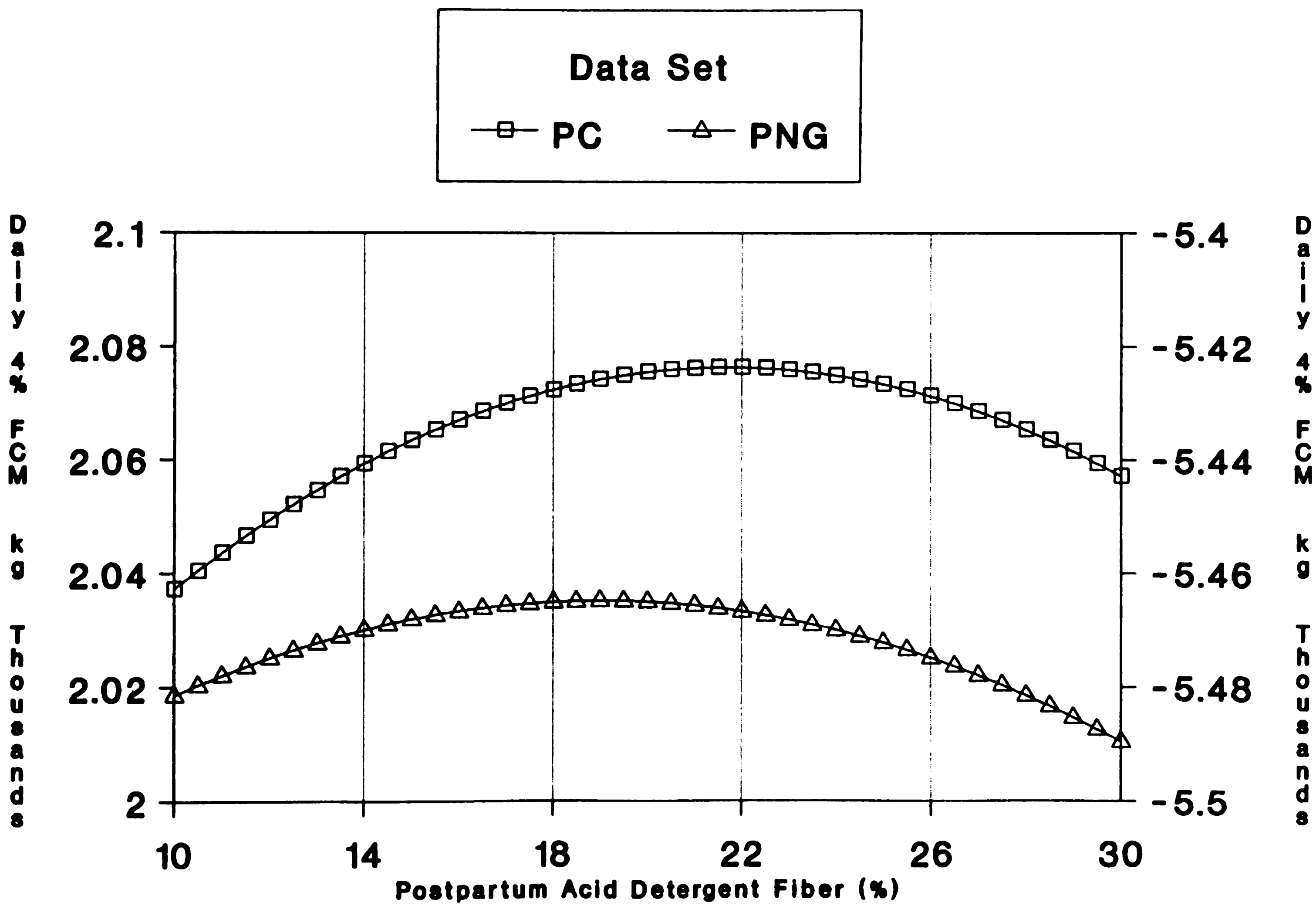

Figure 70: PRIMIPAROUS MILK BY POSTPARTUM ACID DETERGENT FIBER (Tables 1 & 4).

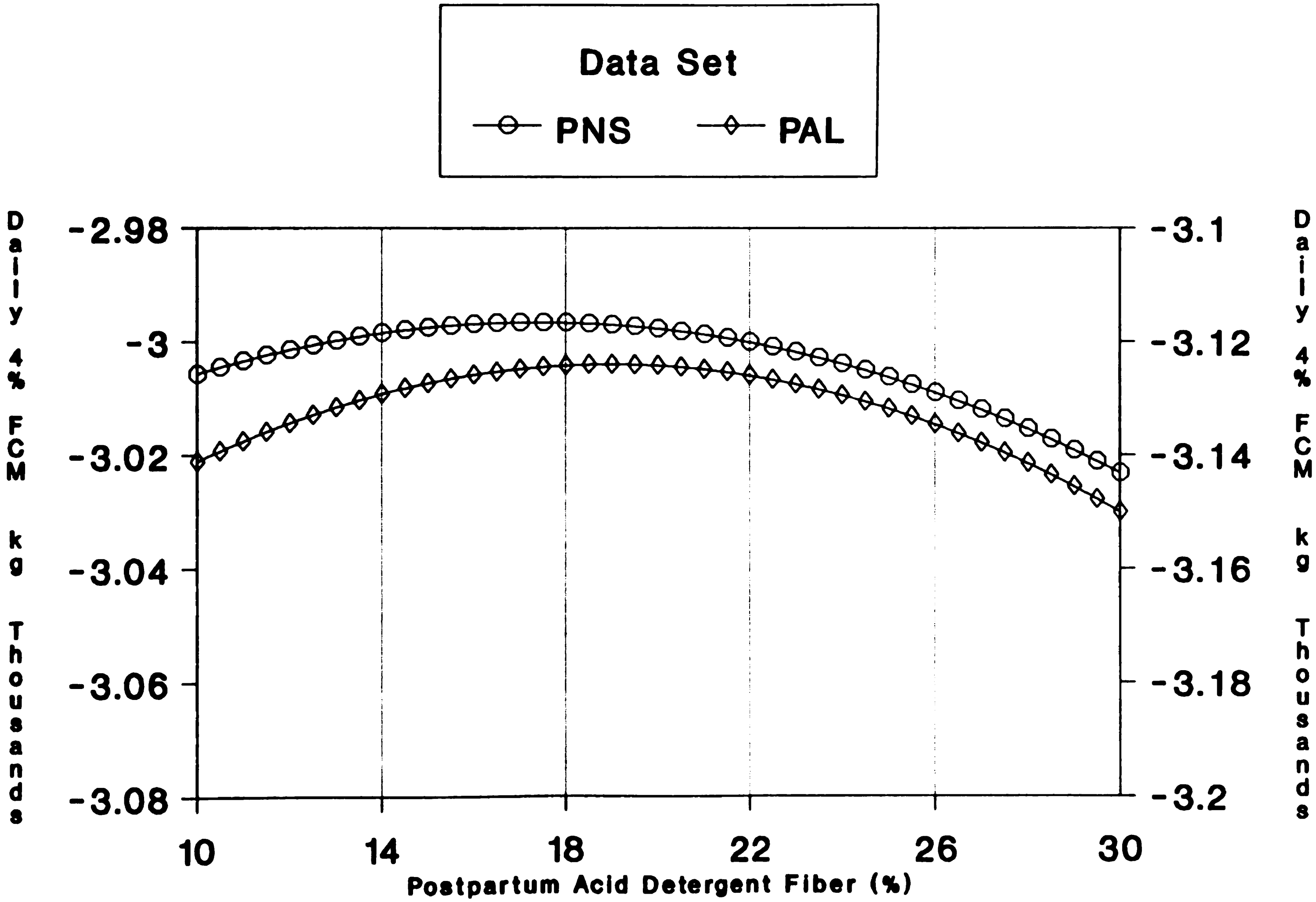

Figure 71: PRIMIPAROUS MILK BY POSTPARTUM ACID DETERGENT FIBER (Tables 7 & 11).

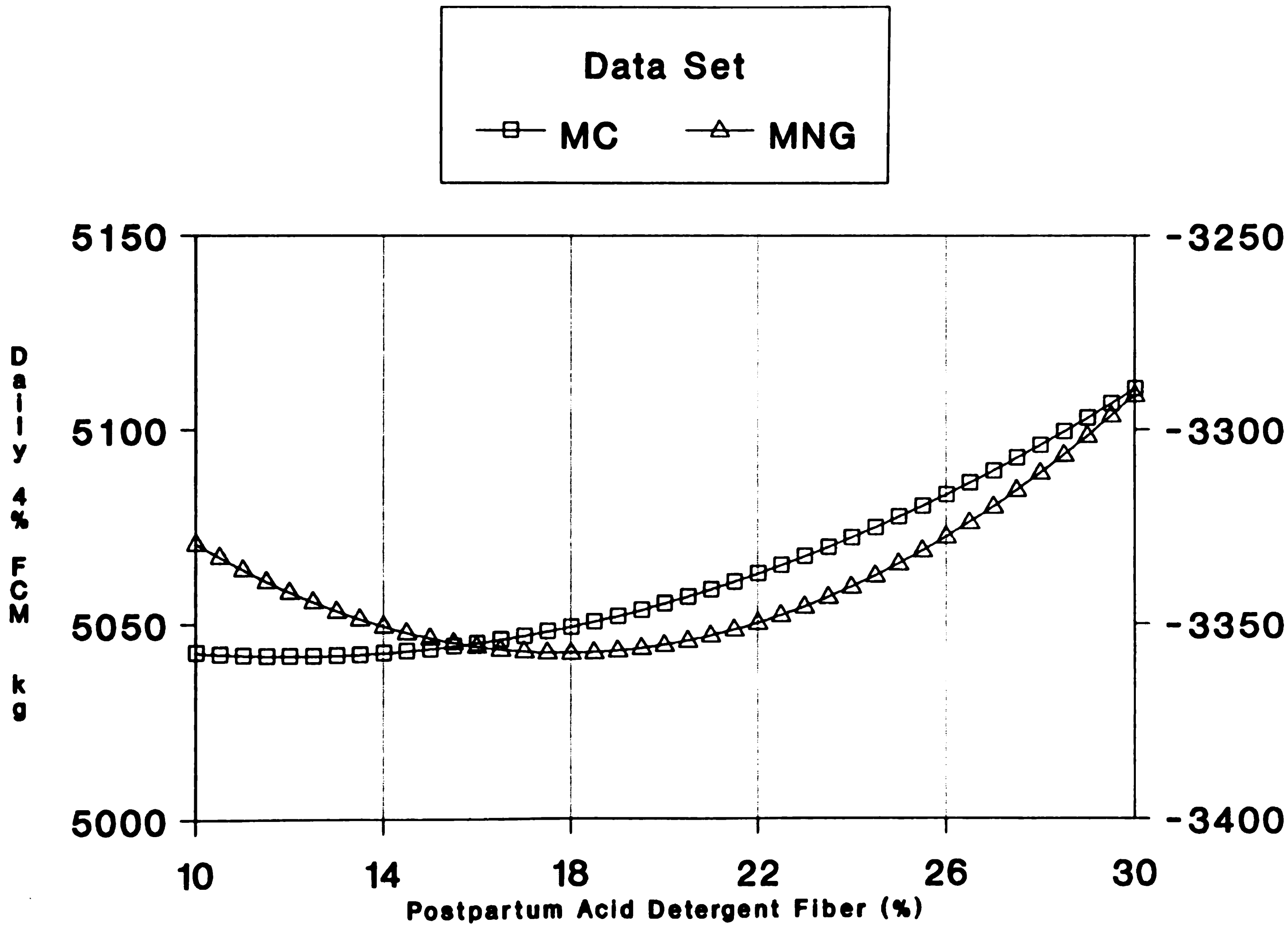

Figure 72: MULTIPAROUS MILK BY POSTPARTUM ACID DETERGENT FIBER (Tables 13 & 17).

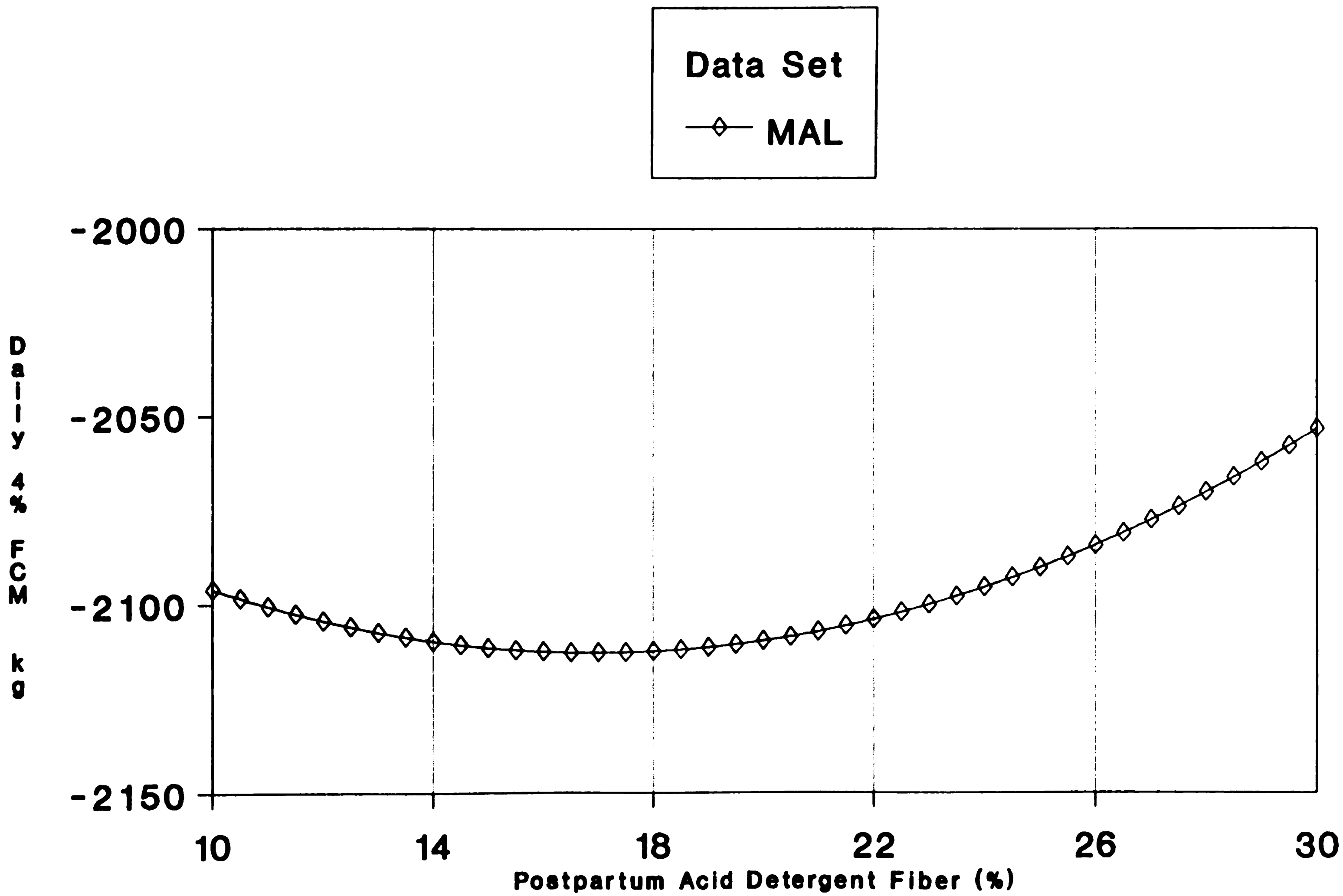

Figure 73: MULTIPAROUS MILK BY POSTPARTUM ACID DETERGENT FIBER (Table 26).

(Mertens, 1987). It would appear, then, that primiparous and multiparous animals do have differing nutritional guidelines and should be managed accordingly.

Energy Density and Body Condition Interaction

Postpartum energy density (ED) and BCS interacted consistently within parity being positive for primiparous (Figures 1, 5, 7, and 8) and negative for multiparous (Figures 13, 14, 17, 20, and 21) animals with significance at the $P < .10$ (Tables 7, 11, 17, 22, and 27) and $P < .05$ (Tables 1, 18, and 26) levels. Graphs (Figures 74-77) again show production response differences between parity levels with primiparous animals responding favorably and multiparous negatively (except for PNS) with increasing energy density (ED) and BCS).

The multiparous data set excluding genetics (MNG) had a negative association of the energy density by BCS (EDXBCS) interaction with production coincided with higher energy density (ED) and lower BCS for larger herds (Table 21). The multiparous data set which excluded SCC (MNS) exhibited an opposite influence on production but again with larger herds having higher energy density (ED) and lower BCS values (Table 25).

Energy Density and Health Interaction

Energy density (ED) and health score (HEALTH) did influence production positively in one primiparous model (Figure 9) and 3 multiparous models (Figures 10, 11, and 12) and negatively in several multiparous models (Figures

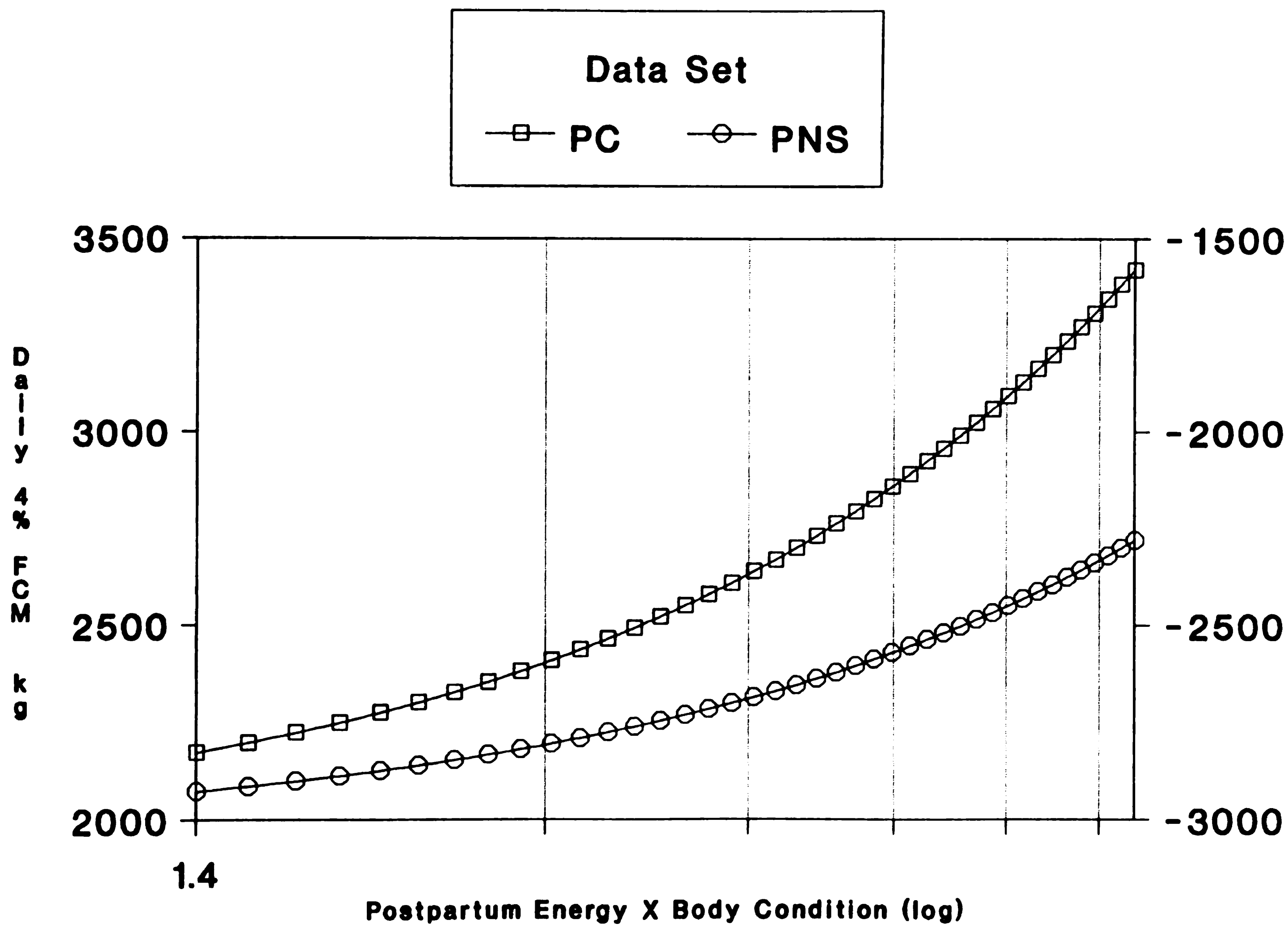

Figure 74: PRIMIPAROUS MILK BY POSTPARTUM ENERGY AND BODY CONDITION (Tables 1 & 7).

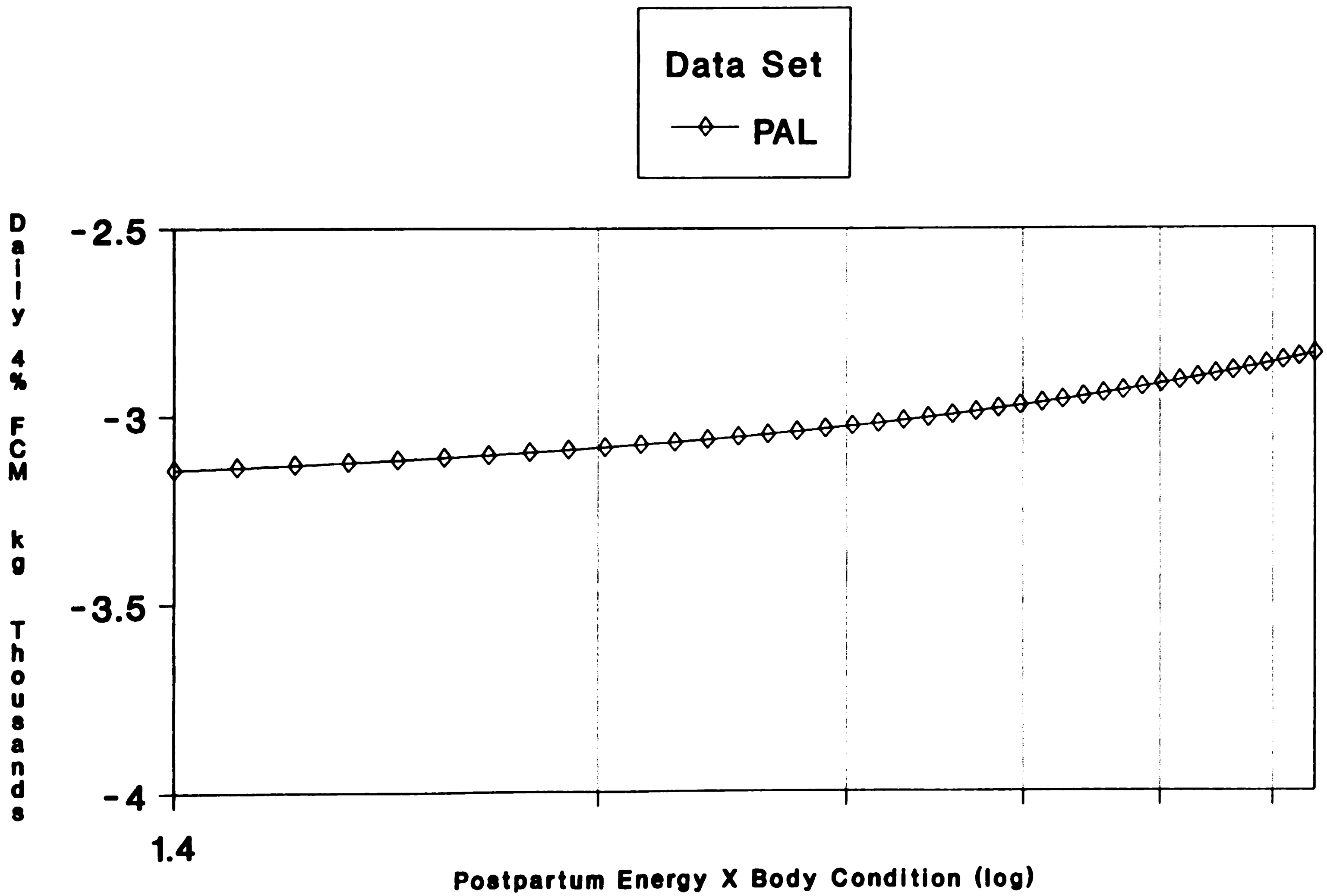

Figure 75: PRIMIPAROUS MILK BY POSTPARTUM ENERGY AND BODY CONDITION (Table 11).

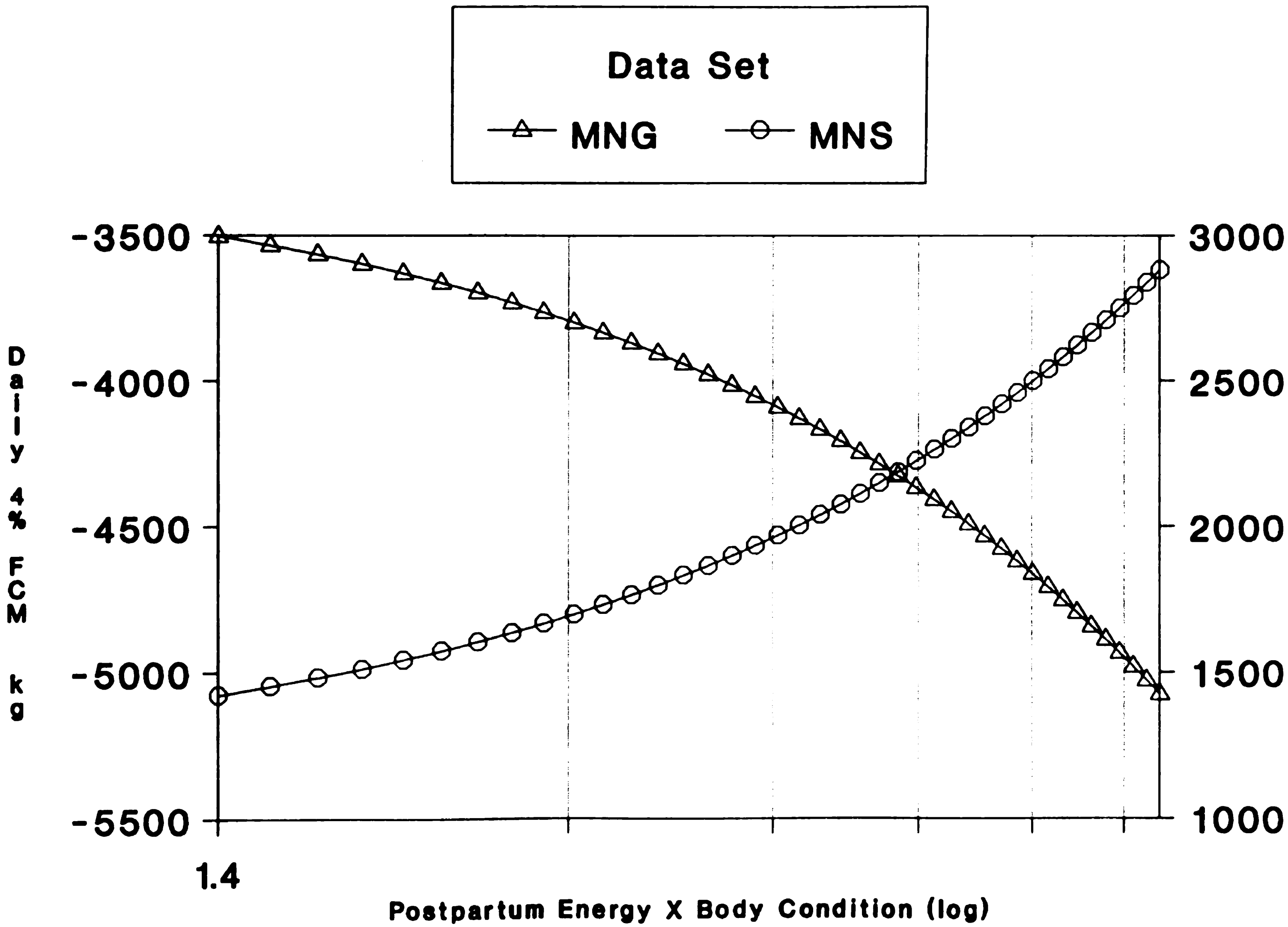

Figure 76: MULTIPAROUS MILK BY POSTPARTUM ENERGY AND BODY CONDITION (Tables 17 & 22).

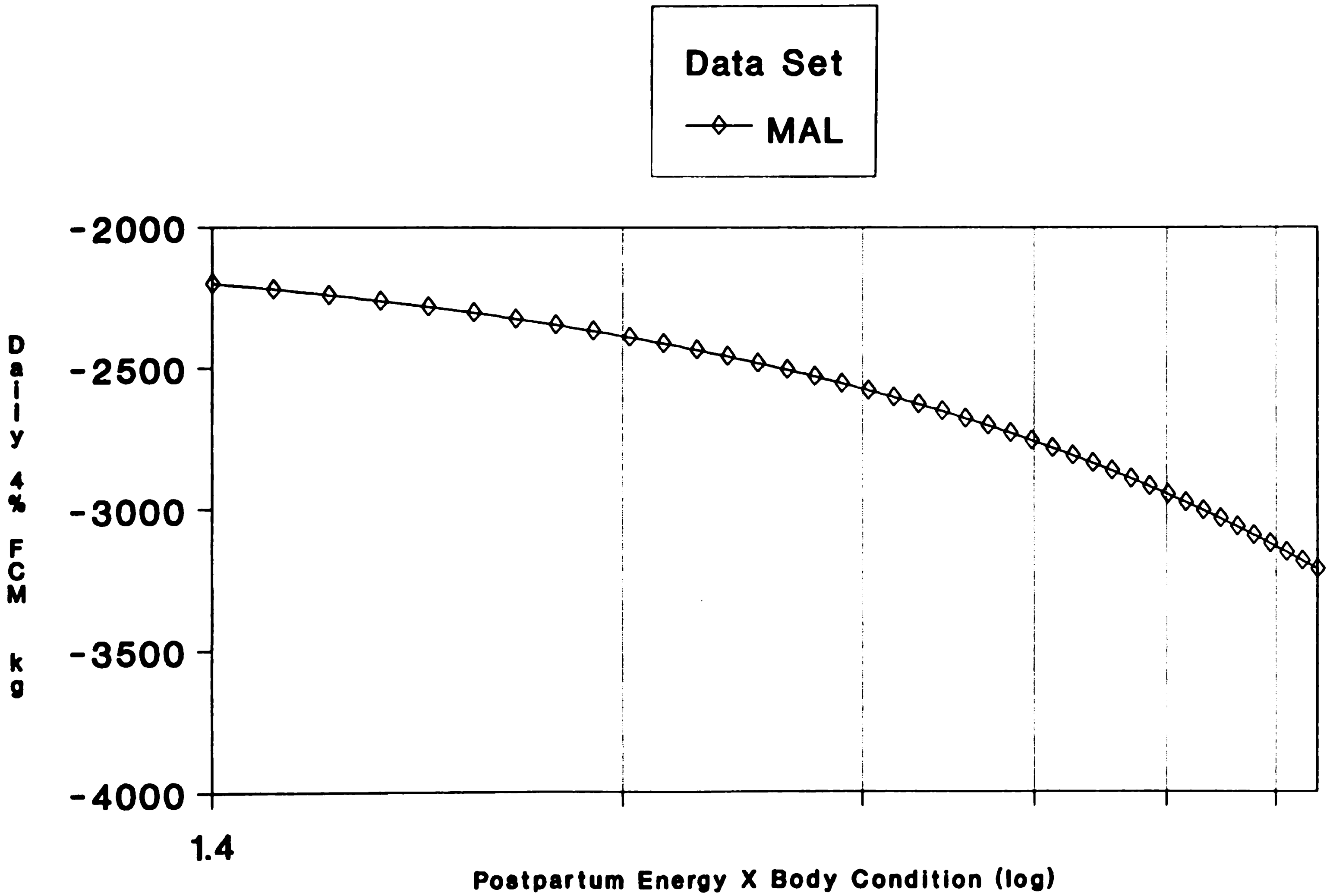

Figure 77: MULTIPAROUS MILK BY POSTPARTUM ENERGY AND BODY CONDITION (Table 26).

13, 15, 16, 20, 21, and 22). The differences in the magnitude and direction of influence make clear cut conclusions difficult. However, with the significance being high ($P < .05$) in several multiparous models (Tables 13, 14, 15, 26, 27, and 28) and being (Tables 12, 19, and 20) or approaching (Table 17) significance at $P < .10$ in other primiparous and multiparous models, one can conclude that energy density and health do interact and can be detrimental to production for multiparous animals (Figures 78 and 79). The differences in multiparous animal production response are not consistent, however, and leads one to think that some herd managers are able to properly care for and therefore minimize any harmful effects of a more energy dense ration. This may be accomplished with more feedings/day and/or feeding rumen buffers.

Crude Protein

CP was higher ($P < .10$) for large herds regardless of parity or data set (Tables 3, 6, 10, 16, 21, and 25). High herds also had greater CP ($P < .10$) in all but one multiparous data set (Tables 3, 6, 10, 16, and 21) due to low herds having a larger STD DEV (Table 25) for CP. This is a good illustration of what a few extreme data points (herds) in a small data set can do to any generalized conclusions.

Primiparous (Figures 1, 3, 5, and 8) and multiparous (Figures 10, 11, and 12) animals exhibited positive production responses to increasing levels of CP with the

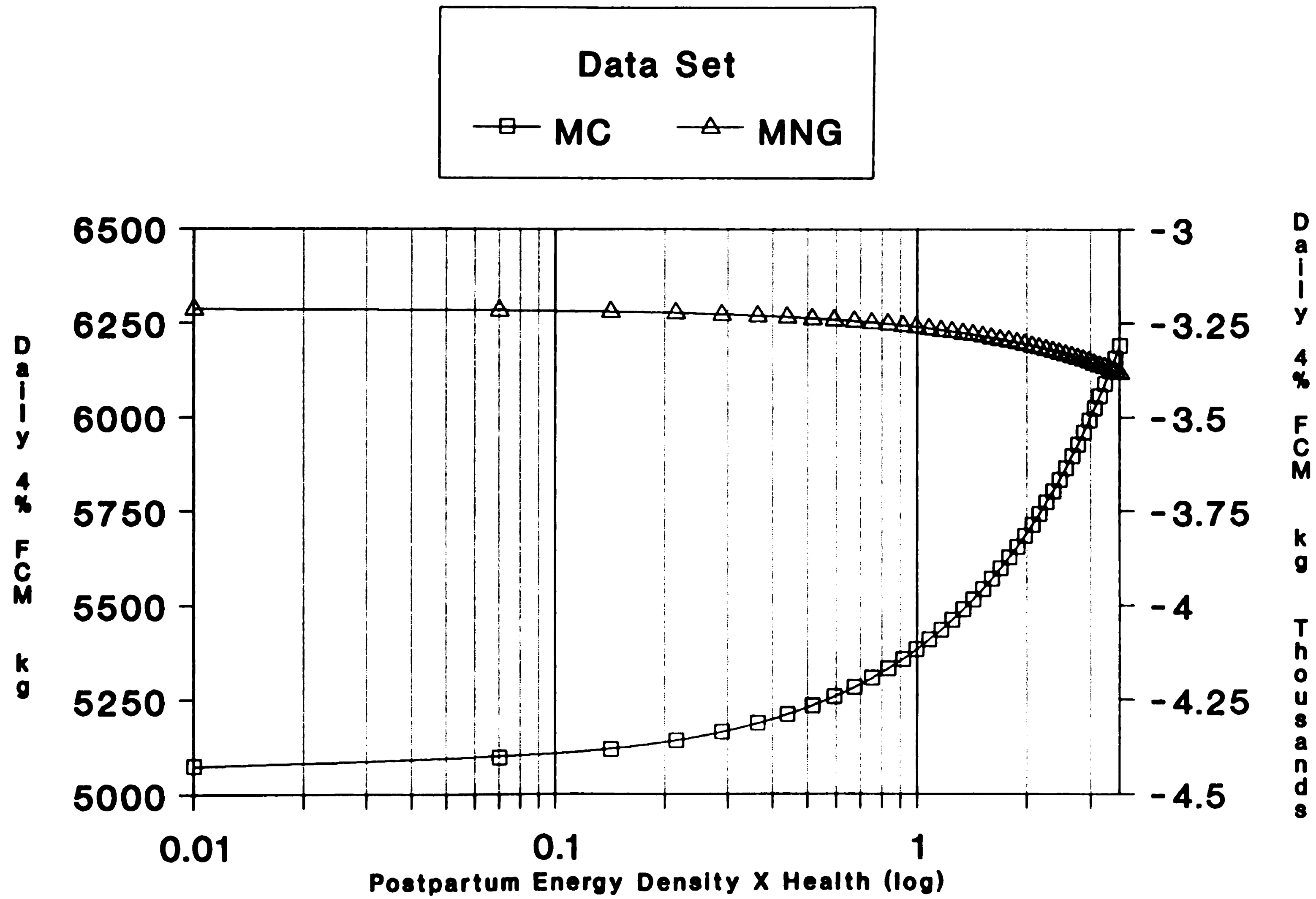

Figure 78: MULTIPAROUS MILK BY POSTPARTUM ENERGY AND HEALTH (Tables 13 & 17).

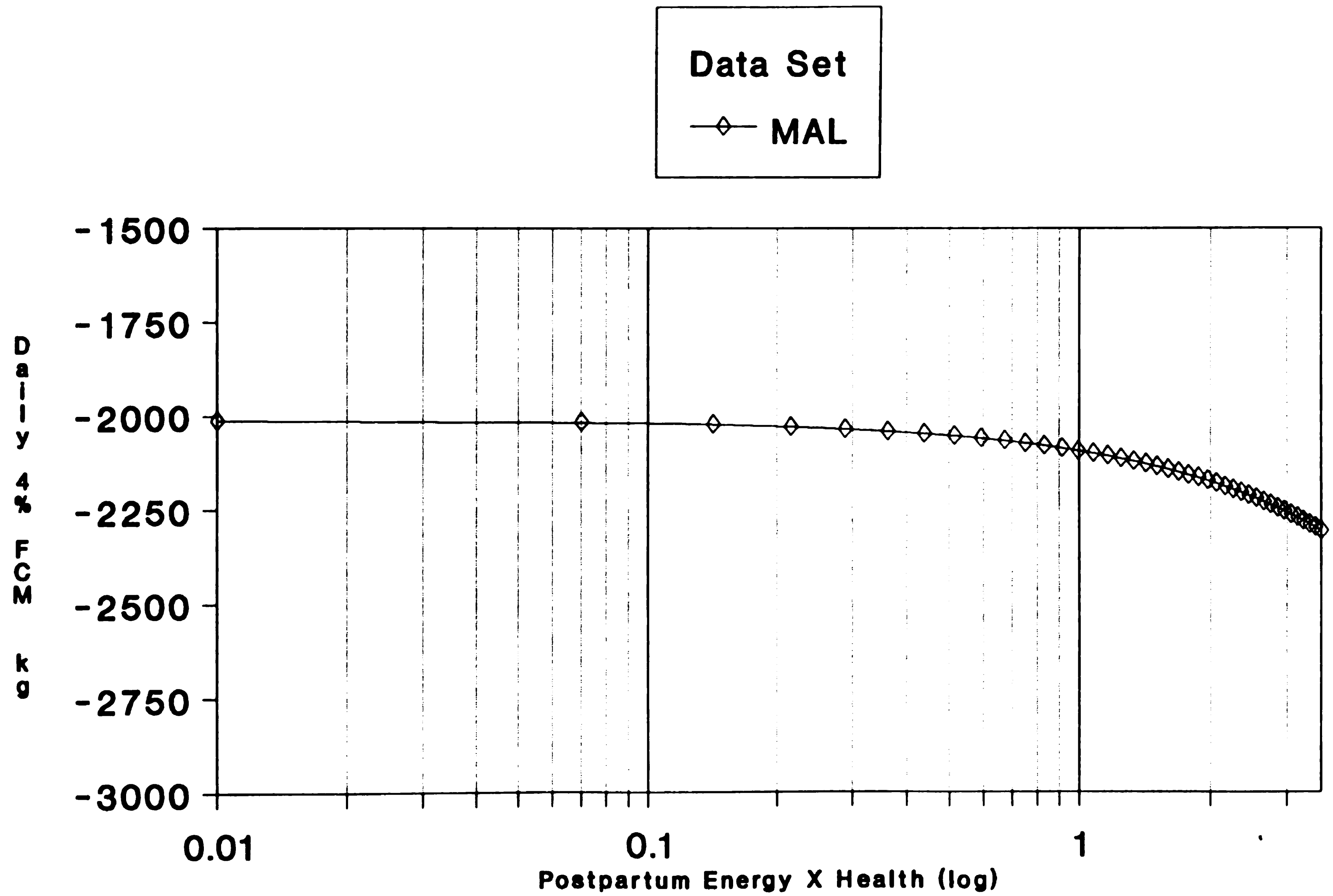

Figure 79: MULTIPAROUS MILK BY POSTPARTUM ENERGY AND HEALTH (Table 26).

quadratic term (CP2) being negative (Figures 5, 10, 11, and 12). The terms significance CP and CP2 at P < .05 in several parity models (Tables 4, 7, 11, 13, 14, 15, 26, and 27) and at (Tables 1, 8, 9, 18, 22, 23, and 28) or approaching P < .10 in others (Tables 5, 8, 12, and 17). Crude protein (CP) levels continue the pattern of differences between primiparous and multiparous animals in production response to different levels in the postpartum ration (Figures 80-83) noting that in the complete, multiparous (MC) data set an optimal CP level of 18.6 can be determined (Table 13).

The consistently higher protein (CP) values for high producing herds across data sets and parities agrees with the reports of increased production with higher ration CP contents (Roffler and Thacker, 1983a and 1983b; Roffler *et al*., 1978). The importance of protein (CP) to primiparous production level disagrees with Cressman *et al*. (1980) who reported an increase of milk with higher protein for multiparous animals only.

Crude Protein and Energy Density Interaction

The energy and protein interaction (EDXCP) influenced primiparous animals in more models (Figures 1, 3, 4, 6, 7, and 9) than multiparous (Figure 12) but in negative and positive directions. The interaction was significant to only one multiparous model (Table 15) and approached significance in other primiparous (Tables 4, 8, and 12) and multiparous (Tables 26 and 27) models. The production of

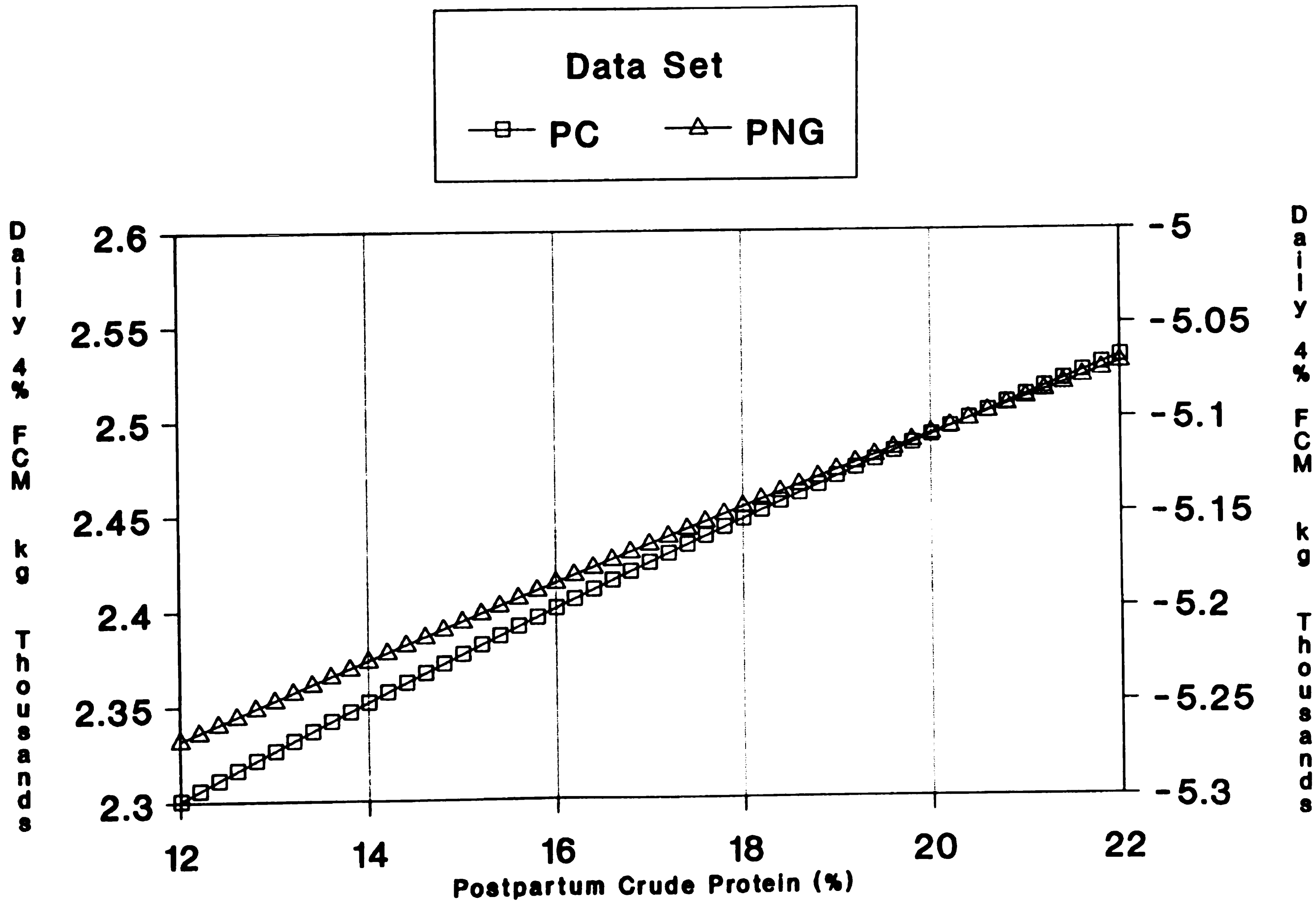

Figure 80: PRIMIPAROUS MILK BY POSTPARTUM CRUDE PROTEIN (Tables 1 & 4).

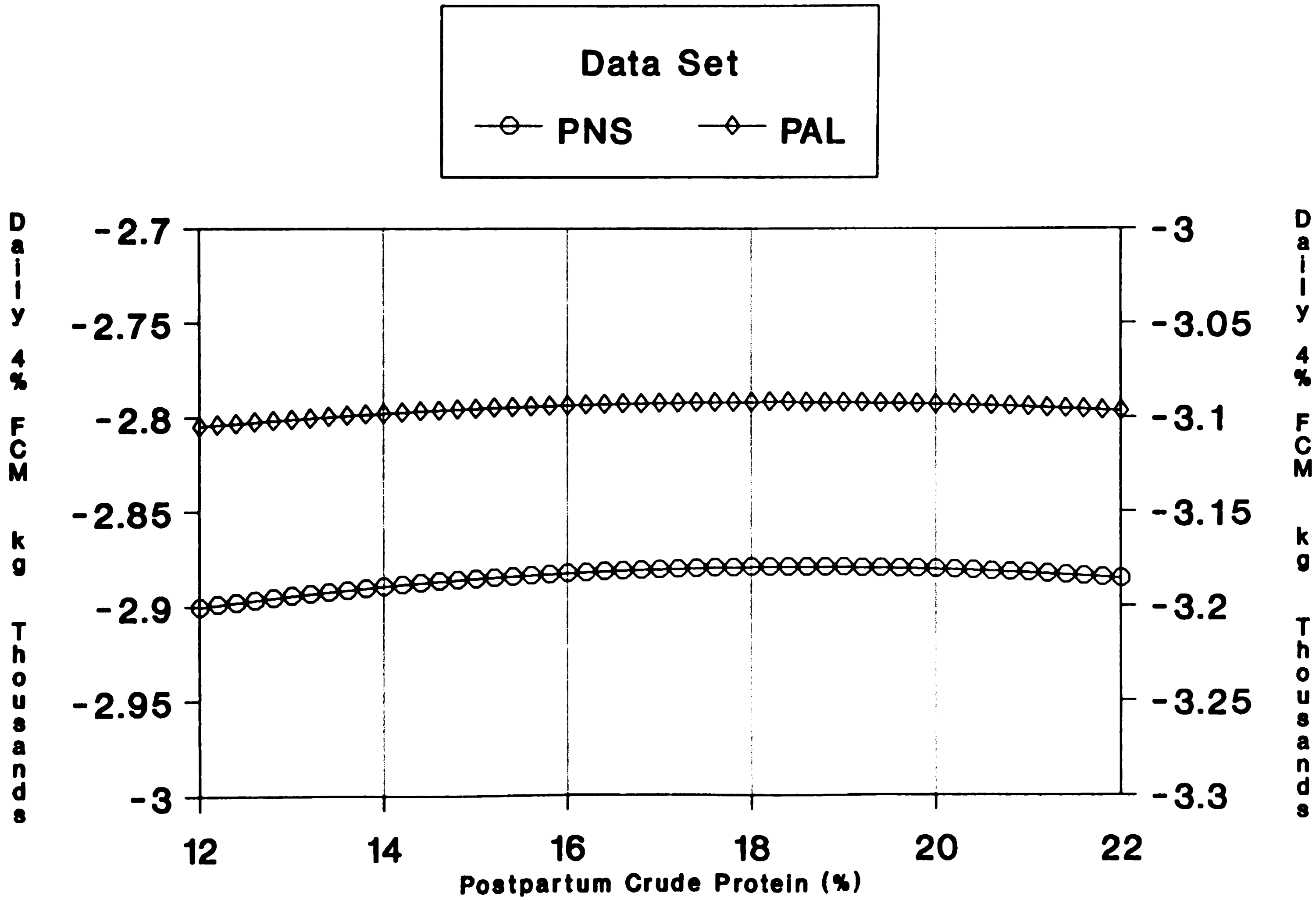

Figure 81: PRIMIPAROUS MILK BY POSTPARTUM CRUDE PROTEIN (Tables 7 & 11).

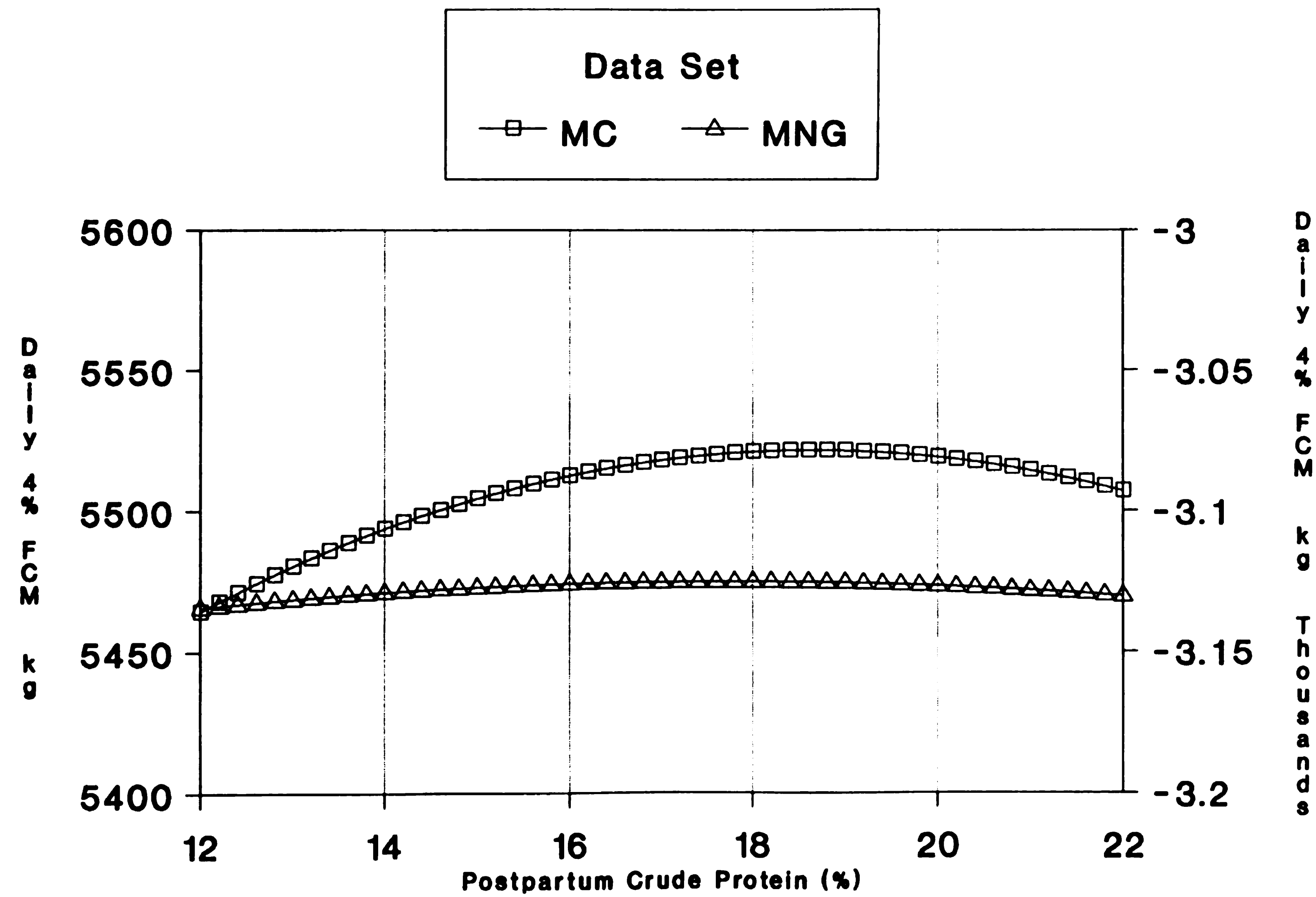

Figure 82: MULTIPAROUS MILK BY POSTPARTUM CRUDE PROTEIN (Tables 13 & 17).

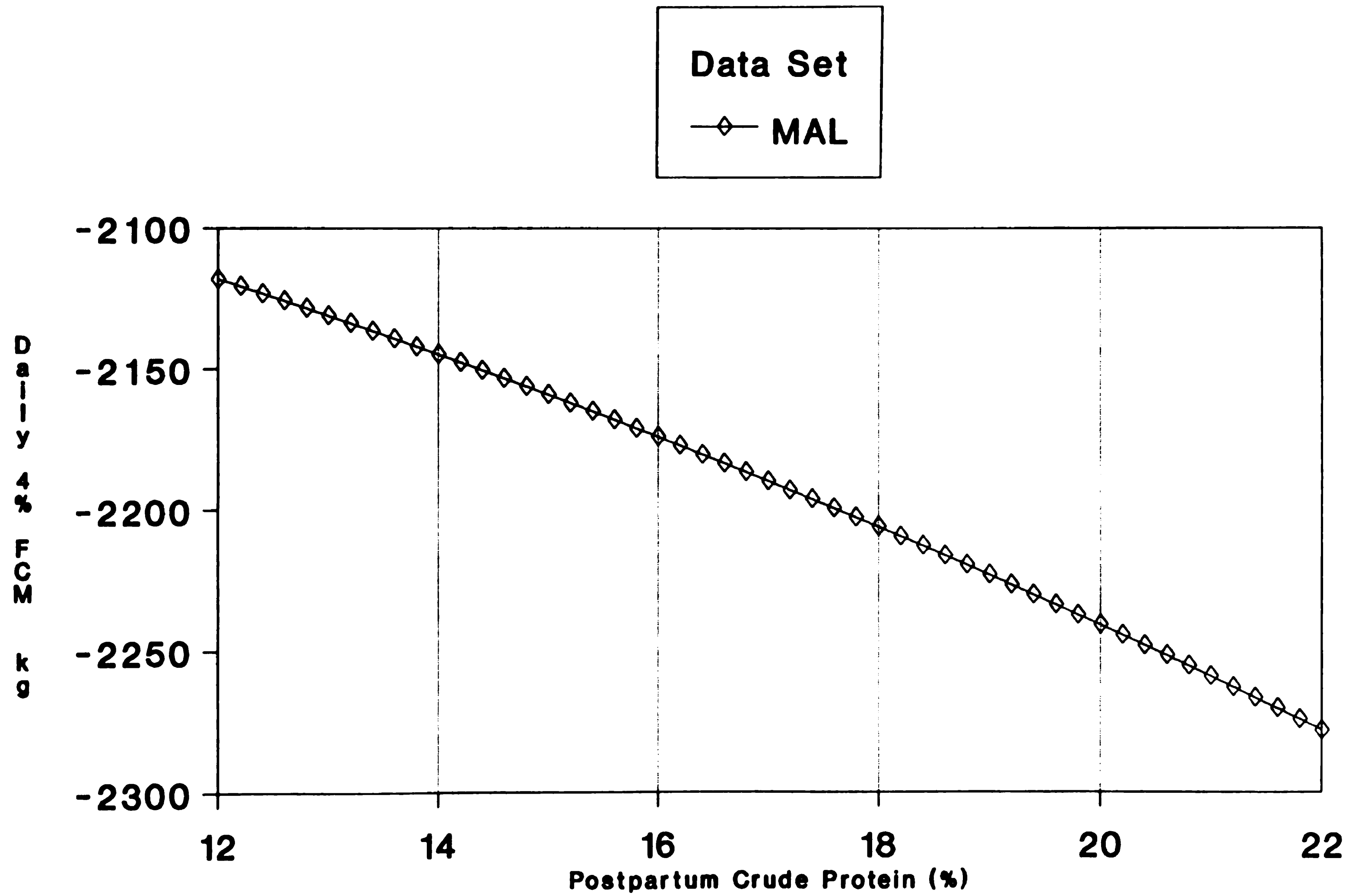

Figure 83: MULTIPAROUS MILK BY POSTPARTUM CRUDE PROTEIN (Table 26).

primiparous animals being negatively associated with increasing energy and protein probably indicates that some low producing herd's production is limited by some other factor ie. genetics, or BCS (Figures 84 and 85).

Variations in negative or positive affects from this study may reflect differences in protein degradibilities and/or carbohydrate fermentation differences. This would then agree with reports (Clark and Davis, 1980; Herrera-Saldan and Huber; 1989; Jaquette _et al_., 1987) that response to added protein is indeed dependent on coordinating degradibility rates of protein and energy. It would appear that some large herds are not taking full advantage of higher energy (ED) and protein (CP) levels as no increase in milk was measured (Tables 3, 6, 10, 16, 21, and 25).

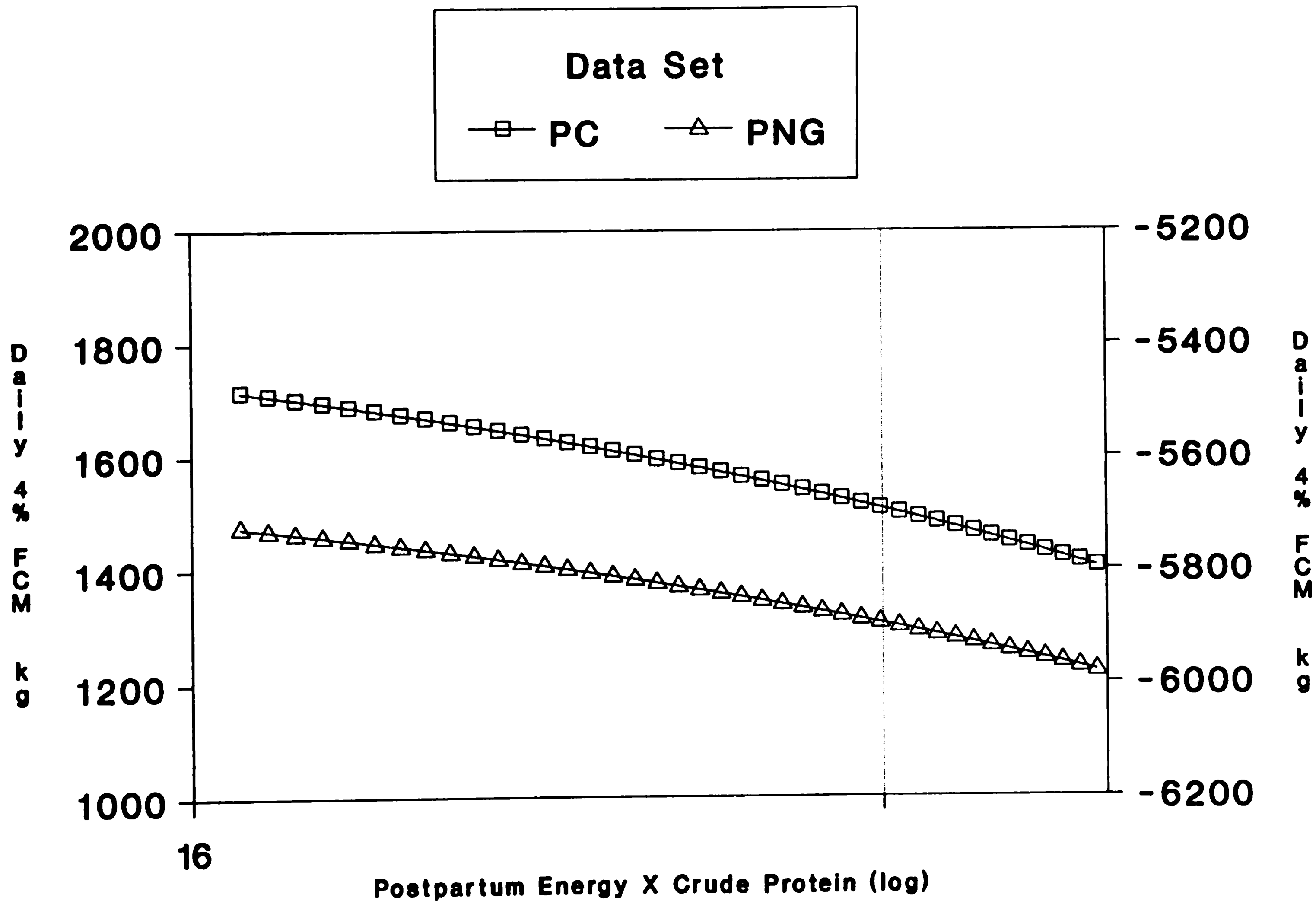

Figure 84: PRIMIPAROUS MILK BY POSTPARTUM ENERGY AND CRUDE PROTEIN (Tables 1 & 4).

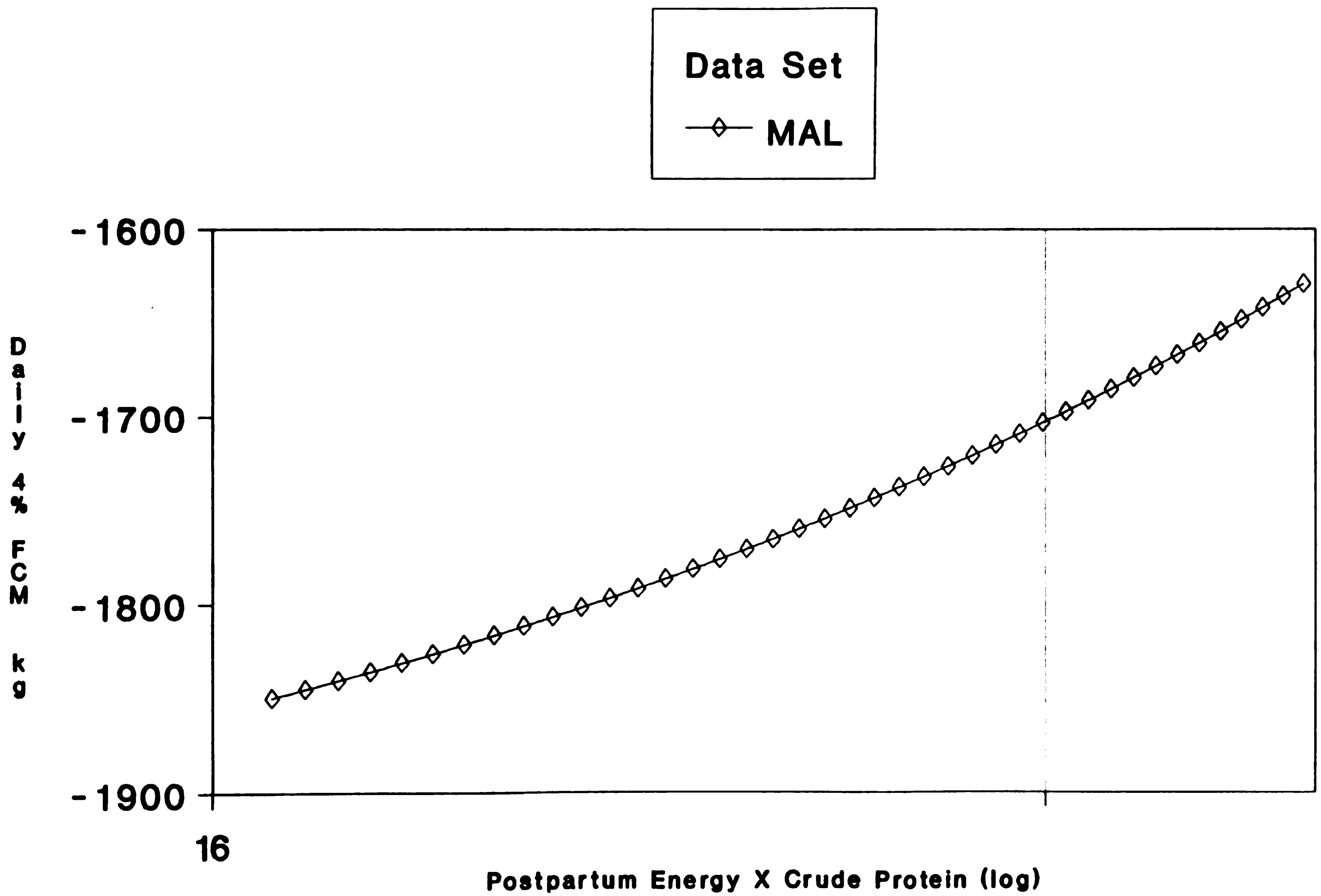

Figure 85: MULTIPAROUS MILK BY POSTPARTUM ENERGY AND CRUDE PROTEIN (Table 26).

SUMMARY AND CONCLUSIONS

Significant production advantages were detected for both primiparous and multiparous animals in high as compared to low producing herds. The reasons for these differences are not as apparent. However, the following general conclusions can be supported or inferred from this study.

Genetic level of animals is very important as high producing herds had significantly higher predicted transmitting ability for milk for animal sires (Tables 3, 6, 10, 16, 21, and 25). These animals have the ability to milk at high levels, if not limited by management. Therefore, selection of sires of higher genetic merit should continue to be recommended. Heifer raising programs are important in that they determine body measures (body weight, withers height at calving) which have a strong positive relationship to primiparous animal milk yield (Tables 2, 4, 5, 7, 8, 9, 11, and 12). Improved facilities and nutrition programs should be emphasized and would have great economic benefits.

Proper prepartum nutrition is important to early lactation milk yield and health problems. Closer monitoring of dry matter and nutrient intakes during the peripartum period could reduce health disorders and enhance production. Furthermore primiparous and multiparous animals differences (Figures 42-54) in response to prepartum energy and protein may indicate 1.) that immediate prepartum nutrient needs may not be adequate for either parity group and 2.) that primiparous animals would benefit from being managed differently prepartum.

Primiparous animals responded differently to most nutritional measures as compared to multiparous animals (Figures 42-85). The differences included are prepartum energy and protein, ADF level, and postpartum energy and protein levels. The conclusion from such is that primiparous animals do need to be managed differently (separately) from multiparous animals. Energy density is an important factor to milk yield. However, it appears, to have its desired effect on production, the energy level must be considered jointly with protein (Tables 4, 8, 12, 15, 26, and 27).

The tendency, while not significant singly, for high producing herds to have higher body conditions scores, shorter dry periods and previous lactations, coupled with higher protein levels in the lactation ration, and greater genetic potential, may indeed indicate the importance of paying attention to details in all areas of management.

The study was probably limited the model's ability to accurately predict production response to different variables due to DMI being "reported" and not actually measured for individual animals, hence some unrealistic influences of DMI on production (Figures 55 and 57). Measuring prepartum DMI would have made the prepartum energy and protein variables much more accurate. Prepartum nutrition's interaction with health score could be more confidently interpreted by using DHI herd health records now available.

Nutritional measures probably should include evaluating degradible and undegradible intake protein (DIP and UIP) levels. Furthermore, the non-structural carbohydrate levels should be considered to more accurately interpret the ADF, energy density, and crude protein interaction.

EFFECTS OF DAIRY HERD MANAGEMENT MEASURES ON EARLY LACTATION MILK YIELD

Volume II

By

Kevin Jay Dill

A DISSERTATION

Submitted to
Michigan State University
in partial fulfillment of the requirements
for the degree of

DOCTOR OF PHILOSOPHY

Department of Animal Science

1991

APPENDICES

Appendix Table 1

PRIMIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
1	C[a]	2	None	0
	NG[b],NS[c]	4	Dystocia/1	1
2	C,NG,NS	3	None	0
3	NG	3	None	0
4	C	2	Ketosis/1	1
	NG,NS	3	Ketosis/1	1
5	C	9	Metritis/1	1
	NG,NS	10	Metritis/2	2
6	C,NG,NS	2	Metritis/2; Died at Calving/1	2
7	C,NG,NS	3	Displaced Abomasum/1; Sold-Displaced Abomasum/1	1
8	C,NG,NS	3	None	0
9	C,NG,NS	3	None	0

Appendix Table 1 - continued

PRIMIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
10	C	1	Ketosis/1	1
	NG,NS	3	Ketosis/1	1
11	C,NG,NS	2	Metritis/1	1
12	C,NG,NS	3	Retained Placenta/1; Metritis/1	2
13	C,NG,NS	4	Mobility Problems/1	1
14	C	2	Metritis/2	2
	NG,NS	3	Metritis/2	2
15	C,NG,NS	3	None	0
16	C,NG,NS	4	Displaced Abomasum/1	1
17	NG	1	Sold-Low Production/1	1
18	C	2	None	0
	NG,NS	3	None	0

Appendix Table 1 - continued

PRIMPIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
19	NG	4	None	0
20	C,NG,NS	3	Metritis/1	1
21	C,NG,NS	3	None	0
22	NS	3	None	0
23	C	4	None	0
	NG,NS	5	None	0
24	C,NG,NS	4	Twins-Dystocia/1	1
25	C	1	None	0
	NG,NS	3	Sold-Udder Problem/1	0
26	C,NG,NS	3	Metritis/4; Off Feed/1; Down Cow/1; Sold-Injury/1	6
27	C,NG,NS	3	Metritis/7	7

Appendix Table 1 - continued

PRIMIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
28	C	2	None	0
	NG,NS	3	None	0
29	C	1	None	0
	NG,NS	3	None	0
30	C	1	Dystocia/1	1
	NG,NS	3	Dystocia/1; Dysentry/1	2
31	C	1	Extremely High Temperature/1	1
	NG,NS	2	Extremely High Temperature/1; Retained Placenta/1	2
32	C	2	Ketosis/1	1
	NG,NS	3	Ketosis/3; Cut Teat/1	4
33	C	1	None	0
	NG,NS	4	None	0
34	C,NG,NS	3	Retained Placenta/1; Sold-Low Production/1	1

Appendix Table 1 - continued

PRIMIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
35	C,NG,NS	3	Retained Placenta/1	1
36	C,NG,NS	3	Metritis/1; Udder Edema/1	2
37	NG	3	None	0
38	C,NG,NS	4	Teat Injury/1; Sold-Dairy Purposes/1	1
39	C	1	None	0
	NG,NS	3	None	0
40	NS	3	Sold-Dairy Purposes/1	0
41	C,NG,NS	3	None	0
42	C	1	None	0
	NG,NS	2	None	0
44	C,NG,NS	3	Laminitis/2	2

[a]C = Complete data
[b]NG = No genetic data
[c]NS = No somatic cell count data

Appendix Table 2

Appendix Table 2

MULTIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
1	C[a],NG[b],NS[c]	8	Milk Fever/2; Retained Placenta/2; Sold-Injury/1; Sold-Low Production/1	4
2	C,NG,NS	3	Metritis/2	2
3	NG	3	None	0
4	C,NG,NS	3	None	0
5	C	3	None	0
	NG,NS	5	None	0
6	NG	3	Metritis/3	3
7	C,NG,NS	3	None	0
8	C,NG,NS	2	Ketosis/1; Extremely High Temperature/1; Sold-Displaced Abomasum/1	2
9	C,NG,NS	3	None	0
10	C,NG,NS	2	Retained Placenta/1	1

Appendix Table 2 - continued

MULTIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
11	NG	4	Metritis/1	1
12	C,NG,NS	3	None	0
13	C	3	Ketosis/1; Displaced Adomasum/1	2
	NG,NS	4	Ketosis/1; Displaced Abomasum/1	2
14	NG	3	None	0
15	C,NG,NS	3	Down Cow/1; Retained Placenta/1; Displaced Abomasum/1	3
16	C,NG,NS	8	Bloat/1	1
17	C	3	None	0
	NG,NS	5	None	0
18	C,NG,NS	4	None	0
19	NG	4	None	0

Appendix Table 2 - continued

MULTIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
20	C	4	Metritis/2	2
	NG,NS	7	Metritis/2	2
21	C,NG,NS	3	None	0
22	NS	4	None	0
23	C	1	None	0
	NG,NS	2	Retained Placenta/1	1
24	C	3	None	0
	NG,NS	4	None	0
25	C	2	Milk Fever/1; Metritis/2	3
	NG,NS	3	Milk Fever/1; Metritis/2	3
26	C,NG,NS	3	Retained Placenta/1; Off Feed/1; Metritis/3	5
27	C,NG,NS	2	Died at Calving/1; Sold-Mastitis/1	0

Appendix Table 2 - continued

MULTIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
28	C,NG,NS	3	None	0
29	C	1	None	0
	NG,NS	3	None	0
30	C	2	None	0
	NG,NS	3	None	0
31	C,NG,NS	7	Retained Placenta/1; Extremely High Temperature/1	2
32	NG	3	Ketosis/2	2
33	C	1	Laminitis/1	1
	NG,NS	3	Laminitis/1	1
34	C,NG,NS	4	None	0
35	C,NG,NS	3	Milk Fever/1; Ketosis/3	4

Appendix Table 2 - continued

MULTIPAROUS HERD HEALTH DATA

Herd	Data Set	Number of Animals	Health Problem/Occurrence	Total
36	C,NG,NS	6	Retained Placenta/2; Udder Edema/1	3
37	C	4	Retained Placenta/1; Metritis/1	2
	NG,NS	8	Retained Placenta/3; Metritis/6	9
38	C,NG,NS	3	Retained Placenta/1; Dysentery/1	2
39	C	2	None	0
	NG,NS	3	None	0
40	NS	3	None	0
41	C,NG,NS	3	None	0
42	NG	3	None	0
44	C,NG,NS	3	Metritis/1	1

[a]C = Complete data
[b]NG = No genetic data
[c]NS = No somatic cell count data

Appendix Table 3

PRIMIPAROUS MONTHLY MILK PRODUCTION

Herd	Data Set	Number of Animals	4% FCM[a] Production Average Test 1	Test 2	Test 3
1	C[b]	2	22.22	22.66	21.97
	NG[c],NS[d]	4	24.17	22.62	22.19
2	C,NG,NS	3	32.28	31.58	33.11
3	NG	3	22.88	29.15	24.01
4	C	2	25.18	26.21	24.49
	NG,NS	3	27.97	34.74	27.55
5	C	9	19.99	17.84	18.14
	NG,NS	10	19.73	17.01	17.66
6	C,NG,NS	2	23.61	33.51	29.26
7	C,NG,NS	3	23.84	20.42	23.74
8	C,NG,NS	3	31.88	35.99	31.74
9	C,NG,NS	3	20.79	20.84	22.92
10	C	1	33.43	37.79	36.97
	NG,NS	3	28.48	27.52	25.98
11	C,NG,NS	2	26.28	28.46	23.89
12	C,NG,NS	3	29.02	29.80	30.25
13	C,NG,NS	4	29.78	35.11	29.65
14	C	2	28.96	28.14	24.58
	NG,NS	3	29.66	29.41	26.16
15	C,NG,NS	3	23.36	26.25	24.98

Appendix Table 3 - continued

PRIMIPAROUS MONTHLY MILK PRODUCTION

Herd	Data Set	Number of Animals	4% FCM Production Average Test 1	Test 2	Test 3
16	C,NG,NS	4	35.43	31.32	28.82
17	NG	1	29.81	31.25	28.58
18	C	2	28.92	21.50	26.60
	NG,NS	3	28.77	23.99	27.38
19	NG	4	26.63	31.42	31.06
20	C,NG,NS	3	28.45	27.30	26.94
21	C,NG,NS	3	22.40	27.50	26.19
22	NS	3	33.96	34.96	35.30
23	C	4	22.50	25.01	25.75
	NG,NS	5	22.73	24.58	24.49
24	C,NG,NS	4	29.61	28.41	26.32
25	C	1	17.65	15.25	0
	NG,NS	3	22.49	23.07	24.32
26	C,NG,NS	3	32.34	23.81	23.09
27	C,NG,NS	3	22.66	17.32	17.14
28	C	2	25.11	29.56	28.41
	NG,NS	3	24.13	28.87	28.30
29	C	1	14.36	21.13	17.96
	NG,NS	3	14.06	24.49	18.83
30	C	1	19.72	22.49	20.68
	NG,NS	3	21.69	22.92	19.96

Appendix Table 3 - continued

PRIMIPAROUS MONTHLY MILK PRODUCTION

Herd	Data Set	Number of Animals	4% FCM Production Average Test 1	Test 2	Test 3
31	C	1	19.13	23.54	22.76
	NG,NS	2	19.55	25.27	25.99
32	C	2	26.09	27.16	26.86
	NG,NS	3	25.47	23.77	24.76
33	C	1	23.13	20.63	26.44
	NG,NS	4	23.04	23.31	23.10
34	C,NG,NS	3	23.21	27.21	20.11
35	C,NG,NS	3	26.30	28.19	26.76
36	C,NG,NS	3	25.64	25.55	27.58
37	NG	3	31.59	36.73	27.65
38	C,NG,NS	4	24.59	23.13	16.32
39	C	1	21.78	21.21	15.43
	NG,NS	3	22.12	24.61	19.22
40	NS	3	36.63	28.94	27.90
41	C,NG,NS	3	31.29	29.18	27.87
42	C	1	32.24	28.16	31.78
	NG,NS	2	27.60	27.19	31.70
44	C,NG,NS	3	26.63	25.29	24.28

[a]FCM = Fat corrected milk
[b]C = Complete data
[c]NG = No genetic data
[d]NS = No somatic cell count data

Appendix Table 4

MULTIPAROUS MONTHLY MILK PRODUCTION

Herd	Data Set	Number of Animals	4% FCM[a] Production Average Test 1	Test 2	Test 3
1	C[b],NG[c],NS[d]	8	40.38	31.37	27.20
2	C,NG,NS	3	48.27	47.60	45.65
3	NG	3	26.34	28.17	19.43
4	C,NG,NS	3	44.95	43.01	34.82
5	C	3	27.08	25.84	32.92
	NG,NS	5	35.72	30.05	32.21
6	NS	3	36.89	33.20	35.08
7	C,NG,NS	3	29.29	36.06	32.78
8	C,NG,NS	2	41.69	41.95	43.35
9	C,NG,NS	3	26.75	31.69	27.08
10	C,NG,NS	2	36.69	26.58	28.39
11	NG	4	35.77	36.95	28.51
12	C,NG,NS	3	48.04	48.98	35.93
13	C	3	39.80	41.61	32.65
	NG,NS	4	44.32	42.54	37.32
14	NG	3	45.58	43.39	36.20
15	C,NG,NS	3	36.77	32.40	33.99
16	C,NG,NS	8	39.29	40.66	37.50

Appendix Table 4 - continued

MULTIPAROUS MONTHLY MILK PRODUCTION

Herd	Data Set	Number of Animals	4% FCM Production Average Test 1	Test 2	Test 3
17	C	3	39.00	38.06	36.70
	NG,NS	5	26.09	34.59	32.01
18	C,NG,NS	4	41.56	37.73	36.66
19	NG	4	32.25	36.84	32.54
20	C	4	33.73	31.46	28.43
	NG,NS	7	34.68	33.53	33.08
21	C,NG,NS	3	31.43	40.30	32.35
22	NS	4	44.22	48.29	39.99
23	C	1	22.05	26.85	30.69
	NG,NS	2	26.66	30.12	29.71
24	C	3	38.68	38.83	34.08
	NG,NS	4	35.91	37.97	33.13
25	C	2	31.29	35.54	31.29
	NG,NS	3	27.43	35.54	31.29
26	C,NG,NS	3	24.62	27.22	25.78
27	C,NG,NS	2	12.73	19.62	24.69
28	C,NG,NS	3	39.96	36.99	35.08
29	C	1	26.95	26.88	26.14
	NG,NS	3	27.15	26.56	26.89
30	C	2	54.89	40.64	39.20
	NG,NS	3	47.67	39.16	37.19

Appendix Table 4 - continued

MULTIPAROUS MONTHLY MILK PRODUCTION

Herd	Data Set	Number of Animals	4% FCM Production Average Test 1	Test 2	Test 3
31	C,NG,NS	7	19.13	23.54	22.76
32	NG	3	40.01	32.46	31.98
33	C	1	30.65	30.84	28.81
	NG,NS	3	46.08	43.48	40.00
34	C,NG,NS	4	36.13	33.53	30.35
35	C,NG,NS	3	36.65	32.56	35.24
36	C,NG,NS	6	37.52	38.04	39.91
37	C	4	36.75	37.80	36.89
	NG,NS	8			
38	C,NG,NS	3	32.78	34.63	35.06
39	C	2	37.64	38.98	36.06
	NG,NS	3	35.21	38.56	34.41
40	NS	3	51.70	44.85	43.40
41	C,NG,NS	3	39.20	40.32	34.15
42	NG	3	35.14	27.49	27.49
44	C,NG,NS	3	25.87	31.37	27.72

[a]FCM = Fat corrected milk
[b]C = Complete data
[c]NG = No genetic data
[d]NS = No somatic cell count data

Appendix Table 5

PRIMIPAROUS COMPLETE DATA - CORRELATIONS

	FCM	BCS	AGE	WH	WT	PTAM	SCC	HEALTH	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
BCS	0.02650[a]													
	0.8763[b]													
AGE	-0.05749	-0.09867												
	0.7354	0.5612												
WH	0.38234	0.07728	0.06190											
	0.0195	0.6494	0.7159											
WT	0.09499	0.56656	0.09722	0.36952										
	0.5760	0.0003	0.5670	0.0245										
PTAM	0.31807	-0.08694	-0.07878	-0.01411	-0.20851									
	0.0550	0.6089	0.6430	0.9539	0.2155									
SCC	-0.24862	0.06875	0.25470	-0.25279	-0.10661	-0.27536								
	0.1379	0.6860	0.1282	0.1312	0.5300	0.0990								
HEALTH	0.02715	-0.33302	0.15514	-0.10863	-0.11220	0.15709	0.06209							
	0.8733	0.0440	0.3592	0.5222	0.5085	0.3531	0.7151							

Appendix Table 5 - continued

PRIMIPAROUS COMPLETE DATA - CORRELATIONS

	FCM	BCS	AGE	WH	WT	PTAM	SCC	HEALTH	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
XSNEL	0.22462	0.40563	0.17557	0.29558	0.27358	-0.01423	0.06776	0.06498						
	0.1814	0.0127	0.2986	0.0778	0.1013	0.9334	0.6903	0.7024						
XSPROTRD	0.13477	0.41049	-0.01751	0.31912	0.24507	-0.07434	0.03773	-0.08154	0.87543					
	0.4265	0.0116	0.9181	0.0542	0.1438	0.6619	0.8245	0.6314	0.0001					
XSPROTES	-0.09851	0.14436	-0.26649	0.13431	-0.05550	-0.13678	0.06516	-0.23316	0.15848	0.58581				
	0.5619	0.3940	0.1109	0.4280	0.7442	0.4195	0.7016	0.1649	0.3488	0.0001				
ED	0.14195	0.09162	0.15508	-0.19677	-0.14649	-0.02283	0.06438	0.11243	0.10841	-0.05281	-0.25459			
	0.4021	0.5897	0.3594	0.2431	0.3869	0.8933	0.7050	0.5076	0.5230	0.7563	0.1283			
ADF	-0.02956	-0.27374	-0.18811	0.23582	-0.00131	-0.05510	-0.09037	-0.05842	-0.12626	0.03018	0.23307	-0.85870		
	0.8621	0.1011	0.2649	0.1600	0.9939	0.7460	0.5948	0.7313	0.4565	0.8593	0.1651	0.0001		
CP	0.23700	0.07122	-0.34738	0.11953	-0.15767	0.24274	-0.22028	-0.07283	0.22979	0.38348	0.33828	0.18837	-0.07468	
	0.1579	0.6753	0.0352	0.4818	0.3514	0.1477	0.1902	0.6684	0.1712	0.0191	0.0406	0.2642	0.6605	
DMI	0.08710	0.18763	-0.16203	0.22137	0.10784	0.06665	-0.13099	0.09499	0.26180	0.23961	0.06285	-0.01143	-0.00270	0.25450
	0.6083	0.2661	0.3380	0.1879	0.5252	0.6951	0.4397	0.5760	0.1175	0.1532	0.7117	0.9465	0.9874	0.1285

[a] = Correlation coefficient
[b] = Significance level

Appendix Table 6

Appendix Table 6

PRIMIPAROUS COMPLETE DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Age (mos)	Withers Height (cm)	Body Weight (kg)	Sire PTAM[a] (kg)	Linear Somatic Cell Count	Health Score
1	4	22.29	2.50	27.00	141.00	483	447.93	1.67	0.00
2	2	32.32	3.00	23.67	139.83	533	329.62	1.33	0.00
4	2	25.29	3.50	24.00	141.50	577	424.34	1.83	0.50
5	3	18.66	2.89	26.11	138.53	504	-466.04	1.81	0.11
6	1	28.79	3.25	31.50	135.00	489	331.58	2.33	1.00
7	4	22.53	1.83	26.00	136.00	435	391.91	3.00	0.33
8	4	33.20	3.17	25.00	136.17	547	361.82	1.22	0.00
9	3	21.52	2.33	25.33	134.50	469	311.02	1.22	0.00
10	1	36.07	2.00	26.00	141.00	504	777.01	1.33	1.00
11	1	26.21	3.00	24.00	138.75	511	435.23	1.33	0.50
12	2	29.69	2.50	32.00	133.00	448	616.74	4.00	0.67
13	4	31.51	2.25	23.50	135.25	476	334.41	2.00	0.25
14	1	27.22	3.00	26.50	137.50	540	573.35	2.17	1.00
15	4	24.87	2.83	25.33	136.00	518	461.31	2.56	0.00
16	4	31.86	3.13	25.75	136.63	569	475.71	2.92	0.25
18	2	25.67	3.25	24.50	137.75	555	339.06	1.83	0.00
20	2	27.56	3.33	27.33	136.00	504	1199.76	2.22	0.33
21	1	25.37	2.50	23.33	136.33	497	440.14	1.33	0.00
23	1	24.42	2.63	27.25	132.75	435	238.59	2.33	0.00
24	2	28.11	3.00	24.25	137.88	489	601.24	2.75	0.25

Appendix Table 6 - continued

PRIMIPAROUS COMPLETE DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Age (mon)	Withers Height (cm)	Body Weight (kg)	Sire PTAM (kg)	Linear Somatic Cell Count	Health Score
25	3	16.45	3.50	24.00	132.00	533	146.51	3.00	0.00
26	3	26.42	2.33	29.67	135.50	540	377.85	1.14	2.00
27	3	19.04	2.50	24.67	132.50	504	-62.60	4.33	1.75
28	3	27.69	3.00	23.00	135.75	540	605.55	1.50	0.00
29	1	17.82	2.50	33.00	134.50	577	-101.61	2.67	0.00
30	3	20.97	2.00	25.00	131.00	422	1199.76	0.33	1.00
31	4	21.81	2.50	22.00	130.00	469	529.35	3.33	1.00
32	1	26.70	2.50	24.50	136.00	483	264.45	2.83	0.50
33	4	23.40	3.00	27.00	134.00	569	529.35	1.00	0.00
34	2	23.51	2.83	32.00	139.50	577	334.45	4.00	0.33
35	2	27.08	2.67	25.67	139.17	533	465.54	1.56	0.33
36	4	26.25	2.67	24.33	135.00	525	540.23	1.78	0.67
38	2	21.35	3.25	24.25	130.25	525	559.29	1.64	0.25
39	1	19.47	3.00	26.00	133.00	476	329.31	4.67	0.00
41	2	29.45	2.83	28.00	135.83	497	486.71	2.44	0.00
42	3	30.73	3.00	24.00	132.50	518	-65.32	2.33	0.00
44	1	25.40	2.67	27.00	138.33	518	327.95	1.67	0.67

[a]PTAM = Predicted transmitting ability for milk

Appendix Table 7

PRIMIPAROUS

Appendix Table 7

PRIMIPAROUS COMPLETE DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL[a] (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
1	4	9.65	1207	148	1.668	21.86	16.95	21.98
2	2	21.36	2205	55	1.622	21.69	17.72	22.05
4	2	26.86	4291	538	1.611	20.68	21.39	26.49
5	3	7.51	1211	293	1.798	13.23	17.21	26.13
6	1	15.97	912	-250	1.771	15.94	18.70	27.40
7	4	5.74	480	-44	1.671	19.82	18.68	24.67
8	4	24.71	3395	331	1.709	17.56	20.76	24.65
9	3	4.45	981	390	1.654	20.88	20.79	21.36
10	1	3.86	776	301	1.670	19.94	17.91	24.15
11	1	1.70	265	88	1.503	23.60	17.37	20.83
12	2	15.77	1826	123	1.660	19.62	17.16	23.16
13	4	5.13	124	-248	1.723	19.79	19.14	20.13
14	1	24.07	2368	19	1.687	18.95	15.68	26.12
15	4	6.53	381	-155	1.634	18.51	17.20	24.31
16	4	13.33	1580	145	1.688	17.12	18.93	26.55
18	2	14.25	1554	86	1.719	15.88	17.68	24.59
20	2	15.47	1176	-127	1.773	11.62	16.43	19.87
21	1	5.31	865	239	1.460	27.38	15.90	30.08
23	1	8.75	1312	252	1.720	16.87	15.21	19.26
24	2	1.50	269	111	1.669	18.12	17.67	24.22

Appendix Table 7 - continued

Appendix Table 7 - continued

PRIMIPAROUS COMPLETE DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
25	3	10.53	1723	373	1.585	21.76	17.37	21.24
26	3	4.71	282	-121	1.725	17.16	15.70	21.79
27	3	13.65	843	-207	1.658	18.82	15.24	25.86
28	3	3.59	520	135	1.633	17.83	17.09	27.94
29	1	9.29	850	-23	1.597	19.50	12.78	17.12
30	3	5.96	458	-70	1.652	19.36	19.73	22.43
31	4	5.59	1131	389	1.682	17.10	18.92	17.98
32	1	5.67	734	124	1.558	23.08	13.85	18.95
33	4	1.27	-474	-539	1.635	17.19	15.96	22.63
34	2	8.93	819	-21	1.614	21.60	16.00	19.70
35	2	6.07	1339	496	1.481	23.84	17.61	19.93
36	4	2.08	-357	-471	1.660	20.80	16.19	21.57
38	2	3.53	688	267	1.666	18.51	16.01	25.16
39	1	5.57	1266	481	1.623	19.09	17.75	23.16
41	2	13.72	1121	-87	1.677	16.53	16.67	20.48
42	3	3.72	469	85	1.721	18.96	16.79	17.18
44	1	18.04	2131	155	1.463	23.24	16.37	24.40

[a]NEL = Net energy for lactation

Appendix Table 8

PRIMIPAROUS COMPLETE DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
1	16.45	91.18	15.00	7.89
2	32.71	59.33	19.41	6.80
4	35.83	73.63	26.38	8.26
5	26.23	44.28	11.62	6.92
6	33.02	48.19	15.91	6.43
7	20.82	54.00	11.24	7.12
8	40.26	52.28	21.05	6.79
9	19.80	47.72	9.45	6.63
10	18.14	54.62	9.91	7.35
11	17.30	59.00	10.21	8.86
12	27.22	58.93	16.04	6.27
13	19.50	56.34	10.99	7.40
14	33.69	67.47	22.73	7.41
15	21.11	48.70	10.28	6.51
16	22.63	65.34	14.79	7.04
18	37.62	46.61	17.53	7.97
20	33.85	47.43	16.05	6.69
21	18.69	66.00	12.33	8.30
23	19.96	73.81	14.73	7.82
24	15.42	67.07	10.34	9.09
25	28.12	49.61	13.95	7.29
26	19.64	65.60	12.88	9.17
27	27.94	56.40	15.76	7.05
28	15.88	68.48	10.87	8.31
29	27.22	53.64	14.60	8.30
30	34.02	31.14	10.59	6.56
31	16.78	61.39	10.30	6.72
32	18.14	65.00	11.79	7.71
33	19.75	44.24	8.74	7.91
34	27.37	49.00	13.41	7.75
35	31.75	41.58	13.20	8.65
36	20.19	50.00	10.09	8.53
38	13.61	72.00	9.80	7.48
39	14.06	83.17	11.69	7.67
41	28.12	54.66	15.37	6.82
42	25.86	42.64	11.02	8.29
44	42.18	49.11	20.71	7.97

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[a]NEL =

Appendix Table 9

PRIMIPAROUS COMPLETE DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL[a])	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
1	184	483	10.71	20.36	9.65
2	191	533	11.53	32.89	21.36
4	197	577	12.24	39.10	26.86
5	187	504	11.06	18.57	7.51
6	185	489	10.82	26.80	15.97
7	177	435	9.91	15.64	5.74
8	193	547	11.76	36.47	24.71
9	182	469	10.47	14.92	4.45
10	187	504	11.06	14.93	3.86
11	188	511	11.17	12.88	1.70
12	179	448	10.13	25.90	15.77
13	183	476	10.60	15.73	5.13
14	192	540	11.65	35.72	24.07
15	189	518	11.29	17.82	6.53
16	196	569	12.12	25.45	13.33
18	194	555	11.89	26.14	14.25
20	187	504	11.06	26.54	15.47
21	186	497	10.94	16.26	5.31
23	177	435	9.91	18.65	8.75
24	185	489	10.82	12.32	1.50
25	191	533	11.53	22.06	10.53
26	192	540	11.65	16.36	4.71
27	187	504	11.06	24.71	13.65
28	192	540	11.65	15.23	3.59
29	197	577	12.24	21.53	9.29
30	175	422	9.68	15.64	5.96
31	182	469	10.47	16.06	5.59
32	184	483	10.71	16.38	5.67
33	196	569	12.12	13.39	1.27
34	197	577	12.24	21.17	8.93
35	191	533	11.53	17.60	6.07
36	190	525	11.41	13.49	2.08
38	190	525	11.41	14.94	3.53
39	183	476	10.60	16.16	5.57
41	186	497	10.94	24.66	13.72
42	189	518	11.29	15.01	3.72
44	189	518	11.29	29.33	18.04

[a]NEL = Net energy for lactation

Appendix Table 10

PRIMIPAROUS COMPLETE DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
1	1027	2234	1207	1175	148
2	1105	3311	2205	1160	55
4	1173	5464	4291	1711	538
5	1059	2270	1211	1352	293
6	1037	1949	912	788	-250
7	949	1429	480	905	-44
8	1128	4523	3395	1459	331
9	1004	1986	981	1393	390
10	1059	1834	776	1360	301
11	1070	1334	265	1158	88
12	971	2797	1826	1093	123
13	1015	1138	124	767	-248
14	1117	3485	2368	1136	19
15	1082	1463	381	926	-155
16	1160	2740	1580	1305	145
18	1139	2693	1554	1224	86
20	1059	2235	1176	931	-127
21	1050	1916	865	1289	239
23	949	2261	1312	1200	252
24	1037	1306	269	1148	111
25	1105	2102	1723	1098	373
26	1117	1399	282	996	-121
27	1059	1902	843	851	-207
28	1117	1637	520	1251	135
29	1173	2023	850	1150	-23
30	927	1385	458	857	-70
31	1004	2136	1131	1393	389
32	1027	1758	734	1150	124
33	1160	686	-474	621	-539
34	1173	1993	819	1152	-21
35	1105	2444	1339	1601	496
36	1093	736	-357	622	-471
38	1093	1781	688	1360	267
39	1015	2282	1266	1496	481
41	1050	2171	1121	963	-87
42	1082	1551	469	1166	85
44	1082	3213	2131	1236	155

Appendix Table 11

Appendix Table 11

PRIMIPAROUS COMPLETE DATA
PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD[a] (%)	Ether Extract (%)	Total Ash (%)	TDN[b] (%)	NEL[c] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	75.44	2.795	5.76	60.28	1.357	14.89	54.22	30.98
2	87.57	4.528	6.24	74.09	1.695	17.06	33.75	18.98
4	81.37	4.371	8.53	65.41	1.482	20.71	45.14	26.09
5	83.77	5.257	7.27	70.17	1.599	19.54	41.37	23.71
6	83.89	4.038	2.41	73.63	1.684	12.25	44.09	21.65
7	75.54	3.829	5.75	61.68	1.391	12.71	61.55	35.37
8	88.93	5.060	6.74	75.62	1.733	21.49	29.04	17.34
9	83.13	5.013	7.14	69.35	1.579	21.01	37.20	22.92
10	79.74	3.979	5.45	66.36	1.506	18.51	42.96	25.52
11	73.84	1.949	7.00	56.38	1.261	13.07	64.58	38.15
12	84.35	4.049	5.68	70.83	1.615	17.44	38.82	23.30
13	76.43	3.386	4.46	63.30	1.431	10.36	60.29	33.89
14	82.40	2.973	4.20	69.02	1.571	15.33	38.91	23.72
15	87.07	3.688	3.12	75.66	1.734	14.23	35.19	17.66
16	88.70	4.439	6.19	75.16	1.721	18.53	28.84	16.02
18	81.51	3.673	7.45	65.75	1.491	15.36	42.00	26.63
20	87.36	4.188	7.33	72.36	1.653	13.92	25.52	14.59
21	74.08	2.955	6.18	58.69	1.318	15.53	52.29	34.00
23	72.74	2.600	6.51	56.58	1.266	15.35	49.31	32.60
24	68.46	3.170	6.00	53.52	1.191	12.63	57.01	35.73
25	81.87	3.677	6.75	66.82	1.519	15.07	45.10	27.83

Appendix Table 11 - continued

Appendix Table 11 - continued

PRIMIPAROUS COMPLETE DATA
PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD (%)	Ether Extract (%)	Total Ash (%)	TDN (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
26	70.94	3.169	5.28	56.72	1.270	10.86	52.75	31.94
27	83.13	2.981	5.04	68.91	1.568	12.07	46.06	25.15
28	75.81	4.773	6.79	62.09	1.401	15.06	50.88	30.55
29	80.61	3.273	6.70	65.10	1.475	13.86	39.32	22.71
30	78.21	3.214	4.17	65.16	1.476	13.07	61.58	32.72
31	84.14	3.348	6.89	68.54	1.559	20.73	37.67	23.09
32	76.74	2.929	5.93	61.57	1.389	14.91	48.36	29.21
33	80.11	2.752	3.17	67.48	1.533	7.85	50.56	23.89
34	85.97	1.357	5.41	69.36	1.579	14.86	38.49	19.85
35	75.48	3.212	7.29	59.31	1.333	18.51	52.70	30.92
36	73.91	2.326	4.44	59.48	1.337	7.29	62.15	33.85
38	83.14	3.516	7.48	67.16	1.525	18.18	39.21	23.97
39	79.91	2.637	9.01	61.29	1.382	19.51	46.43	26.37
41	85.53	3.066	6.08	70.38	1.604	14.12	33.80	18.27
42	76.83	2.782	6.92	60.49	1.362	14.07	54.86	31.78
44	78.79	3.097	7.05	62.71	1.416	15.51	46.08	27.04

[a]IVTD = In vitro true digestibility
[b]TDN = Total digestible nutrients
[c]NEL = Net energy for lactation

Appendix Table 12

PRIMIPAROUS NO GENETIC DATA - CORRELATIONS

	FCM	BCS	AGE	WH	WT	SCC	HEALTH	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
BCS	0.41137[a]												
	0.0075[b]												
AGE	-0.08640	-0.14150											
	0.5912	0.3775											
WH	0.21892	0.16497	0.12941										
	0.1691	0.3027	0.4200										
WT	0.19951	0.51938	0.05134	0.60288									
	0.2111	0.0005	0.7499	0.0001									
SCC	-0.20738	-0.04920	0.34194	-0.05713	-0.01495								
	0.1953	0.7600	0.0287	0.7227	0.9261								
HEALTH	-0.16457	-0.25289	0.12780	-0.22689	-0.09973	0.24089							
	0.3039	0.1107	0.4258	0.1537	0.5350	0.1292							
XSNEL	0.38999	0.41146	0.13511	0.30136	0.34727	0.12840	0.02371						
	0.0117	0.0075	0.3996	0.0555	0.0261	0.4237	0.8830						

Appendix Table 12 - continued

Appendix Table 12 - continued

PRIMIPAROUS NO GENETIC DATA - CORRELATIONS

	FCM	BCS	AGE	WH	WT	SCC	HEALTH	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
XSPROTRD	0.30175	0.42095	-0.01091	0.33642	0.36961	0.01713	-0.10233	0.86946					
	0.0552	0.0061	0.9460	0.0315	0.0174	0.9154	0.5243	0.0001					
XSPROTES	-0.06936	0.17801	-0.17873	0.11776	0.12246	-0.12862	-0.20777	0.14476	0.58788				
	0.6665	0.2655	0.2635	0.4634	0.4456	0.4229	0.1924	0.3665	0.0001				
ED	0.08985	0.19053	0.10916	-0.30857	-0.17882	0.08558	0.05879	0.08946	-0.10676	-0.34779			
	0.5764	0.2328	0.4969	0.0497	0.2633	0.5947	0.7150	0.5781	0.5064	0.0259			
ADF	0.00033	-0.31127	-0.12370	0.29958	0.09157	-0.09219	-0.04086	-0.14217	0.03535	0.27062	-0.84798		
	0.9983	0.0476	0.4410	0.0571	0.5691	0.5665	0.7998	0.3752	0.8263	0.0870	0.0001		
CP	0.31377	0.14774	-0.30331	0.03292	-0.16601	-0.18755	-0.18035	0.16565	0.30509	0.26238	0.21880	-0.09069	
	0.0457	0.3566	0.0539	0.8381	0.2996	0.2403	0.2592	0.3006	0.0524	0.0975	0.1693	0.5728	
DMI	0.13654	0.17336	-0.19906	0.13247	0.09262	-0.09231	0.01239	0.25382	0.23700	0.07424	-0.02955	-0.03690	0.20728
	0.3946	0.2784	0.2121	0.4090	0.5647	0.5660	0.9387	0.1093	0.1357	0.6446	0.8545	0.8189	0.1935

[a] = Correlation coefficient
[b] = Significance level

Appendix Table 13

Appendix Table 13

PRIMIPAROUS NO GENETIC DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Age (mos)	Withers Height (cm)	Body Weight (kg)	Linear Somatic Cell Count	Health Score
1	4	22.99	2.50	28.75	140.00	518	2.00	0.25
2	2	32.32	3.00	23.67	139.83	533	1.33	0.00
3	3	25.35	2.67	29.67	141.00	540	2.22	0.00
4	2	30.09	3.50	24.00	142.50	577	2.11	0.33
5	3	18.13	2.85	26.00	138.33	504	1.83	0.20
6	1	28.79	3.25	31.50	135.00	489	2.33	1.00
7	4	22.53	1.83	26.00	136.00	435	3.00	0.33
8	4	33.20	3.17	25.00	136.17	547	1.22	0.00
9	3	21.52	2.33	25.33	134.50	476	1.22	0.00
10	1	27.32	2.50	24.67	136.83	497	1.67	0.33
11	1	26.21	3.00	24.00	138.75	511	1.33	0.50
12	2	29.69	2.50	32.00	133.00	448	4.00	0.67
13	4	31.51	2.25	23.50	135.25	476	2.00	0.25
14	1	28.41	3.00	26.00	138.00	547	2.11	0.67
15	4	24.87	2.83	25.33	136.00	518	2.56	0.00
16	4	31.86	3.13	25.75	136.63	569	2.92	0.25
17	3	29.88	3.00	25.00	134.13	476	2.00	0.00
18	2	26.71	3.17	24.67	136.17	547	2.22	0.00
19	1	29.71	3.00	25.25	136.38	533	1.58	0.00
20	2	27.56	3.33	27.33	136.00	504	2.22	0.33
21	1	25.37	2.50	23.33	136.33	497	1.33	0.00

Table 13 - continued

Table 13 - continued

PRIMIPAROUS NO GENETIC DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Age (mos)	Withers Height (cm)	Body Weight (kg)	Linear Somatic Cell Count	Health Score
23	1	23.94	2.70	28.40	132.70	448	2.13	0.00
24	2	28.11	3.00	24.25	137.88	489	2.75	0.25
25	3	23.16	3.00	24.67	136.83	525	3.38	0.00
26	3	26.42	2.33	29.67	135.50	540	1.14	2.00
27	3	19.04	2.50	24.67	132.50	504	4.33	1.75
28	3	27.10	2.83	23.67	137.50	533	1.11	0.00
29	1	19.13	2.33	30.67	135.50	540	2.33	0.00
30	3	21.52	2.17	24.33	130.00	409	1.11	0.60
31	4	23.61	2.75	23.50	128.25	455	2.50	1.00
32	1	24.67	2.50	24.33	135.67	504	2.78	1.33
33	4	23.15	2.63	27.50	137.63	525	2.08	0.00
34	2	23.51	2.83	32.00	139.50	577	4.00	0.33
35	2	27.08	2.67	25.67	139.17	533	1.56	0.33
36	4	26.25	2.67	24.33	135.00	525	1.78	0.67
37	4	31.99	2.83	27.67	134.33	489	1.44	0.00
38	2	21.35	3.25	24.25	130.25	525	1.64	0.25
39	1	21.98	3.00	25.33	133.50	511	2.33	0.00
41	2	29.45	2.83	28.00	135.83	497	2.44	0.00
42	3	28.83	3.25	24.00	132.25	525	1.67	0.00
44	1	25.40	2.67	27.00	138.33	518	1.67	0.67

Appendix Table 14

Appendix Table 14

PRIMIPAROUS NO GENETIC DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL[a] (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
1	4	9.06	1152	157	1.668	21.86	16.95	21.98
2	2	21.36	2205	55	1.622	21.69	17.72	22.05
3	3	7.12	1051	228	1.582	23.72	16.95	17.37
4	2	26.86	4291	538	1.611	20.68	21.39	26.49
5	3	7.51	1211	293	1.798	13.23	17.21	26.13
6	1	15.97	912	-250	1.771	15.94	18.70	27.40
7	4	5.74	480	-44	1.671	19.82	18.68	24.67
8	4	24.71	3395	331	1.709	17.56	20.76	24.65
9	3	4.32	970	395	1.654	20.88	20.79	21.36
10	1	3.98	785	295	1.670	19.94	17.91	24.15
11	1	1.70	265	88	1.503	23.60	17.37	20.83
12	2	15.77	1826	123	1.660	19.62	17.16	23.16
13	4	5.13	124	-248	1.723	19.79	19.14	20.13
14	1	23.95	2357	20	1.687	18.95	15.68	26.12
15	4	6.53	381	-155	1.634	18.51	17.20	24.31

Appendix Table 14 - continued

Appendix Table 14 - continued

PRIMIPAROUS NO GENETIC DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
16	4	13.33	1580	145	1.688	17.12	18.93	26.55
17	3	5.47	-230	-497	1.796	17.58	18.38	20.97
18	2	14.38	1565	84	1.719	15.88	17.68	24.59
19	1	18.17	1921	70	1.629	19.39	14.78	24.18
20	2	15.47	1176	-127	1.773	11.62	16.43	19.87
21	1	5.31	865	239	1.460	27.38	15.90	30.08
23	1	8.52	1290	257	1.720	16.87	15.21	19.26
24	2	1.50	269	111	1.669	18.12	17.67	24.22
25	3	10.65	1735	370	1.585	21.76	17.37	21.24
26	3	4.71	282	-121	1.725	17.16	15.70	21.79
27	3	13.65	843	-207	1.658	18.82	15.24	25.86
28	3	3.70	532	134	1.633	17.83	17.09	27.94
29	1	9.88	906	-23	1.597	19.50	12.78	17.12
30	3	6.18	480	-67	1.652	19.36	19.73	22.43
31	4	5.81	1154	381	1.682	17.10	18.92	17.98

Appendix Table 14 - continued

Appendix Table 14 - continued

PRIMIPAROUS NO GENETIC DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
32	1	5.32	702	130	1.558	23.08	13.85	18.95
33	4	1.98	-407	-509	1.635	17.19	15.96	22.63
34	2	8.93	819	-21	1.614	21.60	16.00	19.70
35	2	6.07	1339	496	1.481	23.84	17.61	19.93
36	4	2.08	-357	-471	1.660	20.80	16.19	21.57
37	4	4.04	662	200	1.568	21.67	16.76	26.10
38	2	3.53	688	267	1.666	18.51	16.01	25.16
39	1	4.99	1211	507	1.623	19.09	17.75	23.16
41	2	13.72	1121	-87	1.677	16.53	16.67	20.48
42	3	3.60	458	86	1.721	18.96	16.79	17.18
44	1	18.04	2131	155	1.463	23.24	16.37	24.40

[a]NEL = Net energey for lactation

Appendix Table 15

PRIMIPAROUS NO GENETIC DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
1	16.45	91.18	15.00	8.32
2	32.71	59.33	19.41	6.80
3	28.35	51.61	14.63	9.08
4	35.83	73.63	26.38	8.26
5	26.23	44.28	11.62	6.92
6	33.02	48.19	15.91	6.43
7	20.82	54.00	11.24	7.12
8	40.26	52.28	21.05	6.79
9	19.80	47.72	9.45	6.71
10	18.14	54.62	9.91	7.27
11	17.30	59.00	10.21	8.86
12	27.22	58.93	16.04	6.27
13	19.50	56.34	10.99	7.40
14	33.69	67.47	22.73	7.49
15	21.11	48.70	10.28	6.51
16	22.63	65.34	14.79	7.04
17	20.56	49.09	10.09	6.66
18	37.62	46.61	17.53	7.89
19	35.80	53.94	19.31	7.50
20	33.85	47.43	16.05	6.69
21	18.69	66.00	12.33	8.30
23	19.96	73.81	14.73	8.00
24	15.42	67.07	10.34	9.09
25	28.12	49.61	13.95	7.22

Appendix Table 15 - continued

PRIMIPAROUS NO GENETIC DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
26	19.64	65.60	12.88	9.17
27	27.94	56.40	15.76	7.05
28	15.88	68.48	10.87	8.23
29	27.22	53.64	14.60	7.90
30	34.02	31.14	10.59	6.41
31	16.78	61.39	10.30	6.57
32	18.14	65.00	11.79	7.96
33	19.75	44.24	8.74	7.44
34	27.37	49.00	13.41	7.75
35	31.75	41.58	13.20	8.65
36	20.19	50.00	10.09	8.53
37	14.52	86.36	12.54	9.13
38	13.61	72.00	9.80	7.48
39	14.06	83.17	11.69	8.09
41	28.12	54.66	15.37	6.82
42	25.86	42.64	11.02	8.38
44	42.18	49.11	20.71	7.97

Appendix Table 16

PRIMIPAROUS NO GENETIC DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL[a])	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
1	189	518	11.29	20.36	9.06
2	191	533	11.53	32.89	21.36
3	192	540	11.65	18.77	7.12
4	197	577	12.24	39.10	26.86
5	187	504	11.06	18.57	7.51
6	185	489	10.82	26.80	15.97
7	177	435	9.91	15.64	5.74
8	193	547	11.76	36.47	24.71
9	182	476	10.60	14.92	4.32
10	186	497	10.94	14.93	3.98
11	188	511	11.17	12.88	1.70
12	179	448	10.13	25.90	15.77
13	183	476	10.60	15.73	5.13
14	193	547	11.76	35.72	23.95
15	189	518	11.29	17.82	6.53
16	196	569	12.12	25.45	13.33
17	183	476	10.60	16.07	5.47
18	193	547	11.76	26.14	14.38
19	191	533	11.53	29.70	18.17
20	187	504	11.06	26.54	15.47
21	186	497	10.94	16.26	5.31
23	179	448	10.13	18.65	8.52
24	185	489	10.82	12.32	1.50
25	190	525	11.41	22.06	10.65

Appendix Table 16 - continued

PRIMIPAROUS NO GENETIC DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL)	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
26	192	540	11.65	16.36	4.71
27	187	504	11.06	24.71	13.65
28	191	533	11.53	15.23	3.70
29	192	540	11.65	21.53	9.88
30	173	409	9.46	15.64	6.18
31	180	455	10.25	16.06	5.81
32	187	504	11.06	16.38	5.32
33	190	525	11.41	13.39	1.98
34	197	577	12.24	21.17	8.93
35	191	533	11.53	17.60	6.07
36	190	525	11.41	13.49	2.08
37	185	489	10.82	14.86	4.04
38	190	525	11.41	14.94	3.53
39	188	511	11.17	16.16	4.99
41	186	497	10.94	24.66	13.72
42	190	525	11.41	15.01	3.60
44	189	518	11.29	29.33	18.04

[a]NEL = Net energy for lactation

Appendix Table 17

PRIMIPAROUS NO GENETIC DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
1	1082	2234	1152	1239	157
2	1105	3311	2205	1160	55
3	1117	2169	1051	1346	228
4	1173	5464	4291	1711	538
5	1059	2270	1211	1352	293
6	1037	1949	912	788	-250
7	949	1429	480	905	-44
8	1128	4523	3395	1459	331
9	1015	1986	970	1410	395
10	1050	1834	785	1346	295
11	1070	1334	265	1158	88
12	971	2797	1826	1093	123
13	1015	1138	124	767	-248
14	1128	3485	2357	1148	20
15	1082	1463	381	926	-155
16	1160	2740	1580	1305	145
17	1015	785	-230	518	-497
18	1128	2693	1565	1212	84
19	1105	3026	1921	1175	70
20	1059	2235	1176	931	-127
21	1050	1916	865	1289	239
23	971	2261	1290	1228	257
24	1037	1306	269	1148	111
25	1093	2102	1735	1088	370

Appendix Table 17 - continued

PRIMIPAROUS NO GENETIC DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
26	1117	1399	282	996	-121
27	1059	1902	843	851	-207
28	1105	1637	532	1239	134
29	1117	2023	906	1095	-23
30	905	1385	480	838	-67
31	981	2136	1154	1362	381
32	1059	1758	702	1187	130
33	1093	686	-407	584	-509
34	1173	1993	819	1152	-21
35	1105	2444	1339	1601	496
36	1093	736	-357	622	-471
37	1037	1699	662	1237	200
38	1093	1781	688	1360	267
39	1070	2282	1211	1578	507
41	1050	2171	1121	963	-87
42	1093	1551	458	1179	86
44	1082	3213	2131	1236	155

Appendix Table 18

PRIMIPAROUS NO GENETIC DATA
PREPARTUM RATION NUTRIENT COMPOSITONS

Herd	IVTD[a] (%)	Ether Extract (%)	Total Ash (%)	TDN[b] (%)	NEL[c] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	75.44	2.795	5.76	60.28	1.357	14.89	54.22	30.98
2	87.57	4.528	6.24	74.09	1.695	17.06	33.75	18.98
3	73.07	3.586	7.46	57.19	1.283	14.82	54.86	35.93
4	81.37	4.371	8.53	65.41	1.482	20.71	45.14	26.09
5	83.77	5.257	7.27	70.17	1.599	19.54	41.37	23.71
6	83.89	4.038	2.41	73.63	1.684	12.25	44.09	21.65
7	75.54	3.829	5.75	61.68	1.391	12.71	61.55	35.37
8	88.93	5.060	6.74	75.62	1.733	21.49	29.04	17.34
9	83.13	5.013	7.14	69.35	1.579	21.01	37.20	22.92
10	79.74	3.979	5.45	66.36	1.506	18.51	42.96	25.52
11	73.84	1.949	7.00	56.38	1.261	13.07	64.58	38.15
12	84.35	4.049	5.68	70.83	1.615	17.44	38.82	23.30
13	76.43	3.386	4.46	63.30	1.431	10.36	60.29	33.89
14	82.40	2.973	4.20	69.02	1.571	15.33	38.91	23.72
15	87.07	3.688	3.12	75.66	1.734	14.23	35.19	17.66
16	88.70	4.439	6.19	75.16	1.721	18.53	28.84	16.02
17	81.87	2.744	2.51	69.89	1.592	7.78	43.91	20.79
18	81.51	3.673	7.45	65.75	1.491	15.36	42.00	26.63
19	82.97	3.248	6.46	67.67	1.538	15.67	38.83	22.51
20	87.36	4.188	7.33	72.36	1.653	13.92	25.52	14.59
21	74.08	2.955	6.18	58.69	1.318	15.53	52.29	34.00
23	72.74	2.600	6.51	56.58	1.266	15.35	49.31	32.60
24	68.46	3.170	6.00	53.52	1.191	12.63	57.01	35.73
25	81.87	3.677	6.75	66.82	1.519	15.07	45.10	27.83

Appendix Table 18 - continued

PRIMIPAROUS NO GENETIC DATA
PREPARTUM RATION NUTRIENT COMPOSITONS

Herd	IVTD (%)	Ether Extract (%)	Total Ash (%)	TDN (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
26	70.94	3.169	5.28	56.72	1.270	10.86	52.75	31.94
27	83.13	2.981	5.04	68.91	1.568	12.07	46.06	25.15
28	75.81	4.773	6.79	62.09	1.401	15.06	50.88	30.55
29	80.61	3.273	6.70	65.10	1.475	13.86	39.32	22.71
30	78.21	3.214	4.17	65.16	1.476	13.07	61.58	32.72
31	84.14	3.348	6.89	68.54	1.559	20.73	37.67	23.09
32	76.74	2.929	5.93	61.57	1.389	14.91	48.36	29.21
33	80.11	2.752	3.17	67.48	1.533	7.85	50.56	23.89
34	85.97	1.357	5.41	69.36	1.579	14.86	38.49	19.85
35	75.48	3.212	7.29	59.31	1.333	18.51	52.70	30.92
36	73.91	2.326	4.44	59.48	1.337	7.29	62.15	33.85
37	71.79	1.461	7.47	53.25	1.185	13.55	60.89	37.94
38	83.14	3.516	7.48	67.16	1.525	18.18	39.21	23.97
39	79.91	2.637	9.01	61.29	1.382	19.51	46.43	26.37
41	85.53	3.066	6.08	70.38	1.604	14.12	33.80	18.27
42	76.83	2.782	6.92	60.49	1.362	14.07	54.86	31.78
44	78.79	3.097	7.05	62.71	1.416	15.51	46.08	27.04

[a]IVTD = In vitro true digestibility
[b]TDN = Total digestible nutrients
[c]NEL = Net energy for lactation

Appendix Table 19

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - CORRELATIONS

	FCM	BCS	AGE	WH	WT	PTAM	HEALTH	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
BCS	0.32101[a]												
	0.0463[b]												
AGE	-0.02954	-0.13549											
	0.8583	0.4108											
WH	0.31890	0.15878	0.08345										
	0.0478	0.3343	0.6135										
WT	0.26147	0.53822	0.03322	0.58903									
	0.1079	0.0004	0.8409	0.0001									
PTAM	0.21237	0.01121	-0.09581	-0.10643	-0.24093								
	0.1943	0.9460	0.5618	0.5190	0.1395								
HEALTH	-0.14347	-0.23005	0.14093	-0.22547	-0.10327	0.03036							
	0.3836	0.1589	0.3921	0.1676	0.5315	0.8544							
XSNEL	0.28686	0.43726	0.13333	0.23534	0.29271	0.01680	0.04188						
	0.0766	0.0054	0.4184	0.1492	0.0706	0.9191	0.8002						

Appendix Table 19 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - CORRELATIONS

	FCM	BCS	AGE	WH	WT	PTAM	HEALTH	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
XSPROTRD	0.24618	0.46503	-0.04004	0.27473	0.31087	-0.04398	-0.10275	0.88034					
	0.1309	0.0029	0.8088	0.0905	0.0541	0.7904	0.5337	0.0001					
XSPROTES	-0.01576	0.22457	-0.26132	0.09599	0.07548	-0.12389	-0.24263	0.13852	0.56197				
	0.9241	0.1693	0.1081	0.5610	0.6479	0.4524	0.1367	0.4003	0.0002				
ED	0.08008	0.18909	0.19598	-0.32550	-0.15854	-0.04362	0.04261	0.12607	-0.03816	-0.27444			
	0.6280	0.2490	0.2318	0.0432	0.3350	0.7921	0.7967	0.4444	0.8176	0.0909			
ADF	0.00362	-0.31789	-0.21121	0.28662	0.07368	-0.04290	-0.00310	-0.14210	0.01653	0.24761	-0.86073		
	0.9825	0.0486	0.1968	0.0769	0.6557	0.7954	0.9850	0.3882	0.9204	0.1286	0.0001		
CP	0.25514	0.19285	-0.31266	-0.02723	-0.16955	0.23114	-0.19867	0.27796	0.40538	0.29082	0.23657	-0.11464	
	0.1170	0.2395	0.0526	0.8693	0.3021	0.1568	0.2253	0.0867	0.0109	0.0725	0.1471	0.4871	
DMI	0.01891	0.19599	-0.17970	0.15090	0.10463	0.07241	0.00544	0.30710	0.27124	0.03670	0.03827	-0.03833	0.31115
	0.9091	0.2318	0.2737	0.3592	0.5262	0.6613	0.9738	0.0572	0.0949	0.8244	0.8171	0.8168	0.0538

[a] = Correlation coefficient
[b] = Significance level

Appendix Table 20

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Age (mos)	Withers Height (cm)	Body Weight (kg)	Sire PTAM[a] (kg)	Health Score
1	4	22.99	2.50	28.75	140.00	518	447.93	0.25
2	2	32.32	3.00	23.67	139.83	533	329.62	0.00
4	2	30.09	3.50	24.00	142.50	577	424.34	0.33
5	3	18.13	2.85	26.00	138.33	504	-466.04	0.20
6	1	28.79	3.25	31.50	135.00	489	331.58	1.00
7	4	22.53	1.83	26.00	136.00	435	391.91	0.33
8	4	33.20	3.17	25.00	136.17	547	361.82	0.00
9	3	21.52	2.33	25.33	134.50	469	311.02	0.00
10	1	27.32	2.50	24.67	136.83	497	777.01	0.33
11	1	26.21	3.00	24.00	138.75	511	435.23	0.50
12	2	29.69	2.50	32.00	133.00	448	616.74	0.67
13	4	31.51	2.25	23.50	135.25	476	334.41	0.25
14	1	28.41	3.00	26.00	138.00	547	573.35	0.67
15	4	24.87	2.83	25.33	136.00	518	461.31	0.00
16	4	31.86	3.13	25.75	136.63	569	475.71	0.25
18	2	26.71	3.17	24.67	136.17	547	339.06	0.00
20	2	27.56	3.33	27.33	136.00	504	1199.76	0.33
21	1	25.37	2.50	23.33	136.33	497	440.14	0.00
22	4	33.97	2.67	28.33	136.00	511	84.67	0.00
23	1	23.94	2.70	28.40	132.70	448	238.59	0.00
24	2	28.11	3.00	24.25	137.88	489	601.24	0.25
25	3	23.16	3.00	24.67	136.83	525	146.51	0.00

Appendix Table 20 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Age (mos)	Withers Height (cm)	Body Weight (kg)	Sire PTAM (kg)	Health Score
26	3	26.42	2.33	29.67	135.50	540	377.85	2.00
27	3	19.04	2.50	24.67	132.50	504	-62.60	1.75
28	3	27.10	2.83	23.67	137.50	533	605.55	0.00
29	1	19.13	2.33	30.67	135.50	540	-101.61	0.00
30	3	21.52	2.17	24.33	130.00	409	1199.76	0.60
31	4	23.61	2.75	23.50	128.25	455	529.35	1.00
32	1	24.67	2.50	24.33	135.67	504	264.45	1.33
33	4	23.15	2.63	27.50	137.63	525	529.35	0.00
34	2	23.51	2.83	32.00	139.50	577	334.45	0.33
35	2	27.08	2.67	25.67	139.17	533	465.54	0.33
36	4	26.25	2.67	24.33	135.00	525	540.23	0.67
38	2	21.35	3.25	24.25	130.25	525	559.29	0.25
39	1	21.98	3.00	25.33	133.50	511	329.31	0.00
40	2	31.94	2.50	26.67	140.83	533	386.61	0.33
41	2	29.45	2.83	28.00	135.83	497	486.71	0.00
42	3	28.83	3.25	24.00	132.25	525	-65.32	0.00
44	1	25.40	2.67	27.00	138.33	518	327.95	0.67

[a]PTAM = Predicted transmitting ability for milk

Appendix Table 21

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL[a] (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
1	4	9.65	1207	148	1.668	21.86	16.95	21.98
2	2	21.36	2205	55	1.622	21.69	17.72	22.05
4	2	26.86	4291	538	1.611	20.68	21.39	26.49
5	3	7.51	1211	293	1.798	13.23	17.21	26.13
6	1	15.97	912	-250	1.771	15.94	18.70	27.40
7	4	5.74	480	-44	1.671	19.82	18.68	24.67
8	4	24.71	3395	331	1.709	17.56	20.76	24.65
9	3	4.45	981	390	1.654	20.88	20.79	21.36
10	1	3.86	776	301	1.670	19.94	17.91	24.15
11	1	1.70	265	88	1.503	23.60	17.37	20.83
12	2	15.77	1826	123	1.660	19.62	17.16	23.16
13	4	5.13	124	-248	1.723	19.79	19.14	20.13
14	1	24.07	2368	19	1.687	18.95	15.68	26.12
15	4	6.53	381	-155	1.634	18.51	17.20	24.31
16	4	13.33	1580	145	1.688	17.12	18.93	26.55

Appendix Table 21 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
18	2	14.25	1554	86	1.719	15.88	17.68	24.59
20	2	15.47	1176	-127	1.773	11.62	16.43	19.87
21	1	5.31	865	239	1.460	27.38	15.90	30.08
22	4	2.34	217	-6	1.717	18.04	17.20	22.03
23	1	8.75	1312	252	1.720	16.87	15.21	19.26
24	2	1.50	269	111	1.669	18.12	17.67	24.22
25	3	10.53	1723	373	1.585	21.76	17.37	21.24
26	3	4.71	282	-121	1.725	17.16	15.70	21.79
27	3	13.65	843	-207	1.658	18.82	15.24	25.86
28	3	3.59	520	135	1.633	17.83	17.09	27.94
29	1	9.29	850	-23	1.597	19.50	12.78	17.12
30	3	5.96	458	-70	1.652	19.36	19.73	22.43
31	4	5.59	1131	389	1.682	17.10	18.92	17.98

Appendix Table 21 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
32	1	5.67	734	124	1.558	23.08	13.85	18.95
33	4	1.27	-474	-539	1.635	17.19	15.96	22.63
34	2	8.93	819	-21	1.614	21.60	16.00	19.70
35	2	6.07	1339	496	1.481	23.84	17.61	19.93
36	4	2.08	-357	-471	1.660	20.80	16.19	21.57
38	2	3.53	688	267	1.666	18.51	16.01	25.16
39	1	5.57	1266	481	1.623	19.09	17.75	23.16
40	2	-0.38	199	243	1.545	22.03	13.84	17.79
41	2	13.72	1121	-87	1.677	16.53	16.67	20.48
42	3	3.72	469	85	1.721	18.96	16.79	17.18
44	1	18.04	2131	155	1.463	23.24	16.37	24.40

[a]NEL = Net energy for lacation

Appendix Table 22

PRIMIPAROUS NO SOMATIC CELL COUNT DATA PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
1	16.45	91.18	15.00	7.89
2	32.71	59.33	19.41	6.80
4	35.83	73.63	26.38	8.26
5	26.23	44.28	11.62	6.92
6	33.02	48.19	15.91	6.43
7	20.82	54.00	11.24	7.12
8	40.26	52.28	21.05	6.79
9	19.80	47.72	9.45	6.63
10	18.14	54.62	9.91	7.35
11	17.30	59.00	10.21	8.86
12	27.22	58.93	16.04	6.27
13	19.50	56.34	10.99	7.40
14	33.69	67.47	22.73	7.41
15	21.11	48.70	10.28	6.51
16	22.63	65.34	14.79	7.04
18	37.62	46.61	17.53	7.97
20	33.85	47.43	16.05	6.69
21	18.69	66.00	12.33	8.30
22	15.77	67.59	10.66	8.81
23	19.96	73.81	14.73	7.82
24	15.42	67.07	10.34	9.09
25	28.12	49.61	13.95	7.29

Appendix Table 22 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
26	19.64	65.60	12.88	9.17
27	27.94	56.40	15.76	7.05
28	15.88	68.48	10.87	8.31
29	27.22	53.64	14.60	8.30
30	34.02	31.14	10.59	6.56
31	16.78	61.39	10.30	6.72
32	18.14	65.00	11.79	7.71
33	19.75	44.24	8.74	7.91
34	27.37	49.00	13.41	7.75
35	31.75	41.58	13.20	8.65
36	20.19	50.00	10.09	8.53
38	13.61	72.00	9.80	7.48
39	14.06	83.17	11.69	7.67
40	8.62	86.76	7.48	7.73
41	28.12	54.66	15.37	6.82
42	25.86	42.64	11.02	8.29
44	42.18	49.11	20.71	7.97

Appendix Table 23

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL[a])	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
1	184	483	10.71	20.36	9.65
2	191	533	11.53	32.89	21.36
4	197	577	12.24	39.10	26.86
5	187	504	11.06	18.57	7.51
6	185	489	10.82	26.80	15.97
7	177	435	9.91	15.64	5.74
8	193	547	11.76	36.47	24.71
9	182	469	10.47	14.92	4.45
10	187	504	11.06	14.93	3.86
11	188	511	11.17	12.88	1.70
12	179	448	10.13	25.90	15.77
13	183	476	10.60	15.73	5.13
14	192	540	11.65	35.72	24.07
15	189	518	11.29	17.82	6.53
16	196	569	12.12	25.45	13.33
18	194	555	11.89	26.14	14.25
20	187	504	11.06	26.54	15.47
21	186	497	10.94	16.26	5.31
22	188	511	11.17	13.51	2.34
23	177	435	9.91	18.65	8.75
24	185	489	10.82	12.32	1.50
25	191	533	11.53	22.06	10.53

Appendix Table 23 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL)	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
26	192	540	11.65	16.36	4.71
27	187	504	11.06	24.71	13.65
28	192	540	11.65	15.23	3.59
29	197	577	12.24	21.53	9.29
30	175	422	9.68	15.64	5.96
31	182	469	10.47	16.06	5.59
32	184	483	10.71	16.38	5.67
33	196	569	12.12	13.39	1.27
34	197	577	12.24	21.17	8.93
35	191	533	11.53	17.60	6.07
36	190	525	11.41	13.49	2.08
38	190	525	11.41	14.94	3.53
39	183	476	10.60	16.16	5.57
40	191	533	11.53	11.15	-0.38
41	186	497	10.94	24.66	13.72
42	189	518	11.29	15.01	3.72
44	189	518	11.29	29.33	18.04

[a]NEL = Net energy for lactation

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Appendix Table 24

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
1	1027	2234	1207	1175	148
2	1105	3311	2205	1160	55
4	1173	5464	4291	1711	538
5	1059	2270	1211	1352	293
6	1037	1949	912	788	-250
7	949	1429	480	905	-44
8	1128	4523	3395	1459	331
9	1004	1986	981	1393	390
10	1059	1834	776	1360	301
11	1070	1334	265	1158	88
12	971	2797	1826	1093	123
13	1015	1138	124	767	-248
14	1117	3485	2368	1136	19
15	1082	1463	381	926	-155
16	1160	2740	1580	1305	145
18	1139	2693	1554	1224	86
20	1059	2235	1176	931	-127
21	1050	1916	865	1289	239
22	1070	1287	217	1064	-6
23	949	2261	1312	1200	252
24	1037	1306	269	1148	111
25	1105	2102	1723	1098	373
26	1117	1399	282	996	-121
27	1059	1902	843	851	-207
28	1117	1637	520	1251	135
29	1173	2023	850	1150	-23
30	927	1385	458	857	-70
31	1004	2136	1131	1393	389
32	1027	1758	734	1150	124
33	1160	686	-474	621	-539
34	1173	1993	819	1152	-21
35	1105	2444	1339	1601	496
36	1093	736	-357	622	-471
38	1093	1781	688	1360	267
39	1015	2282	1266	1496	481
40	1105	1304	199	1348	243
41	1050	2171	1121	963	-87
42	1082	1551	469	1166	85
44	1082	3213	2131	1236	155

Appendix Table 25

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD[a] (%)	Ether Extract (%)	Total Ash (%)	TDN[b] (%)	NEL[c] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	75.44	2.795	5.76	60.28	1.357	14.89	54.22	30.98
2	87.57	4.528	6.24	74.09	1.695	17.06	33.75	18.98
4	81.37	4.371	8.53	65.41	1.482	20.71	45.14	26.09
5	83.77	5.257	7.27	70.17	1.599	19.54	41.37	23.71
6	83.89	4.038	2.41	73.63	1.684	12.25	44.09	21.65
7	75.54	3.829	5.75	61.68	1.391	12.71	61.55	35.37
8	88.93	5.060	6.74	75.62	1.733	21.49	29.04	17.34
9	83.13	5.013	7.14	69.35	1.579	21.01	37.20	22.92
10	79.74	3.979	5.45	66.36	1.506	18.51	42.96	25.52
11	73.84	1.949	7.00	56.38	1.261	13.07	64.58	38.15
12	84.35	4.049	5.68	70.83	1.615	17.44	38.82	23.30
13	76.43	3.386	4.46	63.30	1.431	10.36	60.29	33.89
14	82.40	2.973	4.20	69.02	1.571	15.33	38.91	23.72
15	87.07	3.688	3.12	75.66	1.734	14.23	35.19	17.66
16	88.70	4.439	6.19	75.16	1.721	18.53	28.84	16.02
18	81.51	3.673	7.45	65.75	1.491	15.36	42.00	26.63
20	87.36	4.188	7.33	72.36	1.653	13.92	25.52	14.59
21	74.08	2.955	6.18	58.69	1.318	15.53	52.29	34.00
22	71.88	3.006	6.09	56.65	1.268	12.08	54.07	32.95
23	72.74	2.600	6.51	56.58	1.266	15.35	49.31	32.60
24	68.46	3.170	6.00	53.52	1.191	12.63	57.01	35.73
25	81.87	3.677	6.75	66.82	1.519	15.07	45.10	27.83

Appendix Table 25 - continued

PRIMIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD (%)	Ether Extract (%)	Total Ash (%)	TDN (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
26	70.94	3.169	5.28	56.72	1.270	10.86	52.75	31.94
27	83.13	2.981	5.04	68.91	1.568	12.07	46.06	25.15
28	75.81	4.773	6.79	62.09	1.401	15.06	50.88	30.55
29	80.61	3.273	6.70	65.10	1.475	13.86	39.32	22.71
30	78.21	3.214	4.17	65.16	1.476	13.07	61.58	32.72
31	84.14	3.348	6.89	68.54	1.559	20.73	37.67	23.09
32	76.74	2.929	5.93	61.57	1.389	14.91	48.36	29.21
33	80.11	2.752	3.17	67.48	1.533	7.85	50.56	23.89
34	85.97	1.357	5.41	69.36	1.579	14.86	38.49	19.85
35	75.48	3.212	7.29	59.31	1.333	18.51	52.70	30.92
36	73.91	2.326	4.44	59.48	1.337	7.29	62.15	33.85
38	83.14	3.516	7.48	67.16	1.525	18.18	39.21	23.97
39	79.91	2.637	9.01	61.29	1.382	19.51	46.43	26.37
40	82.60	2.886	7.50	65.81	1.492	17.44	39.61	23.86
41	85.53	3.066	6.08	70.38	1.604	14.12	33.80	18.27
42	76.83	2.782	6.92	60.49	1.362	14.07	54.86	31.78
44	78.79	3.097	7.05	62.71	1.416	15.51	46.08	27.04

[a]IVTD = In vitro true digestibility
[b]TDN = Total digestible nutrients
[c]NEL = Net energy for lactation

Appendix Table 26

PRIMIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSTIONS - VISIT ONE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL[a] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	32.02	63.85	20.45	86.67	4.674	4.98	74.63	1.709	16.23	38.91	20.93
2	35.43	59.05	20.92	87.17	5.903	6.23	75.42	1.728	17.41	34.70	20.08
3	32.35	56.99	18.43	78.18	3.999	8.06	62.22	1.404	18.07	49.87	29.78
4	39.92	82.38	32.88	85.39	4.584	8.46	69.76	1.589	21.20	39.42	21.55
5	40.02	65.30	26.13	89.98	4.662	5.03	77.88	1.788	18.56	26.79	12.10
6	45.95	58.79	27.02	88.56	4.030	2.80	77.90	1.789	16.53	28.70	14.78
7	38.00	66.54	25.28	88.23	4.362	4.96	75.82	1.738	21.30	30.16	18.43
8	41.28	56.21	23.20	87.40	4.279	6.50	73.34	1.677	21.42	29.68	18.49
9	41.11	50.00	20.55	84.73	5.072	7.27	70.90	1.617	21.63	34.17	21.49
10	34.24	70.91	24.28	85.79	5.427	6.37	73.30	1.676	18.06	33.26	20.52
11	39.64	51.05	20.24	82.68	4.074	6.47	68.40	1.556	16.84	39.19	23.34
12	36.49	61.76	22.53	85.96	4.877	5.85	73.31	1.676	18.50	33.82	20.02
13	40.52	45.16	18.30	86.83	6.397	6.11	75.81	1.737	17.11	36.31	19.79
14	41.73	68.21	28.46	83.36	3.213	3.98	70.49	1.607	16.82	33.33	20.25
15	43.74	56.75	24.82	87.71	5.849	6.45	75.68	1.734	17.30	31.57	17.39
16	41.73	65.27	27.24	85.12	5.613	5.36	73.88	1.690	18.83	30.81	19.46
17	30.39	61.86	18.80	87.84	6.999	4.42	79.26	1.822	19.73	33.61	18.04
18	43.15	56.97	24.58	87.32	6.195	9.79	72.38	1.653	19.14	28.64	15.53
19	43.34	55.83	24.20	79.38	4.405	5.55	66.44	1.508	14.51	39.10	21.97
20	38.27	49.70	19.02	91.30	4.175	6.84	76.78	1.761	17.02	23.47	12.31
21	43.75	68.27	29.87	79.19	5.024	5.77	66.80	1.517	15.05	40.08	26.22
22	33.80	66.87	22.60	84.70	6.560	5.44	74.56	1.707	17.76	30.98	17.40
23	30.05	64.21	19.30	89.28	3.826	3.85	77.31	1.774	13.10	30.10	16.46

Appendix Table 26 - continued

Appendix Table 26 - continued

PRIMIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSTIONS - VISIT ONE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
24	43.38	53.47	23.19	85.46	4.021	6.87	70.71	1.612	16.72	39.00	19.60
25	38.67	53.71	20.77	82.93	5.763	6.41	70.83	1.615	17.54	36.66	19.83
26	35.88	61.81	22.18	86.46	4.951	6.48	73.27	1.675	16.29	37.63	18.60
27	42.92	60.91	26.14	83.83	2.976	4.58	70.07	1.597	14.47	43.17	20.24
28	47.85	58.56	28.02	86.15	6.074	7.12	73.72	1.686	17.58	31.57	17.54
29	30.16	55.96	16.88	83.92	2.888	6.05	68.58	1.560	13.35	36.94	19.44
30	50.26	45.43	22.83	84.96	3.018	4.61	71.22	1.625	20.61	40.03	20.08
31	65.66	27.25	17.89	87.20	3.279	7.15	71.25	1.626	22.06	29.90	17.44
32	33.57	57.40	19.27	84.43	3.913	5.68	70.75	1.613	13.75	41.34	21.55
33	32.90	54.58	17.96	86.73	3.705	4.18	74.28	1.700	16.69	31.29	16.28
34	37.78	54.00	20.40	85.55	4.630	6.37	72.07	1.646	17.42	38.23	21.47
35	34.02	62.00	21.09	81.56	3.220	6.83	65.85	1.493	17.83	49.50	23.47
36	37.83	60.49	22.89	85.59	4.346	5.45	72.67	1.661	15.21	37.34	19.46
37	53.75	57.74	31.03	82.64	4.776	5.37	70.34	1.603	14.60	46.28	22.79
38	47.73	66.37	31.68	87.27	3.887	6.27	72.96	1.668	16.93	35.48	18.74
39	35.98	64.50	23.21	85.79	2.956	6.96	69.62	1.586	17.66	34.18	21.07
40	31.75	57.43	18.24	85.21	3.258	5.68	70.71	1.612	14.00	36.45	19.15
41	33.31	59.44	19.80	89.21	3.168	6.00	74.27	1.700	16.22	33.15	15.35
42	31.07	56.16	17.45	86.35	5.168	4.89	75.02	1.718	15.83	34.01	19.38
44	44.27	53.69	23.77	80.46	3.774	7.06	65.21	1.478	16.03	42.96	22.38

[a]NEL = Net energy for lactation

Appendix Table 27

PRIMIPAROUS ALL DATA

POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSITIONS - VISIT TWO

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL[a] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	33.38	70.63	23.58	86.97	4.542	4.91	74.84	1.713	16.04	38.55	19.84
2	35.43	63.58	22.53	81.73	4.246	6.03	68.11	1.549	18.88	41.14	23.31
3	29.27	50.43	14.76	83.58	4.564	6.05	70.33	1.603	16.10	44.67	23.32
4	39.92	67.63	27.00	86.21	4.497	7.65	71.28	1.626	21.27	33.69	20.26
5	40.02	62.78	25.13	89.62	5.497	4.44	79.15	1.819	17.66	26.85	12.88
6	45.95	55.09	25.32	88.39	3.739	2.96	77.20	1.771	17.15	37.83	19.20
7	38.00	65.77	24.99	83.72	4.198	6.40	69.67	1.587	17.86	33.10	20.72
8	44.79	56.80	25.44	89.45	4.537	6.38	75.84	1.738	20.86	28.00	16.66
9	41.11	51.20	21.05	85.22	5.401	7.40	71.67	1.636	20.58	34.69	21.00
10	34.24	70.06	23.99	85.35	5.265	7.07	71.96	1.643	18.57	33.99	21.55
11	36.51	56.19	20.52	79.62	4.391	5.48	66.73	1.515	17.01	41.30	26.60
12	36.49	63.47	23.16	85.02	3.864	5.55	71.40	1.629	17.03	37.08	19.36
13	44.50	46.85	20.85	86.13	5.928	5.80	74.83	1.713	19.36	34.45	19.63
14	41.73	57.94	24.18	87.74	3.434	2.98	76.16	1.746	14.83	29.74	16.72
15	43.74	50.20	21.96	82.70	5.901	8.11	69.07	1.572	17.97	37.80	19.76
16	38.10	66.97	25.52	86.91	5.967	6.18	75.29	1.725	18.90	28.98	16.72
17	36.47	58.84	21.46	89.40	7.111	6.35	79.04	1.817	18.36	27.97	15.51
18	43.15	53.94	23.28	89.36	5.342	5.97	77.17	1.771	16.74	25.78	14.74
19	43.34	57.32	24.84	87.10	4.855	5.58	74.69	1.710	15.13	33.35	17.25
20	38.22	54.06	20.66	92.91	4.293	7.12	78.25	1.797	15.91	20.20	10.03
21	43.75	68.53	29.98	77.98	4.416	6.57	64.03	1.449	16.12	44.17	28.87
22	33.80	65.77	22.23	85.75	5.688	6.10	73.86	1.690	18.12	30.86	18.52
23	30.05	61.85	18.59	86.57	3.849	4.24	74.24	1.699	13.58	30.18	18.00

Appendix Table 27 - continued

PRIMIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSITIONS - VISIT TWO

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
24	43.38	57.83	25.09	87.72	3.873	6.34	73.32	1.676	18.08	33.12	18.40
25	38.67	54.75	21.17	82.05	5.925	7.46	69.10	1.573	17.09	39.93	22.31
26	34.24	62.11	21.27	88.66	4.668	5.16	76.44	1.753	14.84	37.89	16.78
27	42.32	63.22	26.76	87.60	4.035	3.66	76.08	1.744	14.27	36.49	17.03
28	47.85	58.31	27.90	87.11	5.674	6.91	74.40	1.703	16.98	32.21	16.72
29	30.16	53.61	16.17	86.08	3.523	5.93	71.65	1.635	12.67	35.57	18.81
30	50.26	43.24	21.73	86.28	2.844	4.53	72.41	1.654	18.58	39.44	19.11
31	32.21	60.91	19.62	88.52	3.304	4.56	75.20	1.722	16.65	30.23	15.51
32	33.57	55.59	18.66	81.95	3.240	5.23	67.87	1.543	13.30	43.09	22.75
33	44.73	55.69	24.91	84.66	2.812	5.29	69.98	1.595	15.70	33.67	17.70
34	38.23	48.00	18.35	84.19	4.445	8.01	68.84	1.567	16.05	37.71	22.34
35	21.77	88.66	19.30	81.44	2.836	7.02	65.06	1.474	18.54	47.38	22.95
36	37.83	54.55	20.64	83.25	6.707	5.53	73.21	1.674	16.92	38.98	21.67
37	42.52	57.96	24.64	81.90	3.958	7.30	66.65	1.513	16.16	43.00	23.18
38	34.37	64.35	22.12	87.43	4.561	7.44	72.79	1.663	15.34	34.60	18.25
39	35.98	65.09	23.42	85.69	3.118	6.81	69.88	1.592	17.42	34.86	20.41
40	31.75	54.82	17.41	82.65	2.996	5.73	67.76	1.540	14.51	38.74	22.33
41	33.31	59.84	19.93	89.32	2.841	5.62	74.35	1.702	16.63	31.56	14.57
42	31.07	53.75	16.70	86.46	5.265	5.21	74.93	1.716	16.67	40.64	18.98
44	44.27	56.72	25.11	78.92	3.976	7.07	63.92	1.446	17.09	43.73	25.26

[a]NEL = Net energy for lactation

Appendix Table 28

PRIMIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSTIONS - VISIT THREE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL[a] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	33.38	65.64	21.91	82.88	4.328	5.92	69.47	1.582	18.58	45.69	24.80
2	35.43	64.12	22.72	83.28	4.210	5.87	69.77	1.589	16.88	36.50	21.68
3	29.27	64.62	18.91	88.00	4.540	4.88	75.89	1.739	16.13	34.77	18.06
4	39.92	49.13	19.61	85.32	4.795	7.54	70.87	1.616	21.69	34.20	20.23
5	40.02	67.80	27.13	89.32	4.402	4.05	77.88	1.788	15.41	29.89	14.71
6	45.95	64.97	29.86	90.90	3.152	5.49	76.45	1.753	22.41	26.72	13.83
7	38.00	62.46	23.73	84.41	6.971	6.38	73.84	1.689	16.88	34.44	20.31
8	44.79	56.47	25.29	88.28	4.449	6.17	74.77	1.712	19.99	30.23	17.52
9	41.11	54.71	22.49	87.16	6.152	7.35	74.60	1.708	20.16	31.01	20.14
10	34.24	70.66	24.19	87.10	5.352	7.00	73.89	1.690	17.10	30.09	17.76
11	36.51	59.52	21.73	76.97	3.636	5.03	63.58	1.438	18.27	34.73	20.85
12	36.49	65.17	23.78	86.49	3.926	5.22	73.28	1.675	15.95	35.85	19.47
13	44.45	47.75	21.23	85.48	6.828	6.10	75.02	1.718	20.94	32.37	19.96
14	41.73	61.68	25.74	87.20	3.752	4.37	74.62	1.708	15.39	35.81	19.88
15	43.74	59.76	26.14	84.64	5.158	8.21	69.98	1.594	16.33	33.47	18.37
16	38.10	70.57	26.89	82.22	6.423	5.17	72.18	1.648	19.07	28.67	15.17
17	36.47	62.12	22.65	86.62	7.039	6.26	76.26	1.748	17.05	35.32	19.20
18	43.15	60.06	25.92	88.19	5.472	6.53	75.60	1.732	17.17	28.84	17.38
19	43.34	54.24	23.51	86.34	4.088	5.50	73.04	1.670	14.71	34.47	18.94
20	39.13	50.91	19.92	90.01	3.837	5.11	76.79	1.761	16.36	22.67	12.52
21	43.75	69.44	30.38	76.78	4.564	6.91	62.68	1.416	16.53	42.80	27.04
22	33.80	62.87	21.25	87.41	6.220	5.79	76.50	1.754	15.72	31.79	18.19
23	31.87	62.40	19.89	87.98	4.138	6.45	73.80	1.688	18.94	26.43	16.16

Appendix Table 28 - continued

PRIMIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSTIONS - VISIT THREE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
24	43.99	55.42	24.38	89.88	3.957	6.84	75.09	1.720	18.21	31.94	16.37
25	38.67	56.31	21.77	80.06	6.864	6.94	68.80	1.566	17.49	37.70	23.14
26	34.24	64.03	21.93	89.95	4.701	6.72	76.20	1.747	15.97	37.53	16.09
27	42.32	58.31	24.68	86.55	3.312	6.24	71.55	1.633	16.98	33.99	19.20
28	47.85	58.31	27.90	82.81	4.597	9.16	66.50	1.509	16.70	36.99	19.23
29	30.16	60.73	18.32	84.61	3.542	6.17	69.97	1.594	12.33	37.56	20.26
30	50.26	45.21	22.72	87.74	2.968	5.20	73.35	1.677	20.00	36.33	18.88
31	30.84	53.29	16.44	87.83	3.587	5.17	74.24	1.699	18.06	36.02	18.36
32	33.57	56.38	18.92	80.91	3.587	5.66	66.84	1.517	14.49	46.89	24.93
33	44.73	55.95	25.03	85.00	3.111	5.30	70.69	1.612	15.48	32.62	17.58
34	38.23	53.20	20.34	85.16	3.743	5.50	71.44	1.630	14.52	40.19	20.99
35	21.77	89.11	19.40	81.16	2.691	6.56	65.07	1.474	16.45	46.14	25.10
36	37.83	56.02	21.19	81.97	6.779	5.50	72.05	1.645	16.44	40.68	21.27
37	39.59	57.19	22.64	84.31	4.746	7.68	69.66	1.587	19.52	38.83	19.05
38	34.37	63.06	21.68	87.63	4.172	6.97	72.97	1.668	15.76	35.07	18.53
39	35.98	63.47	22.84	89.18	2.962	6.07	73.91	1.691	18.17	29.32	15.79
40	31.75	55.84	17.73	80.35	2.698	5.36	65.46	1.484	13.01	46.14	24.61
41	33.31	65.20	21.72	87.71	2.589	6.68	71.37	1.628	17.16	36.84	19.67
42	31.07	55.99	17.40	87.12	5.435	5.50	75.52	1.730	17.87	39.66	18.52
44	44.27	54.95	24.32	80.96	3.259	7.47	64.66	1.464	16.00	38.25	22.08

[a]NEL = Net energy for lactation

Appendix Table 29

MULTIPAROUS COMPLETE DATA - CORRELATIONS

	FCM	BCS	WT	PTAM	SCC	HEALTH	DP	PLL	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
BCS	0.33517[a]													
	0.0527[b]													
WT	0.21291	0.50360												
	0.2267	0.0024												
PTAM	-0.04354	-0.09266	-0.13953											
	0.8069	0.6022	0.4313											
SCC	0.00930	0.05405	0.16928	0.29366										
	0.9584	0.7614	0.3385	0.0919										
HEALTH	-0.07192	0.07511	0.12900	0.41956	0.01767									
	0.6861	0.6729	0.4671	0.0135	0.9210									
DP	-0.14783	-0.09292	0.09682	-0.42084	-0.10188	0.00954								
	0.4041	0.6012	0.5859	0.0132	0.5664	0.9573								
PLL	0.08552	0.06218	-0.20818	0.17431	-0.35460	0.19916	-0.27278							
	0.6306	0.7268	0.2374	0.3242	0.0396	0.2588	0.1186							

Appendix Table 29 - continued

MULTIPAROUS COMPLETE DATA - CORRELATIONS

	FCM	BCS	WT	PTAM	SCC	HEALTH	DP	PLL	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
XSNEL	0.17989	0.37120	0.07207	0.10037	0.15805	0.06415	-0.14571	0.02735						
	0.3087	0.0307	0.6854	0.5722	0.3720	0.7185	0.4109	0.8780						
XSPROTRD	0.21124	0.57444	0.19079	-0.01297	0.26911	0.00426	-0.01040	-0.13145	0.82846					
	0.2304	0.0004	0.2798	0.9420	0.1238	0.9809	0.9535	0.4587	0.0001					
XSPROTES	0.05144	0.47961	0.22688	-0.21298	0.23671	-0.12785	0.27499	-0.28501	0.06798	0.59970				
	0.7726	0.0041	0.1969	0.2265	0.1777	0.4712	0.1155	0.1023	0.7024	0.0002				
ED	-0.05565	-0.21536	-0.53438	0.17801	0.22161	-0.09990	-0.40288	0.00876	0.12825	-0.06198	-0.30480			
	0.7546	0.2213	0.0011	0.3138	0.2078	0.5740	0.0182	0.9608	0.4698	0.7277	0.0796			
ADF	0.11537	-0.01444	0.53369	-0.14901	-0.08914	0.05705	0.24593	-0.06474	-0.26524	-0.07373	0.23829	-0.83431		
	0.5159	0.9354	0.0012	0.4003	0.6161	0.7486	0.1609	0.7160	0.1295	0.6786	0.1747	0.0001		
CP	0.45187	0.27519	0.04961	-0.01851	0.06255	0.05121	-0.31090	0.19422	0.07034	0.25450	0.28699	0.14436	-0.00104	
	0.0073	0.1152	0.7805	0.9172	0.7252	0.7736	0.0735	0.2710	0.6926	0.1464	0.0998	0.4153	0.9953	
DMI	0.22097	0.41238	0.29188	0.01798	0.07536	-0.01120	-0.27302	0.18171	0.05563	0.12743	0.09729	-0.28784	0.16866	0.16592
	0.2092	0.0154	0.0939	0.9196	0.6719	0.9499	0.1182	0.3037	0.7547	0.4727	0.5841	0.0988	0.3403	0.3483

[a] = Correlation coefficient
[b] = Significance level

Appendix Table 30

MULTIPAROUS COMPLETE DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Body Weight (kg)	Dry Period (mon)	Previous Lactation Length (days)	Sire PTAM[a] (kg)	Somatic Cell Count	Health Score
1	4	38.21	2.50	621	59.50	358.50	242.73	2.06	0.50
2	2	47.17	3.00	636	54.67	329.33	79.23	1.67	0.67
4	2	40.93	3.00	569	48.33	358.00	-163.60	1.89	0.00
5	3	31.95	2.50	497	66.00	284.00	101.83	4.17	0.00
7	4	36.04	2.00	577	48.00	304.00	362.88	4.11	0.00
8	4	42.33	3.25	614	46.00	319.50	447.70	4.00	1.00
9	3	28.51	2.50	547	74.00	331.33	178.26	1.33	0.00
10	1	30.55	2.75	659	67.00	323.50	47.63	4.00	0.50
12	2	44.32	2.67	614	55.33	318.67	590.89	4.11	0.00
13	4	38.02	2.00	533	62.33	299.00	389.04	3.00	0.67
15	4	34.63	2.33	591	71.33	327.00	372.86	2.50	1.00
16	4	39.15	2.75	621	53.38	347.13	311.11	2.74	0.13
17	3	37.92	2.00	489	46.67	364.33	163.15	2.11	0.00
18	2	38.65	2.63	540	60.00	325.75	498.73	1.75	0.00
20	2	31.21	2.63	518	55.25	346.25	465.39	2.25	0.50
21	1	34.69	2.50	636	56.33	288.00	173.42	1.78	0.00
23	1	26.53	2.50	525	43.50	323.00	529.35	2.33	0.00
24	2	37.19	2.50	547	57.33	346.33	478.09	2.78	0.00

Appendix Table 30 - continued

MULTIPAROUS COMPLETE DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Body Weight (kg)	Dry Period (mon)	Previous Lactation Length (days)	Sire PTAM (kg)	Somatic Cell Count	Health Score
25	3	32.74	2.50	555	68.00	378.50	466.98	2.50	1.50
26	3	25.87	2.33	591	58.00	330.00	624.00	3.22	1.67
27	3	17.45	2.67	629	63.00	347.33	133.81	2.50	0.00
28	3	36.35	3.00	614	67.00	313.67	-337.02	2.00	0.00
29	1	26.66	2.00	511	102.00	321.00	-310.71	0.67	0.00
30	3	44.91	2.50	562	58.50	441.00	119.98	0.83	0.00
31	4	24.77	2.21	547	54.57	294.14	201.91	2.05	0.29
33	4	30.10	2.50	497	27.00	459.00	714.42	1.11	1.00
34	2	33.34	2.50	599	65.00	288.00	424.79	2.75	0.00
35	4	34.76	3.00	621	83.67	345.33	344.13	1.38	1.33
36	4	38.49	2.58	629	54.50	316.17	228.54	0.78	0.50
37	4	37.15	2.38	577	95.50	327.50	212.40	2.33	0.50
38	2	34.16	2.67	547	58.67	299.33	398.56	1.89	0.67
39	1	37.56	3.00	584	77.00	339.50	290.30	3.67	0.00
41	2	37.89	2.83	569	57.00	324.67	200.94	1.56	0.00
44	1	28.32	2.50	577	58.67	362.67	466.60	3.11	0.33

[a]PTAM = Predicted transmitting ability for milk

Appendix Table 31

MULTIPAROUS COMPLETE DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL[a] (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
1	4	7.41	995	181	1.668	21.86	16.95	21.98
2	2	19.71	2049	65	1.645	19.81	18.88	25.80
4	2	7.37	1758	655	1.611	20.68	21.39	26.49
5	3	7.63	1220	287	1.798	13.23	17.21	26.13
7	4	3.40	256	-54	1.671	19.82	18.68	24.67
8	4	23.64	3295	363	1.731	16.24	20.78	26.25
9	3	3.16	857	437	1.702	18.95	20.87	23.66
10	1	1.41	540	367	1.670	19.94	17.91	24.15
12	2	13.07	1569	158	1.672	18.04	16.97	27.20
13	4	4.20	34	-270	1.723	19.79	19.14	20.13
15	4	5.35	268	-171	1.634	18.51	17.20	24.31
16	4	12.50	1501	155	1.688	17.12	18.93	26.55
17	3	5.25	-252	-508	1.796	17.58	18.38	20.97
18	2	14.49	1576	83	1.719	15.88	17.68	24.59
20	2	15.24	1153	-131	1.773	11.62	16.43	19.87
21	1	3.08	654	292	1.460	27.38	15.90	30.08
23	1	7.24	1168	291	1.720	16.87	15.21	19.26
24	2	0.55	178	119	1.714	16.52	18.01	26.40

Appendix Table 31 - continued

MULTIPAROUS COMPLETE DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
25	3	10.17	963	-6	1.616	20.52	18.17	23.35
26	3	3.89	204	-128	1.725	17.16	15.70	21.79
27	3	11.64	651	-245	1.658	18.82	15.24	25.86
28	3	2.40	409	151	1.633	17.83	17.09	27.94
29	1	10.36	953	-20	1.630	17.43	12.85	19.14
30	3	3.64	235	-87	1.652	19.36	19.73	22.43
31	4	4.30	1008	437	1.732	16.33	20.28	20.87
33	4	2.45	-364	-490	1.712	15.61	17.68	31.38
34	2	1.50	87	-51	1.614	21.60	16.00	19.70
35	4	4.66	1205	558	1.479	22.52	18.69	23.50
36	4	0.43	-515	-539	1.637	18.76	17.41	24.24
37	4	2.61	526	227	1.568	21.67	16.76	26.10
38	2	3.18	653	274	1.666	18.51	16.01	25.16
39	1	3.80	1097	561	1.623	19.09	17.75	23.16
41	2	12.54	1011	-93	1.699	14.84	17.72	24.29
44	1	17.09	2040	168	1.526	22.06	17.04	26.23

[a]NEL = Net energy for lactation

Appendix Table 32

MULTIPAROUS COMPLETE DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
1	16.45	91.18	15.00	9.54
2	32.71	59.33	19.41	7.77
4	14.06	88.89	12.50	7.77
5	26.23	44.28	11.62	6.84
7	20.82	54.00	11.24	8.80
8	40.26	52.28	21.05	7.40
9	19.80	47.72	9.45	7.45
10	18.14	54.62	9.91	8.98
12	27.22	58.93	16.04	7.94
13	19.50	56.34	10.99	8.06
15	21.11	48.70	10.28	7.19
16	22.63	65.34	14.79	7.52
17	20.56	49.09	10.09	6.80
18	37.62	46.61	17.53	7.81
20	33.85	47.43	16.05	6.83
21	18.69	66.00	12.33	10.00
23	19.96	73.81	14.73	9.01
24	15.42	67.07	10.34	9.88
25	28.12	49.61	13.95	7.52
26	19.64	65.60	12.88	9.82
27	27.94	56.40	15.76	8.33
28	15.88	68.48	10.87	9.16
29	27.22	53.64	14.60	7.58
30	34.02	31.14	10.59	8.13
31	16.78	61.39	10.30	7.55
33	19.75	44.24	8.74	7.14
34	14.17	78.57	11.14	9.95
35	31.75	41.58	13.20	9.71
36	20.19	50.00	10.09	9.77
37	14.52	86.36	12.54	10.33
38	13.61	72.00	9.80	7.71
39	14.06	83.17	11.69	8.94
41	28.12	54.66	15.37	7.56
44	42.18	49.11	20.71	8.65

Appendix Table 33

MULTIPAROUS COMPLETE DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL[a])	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
1	203	621	12.94	20.36	7.41
2	205	636	13.18	32.89	19.71
4	196	569	12.12	19.49	7.37
5	186	497	10.94	18.57	7.63
7	197	577	12.24	15.64	3.40
8	202	614	12.83	36.47	23.64
9	193	547	11.76	14.92	3.16
10	208	659	13.52	14.93	1.41
12	202	614	12.83	25.90	13.07
13	191	533	11.53	15.73	4.20
15	199	591	12.47	17.82	5.35
16	203	621	12.94	25.45	12.50
17	185	489	10.82	16.07	5.25
18	192	540	11.65	26.14	14.49
20	189	518	11.29	26.54	15.24
21	205	636	13.18	16.26	3.08
23	190	525	11.41	18.65	7.24
24	193	547	11.76	12.32	0.55
25	194	555	11.89	22.06	10.17
26	199	591	12.47	16.36	3.89
27	204	629	13.06	24.71	11.64
28	202	614	12.83	15.23	2.40
29	188	511	11.17	21.53	10.36
30	195	562	12.00	15.64	3.64
31	193	547	11.76	16.06	4.30
33	186	497	10.94	13.39	2.45
34	200	599	12.60	14.10	1.50
35	203	621	12.94	17.60	4.66
36	204	629	13.06	13.49	0.43
37	197	577	12.24	14.86	2.61
38	193	547	11.76	14.94	3.18
39	198	584	12.36	16.16	3.80
41	196	569	12.12	24.66	12.54
44	197	577	12.24	29.33	17.09

[a]NEL = Net energy for lactation

Appendix Table 34

MULTIPAROUS COMPLETE DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
1	1239	2234	995	1421	182
2	1261	3311	2050	1326	65
4	1160	2917	1757	1814	654
5	1050	2270	1220	1337	287
7	1173	1429	256	1118	-55
8	1228	4523	3295	1590	362
9	1128	1986	858	1565	437
10	1295	1834	539	1662	367
12	1228	2797	1569	1385	157
13	1105	1138	33	835	-270
15	1195	1463	268	1023	-172
16	1239	2740	1501	1393	154
17	1037	785	-252	529	-508
18	1117	2693	1576	1200	83
20	1082	2235	1153	951	-131
21	1261	1916	655	1553	292
23	1093	2261	1168	1383	290
24	1128	1306	178	1248	120
25	1139	2102	963	1133	-6
26	1195	1399	204	1066	-129
27	1251	1902	651	1005	-246
28	1228	1637	409	1379	151
29	1070	2023	953	1051	-19
30	1150	1385	235	1063	-87
31	1128	2136	1008	1565	437
33	1050	686	-364	560	-490
34	1207	1294	87	1156	-51
35	1239	2444	1205	1797	558
36	1251	736	-515	712	-539
37	1173	1699	526	1400	227
38	1128	1781	653	1402	274
39	1184	2282	1098	1744	560
41	1160	2171	1011	1067	-93
44	1173	3213	2040	1342	169

Appendix Table 35

MULTIPAROUS COMPLETE DATA
PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD[a] (%)	Ether Extract (%)	Total Ash (%)	TDN[b] (%)	NEL[c] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	75.44	2.795	5.76	60.28	1.357	14.89	54.22	30.98
2	87.57	4.528	6.24	74.09	1.695	17.06	33.75	18.98
4	84.18	4.322	8.13	68.55	1.559	23.34	56.25	25.43
5	83.77	5.257	7.27	70.17	1.599	19.54	41.37	23.71
7	75.54	3.829	5.75	61.68	1.391	12.71	61.55	35.37
8	88.93	5.060	6.74	75.62	1.733	21.49	29.04	17.34
9	83.13	5.013	7.14	69.35	1.579	21.01	37.20	22.92
10	79.74	3.979	5.45	66.36	1.506	18.51	42.96	25.52
12	84.35	4.049	5.68	70.83	1.615	17.44	38.82	23.30
13	76.43	3.386	4.46	63.30	1.431	10.36	60.29	33.89
15	87.07	3.688	3.12	75.66	1.734	14.23	35.19	17.66
16	88.70	4.439	6.19	75.16	1.721	18.53	28.84	16.02
17	81.87	2.744	2.51	69.89	1.592	7.78	43.91	20.79
18	81.51	3.673	7.45	65.75	1.491	15.36	42.00	26.63
20	87.36	4.188	7.33	72.36	1.653	13.92	25.52	14.59
21	74.08	2.955	6.18	58.69	1.318	15.53	52.29	34.00
23	72.74	2.600	6.51	56.58	1.266	15.35	49.31	32.60
24	68.46	3.170	6.00	53.52	1.191	12.63	57.01	35.73
25	81.87	3.677	6.75	66.82	1.519	15.07	45.10	27.83

Appendix Table 35 - continued

MULTIPAROUS COMPLETE DATA
PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD (%)	Ether Extract (%)	Total Ash (%)	TDN (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
26	70.94	3.169	5.28	56.72	1.270	10.86	52.75	31.94
27	83.13	2.981	5.04	68.91	1.568	12.07	46.06	25.15
28	75.81	4.773	6.79	62.09	1.401	15.06	50.88	30.55
29	80.61	3.273	6.70	65.10	1.475	13.86	39.32	22.71
30	78.21	3.214	4.17	65.16	1.476	13.07	61.58	32.72
31	84.14	3.348	6.89	68.54	1.559	20.73	37.67	23.09
33	80.11	2.752	3.17	67.48	1.533	7.85	50.56	23.89
34	69.93	4.840	6.49	56.59	1.266	11.62	58.52	36.69
35	75.48	3.212	7.29	59.31	1.333	18.51	52.70	30.92
36	73.91	2.326	4.44	59.48	1.337	7.29	62.15	33.85
37	71.79	1.461	7.47	53.25	1.185	13.55	60.89	37.94
38	83.14	3.516	7.48	67.16	1.525	18.18	39.21	23.97
39	79.91	2.637	9.01	61.29	1.382	19.51	46.43	26.37
41	85.53	3.066	6.08	70.38	1.604	14.12	33.80	18.27
44	78.79	3.097	7.05	62.71	1.416	15.51	46.08	27.04

[a]IVTD = In vitro true digestibility
[b]TDN = Total digestible nutrients
[c]NEL = Net energy for lactation

Appendix Table 36

MULTIPAROUS NO GENETIC DATA - CORRELATIONS

	FCM	BCS	WT	SCC	HEALTH	DP	PLL	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
BCS	0.31303[a] 0.0463[b]												
WT	0.07235 0.6530	0.40242 0.0091											
SCC	-0.14654 0.3606	-0.08780 0.5851	0.15831 0.3229										
HEALTH	0.01958 0.9033	0.02067 0.8979	0.12959 0.4201	0.08169 0.6116									
DP	-0.12796 0.4253	0.04417 0.7839	0.24526 0.1222	-0.28464 0.0713	0.15969 0.3186								
PLL	0.00895 0.9557	0.00392 0.9806	-0.05628 0.7267	0.13766 0.3907	0.07357 0.6476	-0.16318 0.3080							
XSNEL	0.23372 0.1414	0.42580 0.0055	0.10270 0.5229	0.05351 0.7397	-0.01642 0.9188	-0.25809 0.1033	0.04240 0.7924						

Appendix Table 36 - continued

MULTIPAROUS NO GENETIC DATA - CORRELATIONS

	FCM	BCS	WT	SCC	HEALTH	DP	PLL	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
XSPROTRD	0.19724	0.57864	0.17061	0.13252	0.02702	-0.17252	-0.10908	0.83436					
	0.2164	0.0001	0.2862	0.4088	0.8668	0.2808	0.4972	0.0001					
XSPROTES	-0.05837	0.42943	0.15474	0.14243	0.02697	0.12102	-0.26996	0.06515	0.59067				
	0.7170	0.0051	0.3340	0.3744	0.8670	0.4510	0.0878	0.6857	0.0001				
ED	0.00007	-0.20055	-0.38298	0.09505	-0.09514	-0.17305	0.04326	0.17183	0.01340	-0.23217			
	0.9996	0.2087	0.0135	0.5628	0.5625	0.2795	0.7882	0.2827	0.9337	0.1441			
ADF	-0.03757	0.02996	0.43001	0.05353	0.05571	0.13185	-0.05081	-0.26467	-0.09448	0.21417	-0.84078		
	0.8156	0.8525	0.0050	0.7396	0.7294	0.4112	0.7524	0.0945	0.5568	0.1788	0.0001		
CP	0.27536	0.12804	-0.14753	0.02744	0.02306	-0.22714	0.06234	0.05878	0.26860	0.34042	0.19929	-0.07507	
	0.0814	0.4250	0.3573	0.8648	0.8862	0.1532	0.6986	0.7151	0.0895	0.0294	0.2116	0.6409	
DMI	0.35707	0.26856	0.22529	-0.01554	0.00859	-0.16293	-0.08216	0.24443	0.28058	0.13857	-0.10270	-0.01315	0.21728
	0.0219	0.0895	0.1567	0.9232	0.9575	0.3088	0.6096	0.1235	0.0756	0.3876	0.5228	0.9350	0.1724

[a] = Correlation coefficient
[b] = Significance level

Appendix Table 37

MULTIPAROUS NO GENETIC DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Body Weight (kg)	Dry Period (days)	Previous Lactation Length (days)	Somatic Cell Count	Health Score
1	4	38.21	2.50	621	59.50	358.50	2.06	0.50
2	2	47.17	3.00	636	54.67	329.33	1.67	0.67
3	3	24.65	2.50	591	37.67	373.33	4.11	0.00
4	2	40.93	3.00	569	48.33	358.00	1.89	0.00
5	3	32.66	2.50	547	58.80	317.00	2.93	0.00
6	1	35.05	2.50	547	59.67	377.67	2.56	1.00
7	4	36.04	2.00	577	48.00	304.00	4.11	0.00
8	4	42.33	3.25	614	46.00	319.50	4.00	1.00
9	3	28.51	2.50	547	74.00	331.33	1.33	0.00
10	1	30.55	2.75	659	67.00	323.50	4.00	0.50
11	1	33.74	2.88	533	60.50	277.00	1.50	0.25
12	2	44.32	2.67	614	55.33	318.67	4.11	0.00
13	4	41.40	2.13	533	59.75	295.75	2.50	0.50
14	1	41.72	3.00	606	60.67	304.00	1.11	0.00
15	4	34.63	2.33	591	71.33	327.00	2.50	1.00
16	4	39.15	2.75	621	53.38	347.13	2.74	0.13
17	3	33.08	2.30	511	50.60	372.20	3.13	0.00
18	2	38.65	2.63	540	60.00	325.75	1.75	0.00
19	1	33.87	2.50	591	57.25	392.25	2.33	0.00
20	2	33.76	2.71	525	56.43	351.71	2.10	0.29
21	1	34.69	2.50	636	56.33	288.00	1.78	0.00
23	1	28.83	2.50	525	43.50	323.00	2.00	0.50

Appendix Table 37 - continued

MULTIPAROUS NO GENETIC DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Body Weight (kg)	Dry Period (days)	Previous Lactation Length (days)	Somatic Cell Count	Health Score
24	2	35.67	2.50	540	56.75	330.50	3.00	0.00
25	3	30.85	2.50	555	64.33	382.67	2.71	1.00
26	3	25.87	2.33	591	58.00	330.00	3.22	1.67
27	3	17.45	2.67	629	63.00	347.33	2.50	0.00
28	3	36.35	3.00	614	67.00	313.67	2.00	0.00
29	1	26.87	2.33	555	81.67	292.33	1.78	0.00
30	3	41.34	2.50	555	55.00	382.67	1.67	0.00
31	4	24.77	2.21	547	54.57	294.14	2.05	0.29
32	1	34.81	2.83	644	69.33	374.33	4.33	0.67
33	4	43.19	2.33	540	54.33	400.67	1.11	0.33
34	2	33.34	2.50	599	65.00	288.00	2.75	0.00
35	2	34.76	3.00	621	83.67	345.33	1.38	1.33
36	4	38.49	2.58	629	54.50	316.17	0.78	0.50
37	4	39.11	2.44	584	102.38	308.00	2.13	1.13
38	2	34.16	2.67	547	58.67	299.33	1.89	0.67
39	1	36.06	3.00	569	68.33	344.00	3.22	0.00
41	2	37.89	2.83	569	57.00	324.67	1.56	0.00
42	3	30.04	2.67	636	119.00	328.67	1.22	0.00
44	1	28.32	2.50	577	58.67	362.67	3.11	0.33

Appendix Table 38

MULTIPAROUS NO GENETIC DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL[a] (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
1	4	7.41	995	181	1.668	21.86	16.95	21.98
2	2	19.71	2049	65	1.645	19.81	18.88	25.80
3	3	6.29	973	246	1.582	23.72	18.15	17.37
4	2	7.37	1758	655	1.611	20.68	21.39	26.49
5	3	6.81	1142	310	1.798	13.23	17.21	26.13
6	1	3.84	103	-200	1.771	15.94	18.70	27.40
7	4	3.40	256	-54	1.671	19.82	18.68	24.67
8	4	23.64	3295	363	1.731	16.24	20.78	26.25
9	3	3.16	857	437	1.702	18.95	20.87	23.66
10	1	1.41	540	367	1.670	19.94	17.91	24.15
11	1	1.35	230	90	1.503	23.60	17.37	20.83
12	2	13.07	1569	158	1.672	18.04	16.97	27.20
13	4	4.20	34	-270	1.723	19.79	19.14	20.13
14	1	23.01	2269	24	1.687	18.95	15.68	26.12
15	4	5.35	268	-171	1.634	18.51	17.20	24.31

Appendix Table 38 - continued

MULTIPAROUS NO GENETIC DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
16	4	12.50	1501	155	1.688	17.12	18.93	26.55
17	3	4.89	-285	-524	1.796	17.58	18.38	20.97
18	2	14.49	1576	83	1.719	15.88	17.68	24.59
19	1	6.43	-247	-569	1.629	19.39	14.78	24.18
20	2	15.12	1142	-132	1.773	11.62	16.43	19.87
21	1	3.08	654	292	1.460	27.38	15.90	30.08
23	1	7.24	1168	291	1.720	16.87	15.21	19.26
24	2	0.67	189	118	1.714	16.52	18.01	26.40
25	3	10.17	963	-6	1.616	20.52	18.17	23.35
26	3	3.89	204	-128	1.725	17.16	15.70	21.79
27	3	11.64	651	-245	1.658	18.82	15.24	25.86
28	3	2.40	409	151	1.633	17.83	17.09	27.94
29	1	9.64	884	-22	1.630	17.43	12.85	19.14
30	3	3.75	246	-86	1.652	19.36	19.73	22.43
31	4	4.30	1008	437	1.732	16.33	20.28	20.87

Appendix Table 38 - continued

MULTIPAROUS NO GENETIC DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
32	1	3.09	485	155	1.558	23.08	13.85	18.95
33	4	1.75	-431	-521	1.635	17.19	15.96	22.63
34	2	1.50	87	-51	1.614	21.60	16.00	19.70
35	2	4.66	1205	558	1.479	22.52	18.69	23.50
36	4	0.43	-515	-539	1.637	18.76	17.41	24.24
37	4	2.50	515	229	1.568	21.67	16.76	26.10
38	2	3.18	653	274	1.666	18.51	16.01	25.16
39	1	4.04	1121	551	1.623	19.09	17.75	23.16
41	2	12.54	1011	-93	1.699	14.84	17.72	24.29
42	3	1.84	290	100	1.721	18.96	16.79	17.18
44	1	17.09	2040	168	1.526	22.06	17.04	26.23

[a]NEL = Net energy for lactation

Appendix Table 39

MULITPAROUS NO GENETIC DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
1	16.45	91.18	15.00	9.54
2	32.71	59.33	19.41	7.77
3	28.35	51.61	14.63	9.72
4	14.06	88.89	12.50	7.77
5	26.23	44.28	11.62	7.36
6	25.07	41.12	10.31	7.78
7	20.82	54.00	11.24	8.80
8	40.26	52.28	21.05	7.40
9	19.80	47.72	9.45	7.45
10	18.14	54.62	9.91	8.98
11	17.30	59.00	10.21	9.14
12	27.22	58.93	16.04	7.94
13	19.50	56.34	10.99	8.06
14	33.69	67.47	22.73	8.09
15	21.11	48.70	10.28	7.19
16	22.63	65.34	14.79	7.52
17	20.56	49.09	10.09	7.02
18	37.62	46.61	17.53	7.81
19	28.58	42.99	12.29	8.11
20	33.85	47.43	16.05	6.90
21	18.69	66.00	12.33	10.00
23	19.96	73.81	14.73	9.01
24	15.42	67.07	10.34	9.78
25	28.12	49.61	13.95	7.52

Appendix Table 39 - continued

MULITPAROUS NO GENETIC DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
26	19.64	65.60	12.88	9.82
27	27.94	56.40	15.76	8.33
28	15.88	68.48	10.87	9.16
29	27.22	53.64	14.60	8.06
30	34.02	31.14	10.59	8.05
31	16.78	61.39	10.30	7.55
32	18.14	65.00	11.79	9.57
33	19.75	44.24	8.74	7.60
34	14.17	78.57	11.14	9.95
35	31.75	41.58	13.20	9.71
36	20.19	50.00	10.09	9.77
37	14.52	86.36	12.54	10.43
38	13.61	72.00	9.80	7.71
39	14.06	83.17	11.69	8.77
41	28.12	54.66	15.37	7.56
42	25.86	42.64	11.02	9.68
44	42.18	49.11	20.71	8.65

Appendix Table 40

MULTIPAROUS NO GENETIC DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL[a])	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
1	203	621	12.94	20.36	7.41
2	205	636	13.18	32.89	19.71
3	199	591	12.47	18.77	6.29
4	196	569	12.12	19.49	7.37
5	193	547	11.76	18.57	6.81
6	193	547	11.76	15.60	3.84
7	197	577	12.24	15.64	3.40
8	202	614	12.83	36.47	23.64
9	193	547	11.76	14.92	3.16
10	208	659	13.52	14.93	1.41
11	191	533	11.53	12.88	1.35
12	202	614	12.83	25.90	13.07
13	191	533	11.53	15.73	4.20
14	201	606	12.71	35.72	23.01
15	199	591	12.47	17.82	5.35
16	203	621	12.94	25.45	12.50
17	188	511	11.17	16.07	4.89
18	192	540	11.65	26.14	14.49
19	199	591	12.47	18.90	6.43
20	190	525	11.41	26.54	15.12
21	205	636	13.18	16.26	3.08

Appendix Table 40 - continued

MULTIPAROUS NO GENETIC DATA
PREPARTUM ENERGY REQUIREMENTS AND INTAKES

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL)	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
23	190	525	11.41	18.65	7.24
24	192	540	11.65	12.32	0.67
25	194	555	11.89	22.06	10.17
26	199	591	12.47	16.36	3.89
27	204	629	13.06	24.71	11.64
28	202	614	12.83	15.23	2.40
29	194	555	11.89	21.53	9.64
30	194	555	11.89	15.64	3.75
31	193	547	11.76	16.06	4.30
32	206	644	13.29	16.38	3.09
33	192	540	11.65	13.39	1.75
34	200	599	12.60	14.10	1.50
35	203	621	12.94	17.60	4.66
36	204	629	13.06	13.49	0.43
37	198	584	12.36	14.86	2.50
38	193	547	11.76	14.94	3.18
39	196	569	12.12	16.16	4.04
41	196	569	12.12	24.66	12.54
42	205	636	13.18	15.01	1.84
44	197	577	12.24	29.33	17.09

[a]NEL = Net energy for lactation

Appendix Table 41

MULTIPAROUS NO GENETIC DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
1	1239	2234	995	1421	182
2	1261	3311	2050	1326	65
3	1195	2169	974	1441	246
4	1160	2917	1757	1814	654
5	1128	2270	1142	1438	310
6	1128	1231	103	929	-199
7	1173	1429	256	1118	-55
8	1228	4523	3295	1590	362
9	1128	1986	858	1565	437
10	1295	1834	539	1662	367
11	1105	1334	229	1195	90
12	1228	2797	1569	1385	157
13	1105	1138	33	835	-270
14	1216	3485	2269	1240	24
15	1195	1463	268	1023	-172
16	1239	2740	1501	1393	154
17	1070	785	-285	546	-524
18	1117	2693	1576	1200	83
19	1195	948	-247	626	-569
20	1093	2235	1142	960	-133
21	1261	1916	655	1553	292
23	1093	2261	1168	1383	290
24	1117	1306	189	1235	118
25	1139	2102	963	1133	-6

Appendix Table 41 - continued

MULTIPAROUS NO GENETIC DATA
PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
26	1195	1399	204	1066	-129
27	1251	1902	651	1005	-246
28	1228	1637	409	1379	151
29	1139	2023	884	1117	-22
30	1139	1385	246	1052	-87
31	1128	2136	1008	1565	437
32	1273	1758	485	1427	154
33	1117	686	-431	597	-520
34	1207	1294	87	1156	-51
35	1239	2444	1205	1797	558
36	1251	736	-515	712	-539
37	1184	1699	515	1413	229
38	1128	1781	653	1402	274
39	1160	2282	1122	1711	551
41	1160	2171	1011	1067	-93
42	1261	1551	290	1362	101
44	1173	3213	2040	1342	169

Appendix Table 42

MULTIPAROUS NO GENETIC DATA
PREPARTUM RATION NUTRIENT COMPOSTIONS

Herd	IVTD[a] (%)	Ether Extract (%)	Total Ash (%)	TDN[b] (%)	NEL[c] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	75.44	2.795	5.76	60.28	1.357	14.89	54.22	30.98
2	87.57	4.528	6.24	74.09	1.695	17.06	33.75	18.98
3	73.07	3.586	7.46	57.19	1.283	14.82	54.86	35.93
4	84.18	4.322	8.13	68.55	1.559	23.34	56.25	25.43
5	83.77	5.257	7.27	70.17	1.599	19.54	41.37	23.71
6	78.84	3.347	3.49	66.63	1.513	11.94	53.30	28.60
7	75.54	3.829	5.75	61.68	1.391	12.71	61.55	35.37
8	88.93	5.060	6.74	75.62	1.733	21.49	29.04	17.34
9	83.13	5.013	7.14	69.35	1.579	21.01	37.20	22.92
10	79.74	3.979	5.45	66.36	1.506	18.51	42.96	25.52
11	73.84	1.949	7.00	56.38	1.261	13.07	64.58	38.15
12	84.35	4.049	5.68	70.83	1.615	17.44	38.82	23.30
13	76.43	3.386	4.46	63.30	1.431	10.36	60.29	33.89
14	82.40	2.973	4.20	69.02	1.571	15.33	38.91	23.72
15	87.07	3.688	3.12	75.66	1.734	14.23	35.19	17.66
16	88.70	4.439	6.19	75.16	1.721	18.53	28.84	16.02
17	81.87	2.744	2.51	69.89	1.592	7.78	43.91	20.79
18	81.51	3.673	7.45	65.75	1.491	15.36	42.00	26.63
19	79.77	2.728	2.57	67.71	1.539	7.72	54.48	26.46
20	87.36	4.188	7.33	72.36	1.653	13.92	25.52	14.59
21	74.08	2.955	6.18	58.69	1.318	15.53	52.29	34.00
23	72.74	2.600	6.51	56.58	1.266	15.35	49.31	32.60
24	68.46	3.170	6.00	53.52	1.191	12.63	57.01	35.73

Appendix Table 42 - continued

MULTIPAROUS NO GENETIC DATA
PREPARTUM RATION NUTRIENT COMPOSTIONS

Herd	IVTD (%)	Ether Extract (%)	Total Ash (%)	TDN (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
25	81.87	3.677	6.75	66.82	1.519	15.07	45.10	27.83
26	70.94	3.169	5.28	56.72	1.270	10.86	52.75	31.94
27	83.13	2.981	5.04	68.91	1.568	12.07	46.06	25.15
28	75.81	4.773	6.79	62.09	1.401	15.06	50.88	30.55
29	80.61	3.273	6.70	65.10	1.475	13.86	39.32	22.71
30	78.21	3.214	4.17	65.16	1.476	13.07	61.58	32.72
31	84.14	3.348	6.89	68.54	1.559	20.73	37.67	23.09
32	76.74	2.929	5.93	61.57	1.389	14.91	48.36	29.21
33	80.11	2.752	3.17	67.48	1.533	7.85	50.56	23.89
34	69.93	4.840	6.49	56.59	1.266	11.62	58.52	36.69
35	75.48	3.212	7.29	59.31	1.333	18.51	52.70	30.92
36	73.91	2.326	4.44	59.48	1.337	7.29	62.15	33.85
37	71.79	1.461	7.47	53.25	1.185	13.55	60.89	37.94
38	83.14	3.516	7.48	67.16	1.525	18.18	39.21	23.97
39	79.91	2.637	9.01	61.29	1.382	19.51	46.43	26.37
41	85.53	3.066	6.08	70.38	1.604	14.12	33.80	18.27
42	76.83	2.782	6.92	60.49	1.362	14.07	54.86	31.78
44	78.79	3.097	7.05	62.71	1.416	15.51	46.08	27.04

[a]IVTD = In vitro true digestibility
[b]TDN = Total digestible nutrients
[c]NEL = Net energy for lactation

Appendix Table 43

MULTIPAROUS NO SOMATIC CELL COUNT DATA - CORRELATIONS

	FCM	BCS	WT	PTAM	HEALTH	DP	PLL	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
BCS	0.26853[a]												
	0.1133[b]												
WT	0.12519	0.43921											
	0.4669	0.0074											
PTAM	0.16080	-0.23855	-0.20464										
	0.3488	0.1612	0.2312										
HEALTH	-0.08876	0.05758	0.18171	0.30436									
	0.6067	0.7387	0.2889	0.0711									
DP	-0.21957	-0.00249	0.15390	-0.29335	0.30140								
	0.1982	0.9885	0.3702	0.0825	0.0740								
PLL	0.19250	0.10381	-0.18502	0.24602	-0.00167	-0.21944							
	0.2607	0.5468	0.2800	0.1481	0.9923	0.1985							
XSNEL	0.01525	0.41086	0.07563	0.03184	0.11207	-0.19154	0.05829						
	0.9296	0.0128	0.6611	0.8537	0.5152	0.2631	0.7356						

Appendix Table 43 - continued

MULTIPAROUS NO SOMATIC CELL COUNT DATA - CORRELATIONS

	FCM	BCS	WT	PTAM	HEALTH	DP	PLL	XSNEL	XSPROTRD	XSPROTES	ED	ADF	CP
XSPROTRD	0.05223	0.59649	0.17510	-0.05492	0.11574	-0.10965	-0.05257	0.83460					
	0.7622	0.0001	0.3071	0.7504	0.5015	0.5244	0.7607	0.0001					
XSPROTES	-0.01092	0.46803	0.18096	-0.18729	0.00911	0.15078	-0.17470	0.05244	0.57599				
	0.9496	0.0040	0.2909	0.2740	0.9579	0.3801	0.3082	0.7613	0.0002				
ED	-0.07888	-0.18310	-0.48298	0.11499	-0.12275	-0.37165	0.01991	0.15588	-0.03903	-0.32177			
	0.6475	0.2851	0.0028	0.5042	0.4757	0.0256	0.9083	0.3640	0.8212	0.0557			
ADF	0.10180	-0.02102	0.46275	-0.09917	0.07789	0.23195	-0.04882	-0.28827	-0.09448	0.25288	-0.83894		
	0.5547	0.9032	0.0045	0.5650	0.6516	0.1735	0.7774	0.0882	0.5836	0.1367	0.0001		
CP	0.24767	0.23327	-0.03643	-0.09639	0.02238	-0.16206	0.14874	0.14908	0.29040	0.23668	0.21353	-0.06795	
	0.1453	0.1709	0.8329	0.5760	0.8969	0.3450	0.3866	0.3855	0.0858	0.1646	0.2111	0.6938	
DMI	0.19690	0.29583	0.35437	-0.06752	-0.05076	0.02341	0.05177	0.14923	0.18597	0.06337	-0.18253	0.08936	0.26799
	0.2497	0.0798	0.0340	0.6956	0.7688	0.8922	0.7643	0.3850	0.2775	0.7135	0.2866	0.6043	0.1140

[a] = Correlation coefficient
[b] = Significance level

Appendix Table 44

MULTIPAROUS NO SOMATIC CELL COUNT DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Body Weight (kg)	Dry Period (days)	Previous Lactation Length (days)	Sire PTAM[a] (kg)	Health Score
1	4	38.21	2.50	621	59.50	358.50	242.73	0.50
2	2	47.17	3.00	636	54.67	329.33	79.23	0.67
4	2	40.93	3.00	569	48.33	358.00	-163.60	0.00
5	3	32.66	2.50	547	58.80	317.00	101.83	0.00
7	4	36.04	2.00	577	48.00	304.00	362.88	0.00
8	4	42.33	3.25	614	46.00	319.50	447.70	1.00
9	3	28.51	2.50	547	74.00	331.33	178.26	0.00
10	1	30.55	2.75	659	67.00	323.50	47.63	0.50
12	2	44.32	2.67	614	55.33	318.67	590.89	0.00
13	4	41.40	2.13	533	59.75	295.75	389.04	0.50
15	4	34.63	2.33	591	71.33	327.00	372.86	1.00
16	4	39.15	2.75	624	53.38	347.13	311.11	0.13
17	3	33.08	2.30	489	50.60	372.20	163.15	0.00
18	2	38.65	2.63	540	60.00	325.75	498.73	0.00
20	2	31.21	2.63	518	55.25	346.25	465.39	0.50
21	1	34.69	2.50	636	56.33	288.00	173.42	0.00
22	4	44.16	2.63	599	57.75	350.00	360.16	0.00
23	1	28.83	2.50	525	43.50	323.00	529.35	0.50
24	2	35.67	2.50	540	56.75	330.50	478.09	0.00

Appendix Table 44 - continued

MULTIPAROUS NO SOMATIC CELL COUNT DATA - ANIMAL AND HEALTH MEASURES

Herd	Group	Fat Corrected Milk (kg)	Body Condition Score	Body Weight (kg)	Dry Period (days)	Previous Lactation Length (days)	Sire PTAM (kg)	Health Score
25	3	30.85	2.50	555	64.33	382.67	466.98	1.00
26	3	25.87	2.33	591	58.00	330.00	624.00	1.67
27	3	17.45	2.67	629	63.00	347.33	133.81	0.00
28	3	36.35	3.00	614	67.00	313.67	-337.02	0.00
29	1	26.87	2.33	555	81.67	292.33	-310.71	0.00
30	3	41.34	2.50	555	55.00	382.67	119.98	0.00
31	4	24.77	2.21	547	54.57	294.14	201.91	0.29
33	4	43.19	2.33	540	54.33	400.67	714.42	0.33
34	2	33.34	2.50	599	65.00	288.00	424.79	0.00
35	2	34.76	3.00	621	83.67	345.33	344.13	1.33
36	4	38.49	2.58	629	54.50	316.17	228.54	0.50
37	4	39.11	2.44	584	102.38	308.00	212.40	1.13
38	2	34.16	2.67	547	58.67	299.33	398.56	0.67
39	1	36.06	3.00	569	68.33	344.00	290.30	0.00
40	2	46.65	2.50	569	46.33	374.67	603.43	0.00
41	2	37.89	2.83	569	57.00	324.67	200.94	0.00
44	1	28.32	2.50	577	58.67	362.67	466.60	0.33

[a]PTAM = Predicted transmitting ability for milk

Appendix Table 45

MULTIPAROUS NO SOMATIC CELL COUNT DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL[a] (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
1	4	7.41	995	181	1.668	21.86	16.95	21.98
2	2	19.71	2049	65	1.645	19.81	18.88	25.80
4	2	7.37	1758	655	1.611	20.68	21.39	26.49
5	3	7.63	1220	287	1.798	13.23	17.21	26.13
7	4	3.40	256	-54	1.671	19.82	18.68	24.67
8	4	23.64	3295	363	1.731	16.24	20.78	26.25
9	3	3.16	857	437	1.702	18.95	20.87	23.66
10	1	1.41	540	367	1.670	19.94	17.91	24.15
12	2	13.07	1569	158	1.672	18.04	16.97	27.20
13	4	4.20	34	-270	1.723	19.79	19.14	20.13
15	4	5.35	268	-171	1.634	18.51	17.20	24.31
16	4	12.46	1497	156	1.688	17.12	18.93	26.55
17	3	5.25	-252	-508	1.796	17.58	18.38	20.97
18	2	14.49	1576	83	1.719	15.88	17.68	24.59
20	2	15.24	1153	-131	1.773	11.62	16.43	19.87
21	1	3.08	654	292	1.460	27.38	15.90	30.08
22	4	0.92	80	-7	1.717	18.04	17.20	22.03
23	1	7.24	1168	291	1.720	16.87	15.21	19.26
24	2	0.55	178	119	1.714	16.52	18.01	26.40

Appendix Table 45 - continued

MULTIPAROUS NO SOMATIC CELL COUNT DATA - RATION INFORMATION

		PREPARTUM RATION			POSTPARTUM RATION			
Herd	Group	Reported Excess Energy Intake (Mcal NEL)	Reported Excess Protein Intake (g)	Estimated Excess Protein Intake (g)	NEL (Mcal/kg)	Acid Detergent Fiber (%)	Crude Protein (%)	Reported Dry Matter Intake (kg)
25	3	10.17	963	-6	1.616	20.52	18.17	23.35
26	3	3.89	204	-128	1.725	17.16	15.70	21.79
27	3	11.64	651	-245	1.658	18.82	15.24	25.86
28	3	2.40	409	151	1.633	17.83	17.09	27.94
29	1	10.36	953	-20	1.630	17.43	12.85	19.14
30	3	3.64	235	-87	1.652	19.36	19.73	22.43
31	4	4.30	1008	437	1.732	16.33	20.28	20.87
33	4	2.45	-364	-490	1.712	15.61	17.68	31.38
34	2	1.50	87	-51	1.614	21.60	16.00	19.70
35	2	4.66	1205	558	1.479	22.52	18.69	23.50
36	4	0.43	-515	-539	1.637	18.76	17.41	24.24
37	4	2.61	526	227	1.568	21.67	16.76	26.10
38	2	3.18	653	274	1.666	18.51	16.01	25.16
39	1	3.80	1097	561	1.623	19.09	17.75	23.16
40	2	-0.97	144	257	1.545	22.03	13.84	17.79
41	2	12.54	1011	-93	1.699	14.84	17.72	24.29
44	1	17.09	2040	168	1.526	22.06	17.04	26.23

[a]NEL = Net energy for lactation

Appendix Table 46

MULTIPAROUS NO SOMATIC CELL COUNT DATA
PREPARTUM RATION AMOUNTS AND INTAKES

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Reported Dry Matter Intake (kg)	Estimated Dry Matter Intake (kg)
1	16.45	91.18	15.00	9.54
2	32.71	59.33	19.41	7.77
4	14.06	88.89	12.50	7.77
5	26.23	44.28	11.62	6.84
7	20.82	54.00	11.24	8.80
8	40.26	52.28	21.05	7.40
9	19.80	47.72	9.45	7.45
10	18.14	54.62	9.91	8.98
12	27.22	58.93	16.04	7.94
13	19.50	56.34	10.99	8.06
15	21.11	48.70	10.28	7.19
16	22.63	65.34	14.79	7.55
17	20.56	49.09	10.09	6.80
18	37.62	46.61	17.53	7.81
20	33.85	47.43	16.05	6.83
21	18.69	66.00	12.33	10.00
22	15.77	67.59	10.66	9.93
23	19.96	73.81	14.73	9.01
24	15.42	67.07	10.34	9.88
25	28.12	49.61	13.95	7.52
26	19.64	65.60	12.88	9.82
27	27.94	56.40	15.76	8.33
28	15.88	68.48	10.87	9.16
29	27.22	53.64	14.60	7.58
30	34.02	31.14	10.59	8.13
31	16.78	61.39	10.30	7.55
33	19.75	44.24	8.74	7.14
34	14.17	78.57	11.14	9.95
35	31.75	41.58	13.20	9.71
36	20.19	50.00	10.09	9.77
37	14.52	86.36	12.54	10.33
38	13.61	72.00	9.80	7.71
39	14.06	83.17	11.69	8.94
40	8.62	86.76	7.48	8.12
41	28.12	54.66	15.37	7.56
44	42.18	49.11	20.71	8.65

Appendix Table 47

MULTIPAROUS NO SOMATIC CELL COUNT DATA PREPARTUM ENERGY REQUIREMENTS

Herd	Heart Girth (cm)	Body Weight (kg)	Energy Required (Mcal NEL[a])	Reported Energy Intake (Mcal NEL)	Reported Energy Difference (Mcal NEL)
1	203	621	12.94	20.36	7.41
2	205	636	13.18	32.89	19.71
4	196	569	12.12	19.49	7.37
5	186	497	10.94	18.57	7.63
7	197	577	12.24	15.64	3.40
8	202	614	12.83	36.47	23.64
9	193	547	11.76	14.92	3.16
10	208	659	13.52	14.93	1.41
12	202	614	12.83	25.90	13.07
13	191	533	11.53	15.73	4.20
15	199	591	12.47	17.82	5.35
16	203	624	12.99	25.45	12.46
17	185	489	10.82	16.07	5.25
18	192	540	11.65	26.14	14.49
20	189	518	11.29	26.54	15.24
21	205	636	13.18	16.26	3.08
22	200	599	12.60	13.51	0.92
23	190	525	11.41	18.65	7.24
24	193	547	11.76	12.32	0.55
25	194	555	11.89	22.06	10.17
26	199	591	12.47	16.36	3.89
27	204	629	13.06	24.71	11.64
28	202	614	12.83	15.23	2.40
29	188	511	11.17	21.53	10.36
30	195	562	12.00	15.64	3.64
31	193	547	11.76	16.06	4.30
33	186	497	10.94	13.39	2.45
34	200	599	12.60	14.10	1.50
35	203	621	12.94	17.60	4.66
36	204	629	13.06	13.49	0.43
37	197	577	12.24	14.86	2.61
38	193	547	11.76	14.94	3.18
39	198	584	12.36	16.16	3.80
40	196	569	12.12	11.15	-0.97
41	196	569	12.12	24.66	12.54
44	197	577	12.24	29.33	17.09

[a]NEL = Net energy for lactation

Appendix Table 48

MULTIPAROUS NO SOMATIC CELL COUNT DATA PREPARTUM PROTEIN REQUIREMENTS AND INTAKES

Herd	Protein Required (g)	Reported Protein Intake (g)	Reported Protein Difference (g)	Estimated Protein Intake (g)	Estimated Protein Difference (g)
1	1239	2234	995	1421	182
2	1261	3311	2050	1326	65
4	1160	2917	1757	1814	654
5	1050	2270	1220	1337	287
7	1173	1429	256	1118	-55
8	1228	4523	3295	1590	362
9	1128	1986	858	1565	437
10	1295	1834	539	1662	367
12	1228	2797	1569	1385	157
13	1105	1138	33	835	-270
15	1195	1463	268	1023	-172
16	1243	2740	1497	1399	156
17	1037	785	-252	529	-508
18	1117	2693	1576	1200	83
20	1082	2235	1153	951	-131
21	1261	1916	655	1553	292
22	1207	1287	80	1200	-7
23	1093	2261	1168	1383	290
24	1128	1306	178	1248	120
25	1139	2102	963	1133	-6
26	1195	1399	204	1066	-129
27	1251	1902	651	1005	-246
28	1228	1637	409	1379	151
29	1070	2023	953	1051	-19
30	1150	1385	235	1063	-87
31	1128	2136	1008	1565	437
33	1050	686	-364	560	-490
34	1207	1294	87	1156	-51
35	1239	2444	1205	1797	558
36	1251	736	-515	712	-539
37	1173	1699	526	1400	227
38	1128	1781	653	1402	274
39	1184	2282	1098	1744	560
40	1160	1304	144	1416	256
41	1160	2171	1011	1067	-93
44	1173	3213	2040	1342	169

Appendix Table 49

MULTIPAROUS NO SOMATIC CELL COUNT DATA PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD[a] (%)	Ether Extract (%)	Total Ash (%)	TDN[b] (%)	NEL[c] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	75.44	2.795	5.76	60.28	1.357	14.89	54.22	30.98
2	87.57	4.528	6.24	74.09	1.695	17.06	33.75	18.98
4	84.18	4.322	8.13	68.55	1.559	23.34	56.25	25.43
5	83.77	5.257	7.27	70.17	1.599	19.54	41.37	23.71
7	75.54	3.829	5.75	61.68	1.391	12.71	61.55	35.37
8	88.93	5.060	6.74	75.62	1.733	21.49	29.04	17.34
9	83.13	5.013	7.14	69.35	1.579	21.01	37.20	22.92
10	79.74	3.979	5.45	66.36	1.506	18.51	42.96	25.52
12	84.35	4.049	5.68	70.83	1.615	17.44	38.82	23.30
13	76.43	3.386	4.46	63.30	1.431	10.36	60.29	33.89
15	87.07	3.688	3.12	75.66	1.734	14.23	35.19	17.66
16	88.70	4.439	6.19	75.16	1.721	18.53	28.84	16.02
17	81.87	2.744	2.51	69.89	1.592	7.78	43.91	20.79
18	81.51	3.673	7.45	65.75	1.491	15.36	42.00	26.63
20	87.36	4.188	7.33	72.36	1.653	13.92	25.52	14.59
21	74.08	2.955	6.18	58.69	1.318	15.53	52.29	34.00
22	71.88	3.006	6.09	56.65	1.268	12.08	54.07	32.95
23	72.74	2.600	6.51	56.58	1.266	15.35	49.31	32.60
24	68.46	3.170	6.00	53.52	1.191	12.63	57.01	35.73
25	81.87	3.677	6.75	66.82	1.519	15.07	45.10	27.83

Appendix Table 49 - continued

MULTIPAROUS NO SOMATIC CELL COUNT DATA PREPARTUM RATION NUTRIENT COMPOSITIONS

Herd	IVTD (%)	Ether Extract (%)	Total Ash (%)	TDN (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
26	70.94	3.169	5.28	56.72	1.270	10.86	52.75	31.94
27	83.13	2.981	5.04	68.91	1.568	12.07	46.06	25.15
28	75.81	4.773	6.79	62.09	1.401	15.06	50.88	30.55
29	80.61	3.273	6.70	65.10	1.475	13.86	39.32	22.71
30	78.21	3.214	4.17	65.16	1.476	13.07	61.58	32.72
31	84.14	3.348	6.89	68.54	1.559	20.73	37.67	23.09
33	80.11	2.752	3.17	67.48	1.533	7.85	50.56	23.89
34	69.93	4.840	6.49	56.59	1.266	11.62	58.52	36.69
35	75.48	3.212	7.29	59.31	1.333	18.51	52.70	30.92
36	73.91	2.326	4.44	59.48	1.337	7.29	62.15	33.85
37	71.79	1.461	7.47	53.25	1.185	13.55	60.89	37.94
38	83.14	3.516	7.48	67.16	1.525	18.18	39.21	23.97
39	79.91	2.637	9.01	61.29	1.382	19.51	46.43	26.37
40	82.60	2.886	7.50	65.81	1.492	17.44	39.61	23.86
41	85.53	3.066	6.08	70.38	1.604	14.12	33.80	18.27
44	78.79	3.097	7.05	62.71	1.416	15.51	46.08	27.04

[a]IVTD = In vitro true digestibility
[b]TDN = Total digestible nutrients
[c]NEL = Net energy for lactation

Appendix Table 50

MULTIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSITIONS - VISIT ONE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL[a] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	32.02	63.85	20.45	86.67	4.674	4.98	74.63	1.709	16.23	38.91	20.93
2	39.51	62.16	24.56	86.24	5.217	6.57	73.30	1.676	18.47	40.16	18.23
3	32.35	56.99	18.43	78.18	3.999	8.06	62.22	1.404	18.07	49.87	29.78
4	39.92	82.38	32.88	85.39	4.584	8.46	69.76	1.589	21.20	39.42	21.55
5	40.02	65.30	26.13	89.98	4.662	5.03	77.88	1.788	18.56	26.79	12.10
6	45.95	58.79	27.02	88.56	4.030	2.80	77.90	1.789	16.53	28.70	14.78
7	38.00	66.54	25.28	88.23	4.362	4.96	75.82	1.738	21.30	30.16	18.43
8	41.28	54.49	22.49	87.77	4.795	6.27	74.59	1.707	19.72	29.38	18.79
9	42.55	51.57	21.94	85.96	5.844	6.67	73.69	1.685	22.28	32.89	19.53
10	34.24	70.91	24.28	85.79	5.427	6.37	73.30	1.676	18.06	33.26	20.52
11	39.64	51.05	20.24	82.68	4.074	6.47	68.40	1.556	16.84	39.19	23.34
12	41.08	64.88	26.65	87.85	4.593	5.54	75.15	1.721	17.49	32.39	18.44
13	40.52	45.16	18.30	86.83	6.397	6.11	75.81	1.737	17.11	36.31	19.79
14	41.73	68.21	28.46	83.36	3.213	3.98	70.49	1.607	16.82	33.33	20.25
15	43.74	56.75	24.82	87.71	5.849	6.45	75.68	1.734	17.30	31.57	17.39
16	41.73	65.27	27.24	85.12	5.613	5.36	73.88	1.690	18.83	30.81	19.46
17	30.39	61.86	18.80	87.84	6.999	4.42	79.26	1.822	19.73	33.61	18.04
18	43.15	56.97	24.58	87.32	6.195	9.79	72.38	1.653	19.14	28.64	15.53
19	43.34	55.83	24.20	79.38	4.405	5.55	66.44	1.508	14.51	39.10	21.97
20	38.27	49.70	19.02	91.30	4.175	6.84	76.78	1.761	17.02	23.47	12.31
21	43.75	68.27	29.87	79.19	5.024	5.77	66.80	1.517	15.05	40.08	26.22
22	33.80	66.87	22.60	84.70	6.560	5.44	74.56	1.707	17.76	30.98	17.40

Appendix Table 50 - continued

MULTIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSITIONS - VISIT ONE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
23	30.05	64.21	19.30	89.28	3.826	3.85	77.31	1.774	13.10	30.10	16.46
24	45.80	55.45	25.40	87.28	4.566	6.45	73.64	1.684	17.38	39.54	17.30
25	42.14	55.11	23.22	81.78	6.271	6.82	69.89	1.592	16.99	35.18	19.87
26	35.88	61.81	22.18	86.46	4.951	6.48	73.27	1.675	16.29	37.63	18.60
27	42.92	60.91	26.14	83.83	2.976	4.58	70.07	1.597	14.47	43.17	20.24
28	47.85	58.56	28.02	86.15	6.074	7.12	73.72	1.686	17.58	31.57	17.54
29	33.11	56.60	18.74	84.47	3.245	5.61	70.02	1.596	13.12	34.04	17.00
30	50.26	45.43	22.83	84.96	3.018	4.61	71.22	1.625	20.61	40.03	20.08
31	65.66	29.61	19.44	91.42	2.796	6.18	75.84	1.738	23.25	28.15	14.66
32	33.57	57.40	19.27	84.43	3.913	5.68	70.75	1.613	13.75	41.34	21.55
33	64.35	57.60	37.06	89.32	3.828	4.39	76.81	1.762	17.94	32.58	15.69
34	37.78	54.00	20.40	85.55	4.630	6.37	72.07	1.646	17.42	38.23	21.47
35	38.42	63.79	24.51	79.60	2.681	7.01	63.04	1.425	17.17	50.40	24.10
36	38.33	65.50	25.11	87.69	2.190	5.35	72.18	1.648	17.08	36.20	19.37
37	53.75	57.74	31.03	82.64	4.776	5.37	70.34	1.603	14.60	46.28	22.79
38	47.73	66.37	31.68	87.27	3.887	6.27	72.96	1.668	16.93	35.48	18.74
39	35.98	64.50	23.21	85.79	2.956	6.96	69.62	1.586	17.66	34.18	21.07
40	31.75	57.43	18.24	85.21	3.258	5.68	70.71	1.612	14.00	36.45	19.15
41	37.39	63.16	23.62	91.29	2.587	5.84	75.78	1.737	17.32	27.92	13.11
42	37.65	57.96	21.82	85.82	4.740	4.23	74.61	1.708	14.91	35.92	17.28
44	46.31	55.61	25.75	82.83	4.140	7.31	67.79	1.541	16.58	41.51	21.46

[a]NEL = Net energy for lactation

Appendix Table 51

MULTIAPROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSTIONS - VISIT TWO

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL[a] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	33.38	70.63	23.58	86.97	4.542	4.91	74.84	1.713	16.04	38.55	19.84
2	39.51	66.47	26.26	85.72	4.913	6.29	72.67	1.660	19.20	35.64	20.66
3	29.27	50.43	14.76	83.58	4.564	6.05	70.33	1.603	16.10	44.67	23.32
4	39.92	67.63	27.00	86.21	4.497	7.65	71.28	1.626	21.27	33.69	20.26
5	40.02	62.78	25.13	89.62	5.497	4.44	79.15	1.819	17.66	26.85	12.88
6	45.95	55.09	25.32	88.39	3.739	2.96	77.20	1.771	17.15	37.83	19.20
7	38.00	65.77	24.99	83.72	4.198	6.40	69.67	1.587	17.86	33.10	20.72
8	47.06	59.18	27.85	89.44	4.909	6.79	75.88	1.739	21.34	26.38	14.63
9	46.13	54.41	25.10	87.09	5.463	6.67	74.35	1.702	20.15	30.08	18.56
10	34.24	70.06	23.99	85.35	5.265	7.07	71.96	1.643	18.57	33.99	21.55
11	36.51	56.19	20.52	79.62	4.391	5.48	66.73	1.515	17.01	41.30	26.60
12	41.08	66.17	27.18	84.88	3.673	5.61	70.96	1.619	16.71	33.31	19.23
13	44.50	46.85	20.85	86.13	5.928	5.80	74.83	1.713	19.36	34.45	19.63
14	41.73	57.94	24.18	87.74	3.434	2.98	76.16	1.746	14.83	29.74	16.72
15	43.74	50.20	21.96	82.70	5.901	8.11	69.07	1.572	17.97	37.80	19.76
16	38.10	66.97	25.52	86.91	5.967	6.18	75.29	1.725	18.90	28.98	16.72
17	36.47	58.84	21.46	89.40	7.111	6.35	79.04	1.817	18.36	27.97	15.51
18	43.15	53.94	23.28	89.36	5.342	5.97	77.17	1.771	16.74	25.78	14.74
19	43.34	57.32	24.84	87.10	4.855	5.58	74.69	1.710	15.13	33.35	17.25
20	38.22	54.06	20.66	92.91	4.293	7.12	78.25	1.797	15.91	20.20	10.03
21	43.75	68.53	29.98	77.98	4.416	6.57	64.03	1.449	16.12	44.17	28.87
22	33.80	65.77	22.23	85.75	5.688	6.10	73.86	1.690	18.12	30.86	18.52
23	30.05	61.85	18.59	86.57	3.849	4.24	74.24	1.699	13.58	30.18	18.00

Appendix Table 51 - continued

MULTIAPROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSTIONS - VISIT TWO

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
24	45.80	58.31	26.71	88.32	3.613	6.46	73.48	1.680	18.49	30.95	18.73
25	42.14	56.05	23.62	85.83	6.317	6.43	74.39	1.703	18.47	33.78	19.68
26	34.24	62.11	21.27	88.66	4.668	5.16	76.44	1.753	14.84	37.89	16.78
27	42.32	63.22	26.76	87.60	4.035	3.66	76.08	1.744	14.27	36.49	17.03
28	47.85	58.31	27.90	87.11	5.674	6.91	74.40	1.703	16.98	32.21	16.72
29	33.11	55.25	18.29	86.31	3.986	5.74	72.65	1.660	12.49	30.25	16.75
30	50.26	43.24	21.73	86.28	2.844	4.53	72.41	1.654	18.58	39.44	19.11
31	39.01	58.86	22.96	88.51	3.548	4.57	75.48	1.729	16.94	33.32	17.15
32	33.57	55.59	18.66	81.95	3.240	5.23	67.87	1.543	13.30	43.09	22.75
33	49.87	57.83	28.84	88.87	3.366	5.11	75.07	1.719	17.71	28.12	15.06
34	38.23	48.00	18.35	84.19	4.445	8.01	68.84	1.567	16.05	37.71	22.34
35	25.86	88.61	22.91	82.70	4.290	8.69	66.47	1.509	20.32	39.75	20.27
36	38.33	62.28	23.87	85.47	4.232	6.01	71.85	1.640	17.65	34.47	18.23
37	42.52	57.96	24.64	81.90	3.958	7.30	66.65	1.513	16.16	43.00	23.18
38	34.37	64.35	22.12	87.43	4.561	7.44	72.79	1.663	15.34	34.60	18.25
39	35.98	65.09	23.42	85.69	3.118	6.81	69.88	1.592	17.42	34.86	20.41
40	31.75	54.82	17.41	82.65	2.996	5.73	67.76	1.540	14.51	38.74	22.33
41	37.39	62.90	23.52	90.52	2.922	5.89	75.39	1.727	17.84	34.85	13.44
42	37.65	57.36	21.60	87.02	5.507	3.93	77.07	1.768	18.52	40.16	17.83
44	46.31	56.78	26.30	80.83	4.024	7.28	65.68	1.489	17.54	41.22	24.37

[a]NEL = Net energy for lactation

Appendix Table 52

MULTIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSITIONS - VISIT THREE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL[a] (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
1	33.38	65.64	21.91	82.88	4.328	5.92	69.47	1.582	18.58	45.69	24.80
2	39.51	67.26	26.58	83.40	4.892	6.49	70.13	1.598	18.96	35.68	20.55
3	29.27	64.62	18.91	88.00	4.540	4.88	75.89	1.739	16.13	34.77	18.06
4	39.92	49.13	19.61	85.32	4.795	7.54	70.87	1.616	21.69	34.20	20.23
5	40.02	67.80	27.13	89.32	4.402	4.05	77.88	1.788	15.41	29.89	14.71
6	45.95	64.97	29.86	90.90	3.152	5.49	76.45	1.753	22.41	26.72	13.83
7	38.00	62.46	23.73	84.41	6.971	6.38	73.84	1.689	16.88	34.44	20.31
8	47.06	60.34	28.40	90.27	4.359	6.61	76.21	1.747	21.27	27.29	15.31
9	44.87	53.31	23.92	86.03	7.173	6.98	75.11	1.720	20.18	32.15	18.75
10	34.24	70.66	24.19	87.10	5.352	7.00	73.89	1.690	17.10	30.09	17.76
11	36.51	59.52	21.73	76.97	3.636	5.03	63.58	1.438	18.27	34.73	20.85
12	41.08	67.57	27.76	87.85	2.979	5.37	73.31	1.676	16.72	32.26	16.44
13	44.45	47.75	21.23	85.48	6.828	6.10	75.02	1.718	20.94	32.37	19.96
14	41.73	61.68	25.74	87.20	3.752	4.37	74.62	1.708	15.39	35.81	19.88
15	43.74	59.76	26.14	84.64	5.158	8.21	69.98	1.594	16.33	33.47	18.37
16	38.10	70.57	26.89	82.22	6.423	5.17	72.18	1.648	19.07	28.67	15.17
17	36.47	62.12	22.65	86.62	7.039	6.26	76.26	1.748	17.05	35.32	19.20
18	43.15	60.06	25.92	88.19	5.472	6.53	75.60	1.732	17.17	28.84	17.38
19	43.34	54.24	23.51	86.34	4.088	5.50	73.04	1.670	14.71	34.47	18.94
20	39.13	50.91	19.92	90.01	3.837	5.11	76.79	1.761	16.36	22.67	12.52
21	43.75	69.44	30.38	76.78	4.564	6.91	62.68	1.416	16.53	42.80	27.04
22	33.80	62.87	21.25	87.41	6.220	5.79	76.50	1.754	15.72	31.79	18.19
23	31.87	62.40	19.89	87.98	4.138	6.45	73.80	1.688	18.94	26.43	16.16

Appendix Table 52 - continued

MULTIPAROUS ALL DATA
POSTPARTUM RATION INTAKES AND NUTRIENT COMPOSITIONS - VISIT THREE

Herd	Ration As Fed (kg)	Ration Dry Matter (%)	Dry Matter Intake (kg)	In Vitro True Digestibility (%)	Ether Extract (%)	Total Ash (%)	Total Digestible Nutrients (%)	NEL (Mcal/kg)	Crude Protein (%)	Neutral Detergent Fiber (%)	Acid Detergent Fiber (%)
24	46.41	58.41	27.11	91.48	4.275	6.48	77.45	1.777	18.15	34.09	13.52
25	42.14	55.09	23.21	80.51	6.253	7.14	68.28	1.553	19.04	34.53	22.00
26	34.24	64.03	21.93	89.95	4.701	6.72	76.20	1.747	15.97	37.53	16.09
27	42.32	58.31	24.68	86.55	3.312	6.24	71.55	1.633	16.98	33.99	19.20
28	47.85	58.31	27.90	82.81	4.597	9.16	66.50	1.509	16.70	36.99	19.23
29	33.11	61.52	20.37	85.96	3.942	6.35	71.64	1.635	12.94	33.72	18.53
30	50.26	45.21	22.72	87.74	2.968	5.20	73.35	1.677	20.00	36.33	18.88
31	37.65	53.66	20.20	89.09	3.536	5.18	75.43	1.728	20.64	31.90	17.19
32	33.57	56.38	18.92	80.91	3.587	5.66	66.84	1.517	14.49	46.89	24.93
33	49.87	56.63	28.24	87.01	2.801	5.20	72.41	1.654	17.39	29.72	16.09
34	38.23	53.20	20.34	85.16	3.743	5.50	71.44	1.630	14.52	40.19	20.99
35	25.86	89.25	23.08	82.39	2.587	6.47	66.25	1.503	18.57	48.32	23.18
36	38.33	61.90	23.73	85.36	4.467	6.94	71.10	1.622	17.49	40.78	18.68
37	39.59	57.19	22.64	84.31	4.746	7.68	69.66	1.587	19.52	38.83	19.05
38	34.37	63.06	21.68	87.63	4.172	6.97	72.97	1.668	15.76	35.07	18.53
39	35.98	63.47	22.84	89.18	2.962	6.07	73.91	1.691	18.17	29.32	15.79
40	31.75	55.84	17.73	80.35	2.698	5.36	65.46	1.484	13.01	46.14	24.61
41	37.39	68.80	25.73	87.77	2.577	6.50	71.59	1.634	17.99	40.66	17.96
42	37.65	58.21	21.92	88.49	5.811	4.65	78.21	1.796	15.96	32.83	16.64
44	46.31	57.50	26.63	83.56	3.770	7.35	68.02	1.547	17.00	32.92	20.36

[a]NEL = Net energy for lactation

Appendix Table 53

HERD SIZES AND PRODUCTION LEVELS

	Herd No.	Cows	Production (kg/yr)
Group 1	6	123	8422.8
	10	119	7462.1
	11	69	7991.5
	14	88	7132.8
	19	83	7807.8
	21	83	7452.6
	23	128	7331.5
	29	57	7381.8
	32	74	7207.7
	39	113	7548.8
	44	58	8055.0
Mean		90.45	7617.7
STD[a]		26.10	401.54
Group 2	2	114	9604.0
	4	90	9887.5
	12	52	10463.6
	18	101	9765.0
	20	90	8707.2
	24	92	8684.1
	34	127	10408.2
	35	48	8916.8
	38	71	9293.3
	40	43	9735.6
	41	71	8788.9
Mean		81.73	9465.0
STD		27.31	683.10

Appendix Table 53 - continued

HERD SIZES AND PRODUCTION LEVELS

	Herd No.	Cows	Production (kg/yr)
Group 3	3	233	7175.9
	5	188	7239.9
	9	141	8219.6
	17	131	7957.9
	25	276	8139.8
	26	184	7834.5
	27	238	7099.2
	28	210	8329.4
	30	146	7394.5
	42	154	7067.5
Mean		190.1	7645.8
STD		48.42	500.61
Group 4	1	144	9837.6
	7	140	9148.1
	8	193	10504.4
	13	161	9661.6
	15	189	8765.8
	16	173	10218.2
	22	211	8704.1
	31	320	8805.7
	33	193	9287.9
	36	170	9586.8
	37	195	9484.7
Mean		189.9	9455.0
STD		48.51	589.38

Appendix Table 53 - continued

HERD SIZES AND PRODUCTION LEVELS

Herd No.	Cows	Production (kg/yr)
<u>Small Herds</u> - < 130 cows (Groups 1 and 2)		
Mean	86.09	
STD	26.45	
<u>Large Herds</u> - ≥ 130 cows (Groups 3 and 4)		
Mean	190.0	
STD	47.24	
<u>Low Herds</u> - RHA < 8,636.4 kg/yr (Groups 1 and 3)		
Mean	7631.1	
STD	440.00	
<u>High Herds</u> - RHA ≥ 8,636.4 kg/yr (Groups 2 and 4)		
Mean	9466.3	
STD	605.28	

[a] STD = Standard deviation

Appendix 54

HERD MANAGEMENT INFORMATION

Herd	Group	Prepartum Animals Separate[a]	Primiparous Animals Separate[a]	Lactating Animals/ Group	Housing Type[b]	Feeding Method[c]	Feedings/ Day	Grain Fed Separate[ad]	Total Bunk Space (m)	Bunk Space/ Animal (cm)	Milking Facility Type[e]	Milking Units	Persons Milking	Scheduled Veterinary Interval (wks)	Dry Cow Treat[a]
1	4	Y	N	113	FS	TMR/HAY	2	N	61.0	53.9	HD5	10	2	4	Y
2	2	Y	N	114	FS	TMR/HAY	2	Y/P	48.8	42.8	ST/P	6	2	8	Y
3	3	Y	N	225	FS	TMR	2	N	97.5	43.3	HD6	12	2	4	Y
4	2	Y	N	93	FS	TMR/HAY	2	Y/P	48.8	52.4	ST/P	10	2	4	Y
5	3	Y	N	166	FS	TMR/HAY	3	Y/P	30.5	18.4	ST/P	8	2	4	Y
6	1	Y	N	71	FS	TMR/HAY	2	Y/C	39.0	54.9	HD4	8	1	4	Y
7	4	Y	N	64	FS	TMR/HAY	2	N	39.0	61.0	HD8	16	2	4	Y
8	4	Y	N	114	FS	TMR/HAY	3	Y/C	46.3	40.6	HD6	12	2	4	Y
9	3	Y	N	58	FS	TMR/HAY	3	N	24.4	42.0	HD4	8	1	4	Y
10	1	Y	N	72	FS	TMR	2	N	27.4	38.1	HD6	12	1	4	Y
11	1	Y	N	62	FS	TMR	3	N	35.4	57.0	HD3	6	1	2	Y
12	2	Y	Y	1	TS	TMR/HAY	3	Y/P	1.2	121.9	ST/P	4	1	6	Y
13	4	Y	N	95	FS	TMR	4	N	21.3	22.5	HD5	10	1	8	Y
14	1	Y	N	64	FS	TMR	2	N	24.4	38.1	HD4	8	1	4	Y
15	4	Y	N	100	FS	TMR/HAY	3	N	78.0	78.0	HD8	16	1	1	Y
16	4	Y	N	96	FS	TMR/HAY	4	Y/P	48.8	50.8	HD4	8	1	2	Y
17	3	Y		43	FS	TMR/HAY	1	N	28.0	65.2	HD4	8	1	2	Y
			Y	40	FS	TMR/HAY	1	N	14.6	36.6					
18	2	Y	N	75	FS	TMR	3	N	18.3	24.4	SD10	10	1	4	Y

Appendix 54 - continued

HERD MANAGEMENT INFORMATION

Herd	Group	Prepartum Animals Separate[a]	Primiparous Animals Separate[a]	Lactating Animals/ Group	Housing Type[b]	Feeding Method[c]	Feedings/ Day	Grain Fed Separate[ad]	Total Bunk Space (m)	Bunk Space/ Animal (cm)	Milking Facility Type[e]	Milking Units	Persons Milking	Scheduled Veterinary Interval (wks)	Dry Cow Treat[a]
19	1	Y	N	40	FS	SEPARTATE	2	N	17.1	42.7	HD4	8	1	4	Y
20	2	Y	N	64	FS	TMR/HAY	2	N	30.5	47.6	ST/P	8	2	4	Y
21	1	Y	N	47	FS	TMR/HAY	2	N	36.6	77.8	ST/P	6	2	4	Y
22	4	Y	N	171	FS	TMR	4	N	61.0	35.6	HD8	16	2	4	Y
23	1	Y	N	42	FS	TMR	2	N	30.5	72.6	HD6	12	1	4	Y
24	2	Y	N	83	FS	TMR	4	Y/P	36.6	44.1	HD4	8	1	4	Y
25	3	Y		78	FS	TMR/HAY	3	N	30.5	39.1	HD6	12	1	2	Y
			Y	84	FS	TMR/HAY	3	N	30.5	36.3					
26	3	Y	N	147	FS	TMR/HAY	3	Y/C	48.8	33.2	HD6	6	2	2	N
27	3	Y	N	100	FS	TMR/HAY	4	Y/C	51.8	51.8	TRN17	17	2	2	Y
28	3	Y	N	304	FS	TMR	4	Y/C	91.4	30.1	HD6	12	2	1	Y
29	1	Y	N	55	FS	SEPARATE	2	Y/C	36.6	66.5	HD4	8	1		Y
30	3	Y	N	75	FS	TMR	2	N	30.5	40.6	HD6	12	1	4	Y
31	4	Y		80	FS	TMR	3	Y/P	48.8	61.0	ST/P	12	3	2	Y
			Y	80	FS	TMR	3	Y/P	48.8	61.0					
32	1	Y	N	86	FS	SEPARATE	2	Y/C&P	48.8	56.7	HD4	8	1	2	Y
33	4	Y		60	FS	TMR	3	Y/C	19.5	32.5	HD6	12	1		Y
			Y	72	FS	TMR	3	N	32.3	44.9					
34	2	Y	N	113	FS	TMR/HAY	2	Y/C	58.5	51.8	HD6	12	2	2	Y

Appendix 54 - continued

HERD MANAGEMENT INFORMATION

Herd	Group	Prepartum Animals Separate[a]	Primiparous Animals Separate[a]	Lactating Animals/ Group	Housing Type[b]	Feeding Method[c]	Feedings/ Day	Grain Fed Separate[ad]	Total Bunk Space (m)	Bunk Space/ Animal (cm)	Milking Facility Type[e]	Milking Units	Persons Milking	Scheduled Veterinary Interval (wks)	Dry Cow Treat[a]
35	2	Y	Y	1	TS	SEPARATE	3	Y/P	1.2	121.9	ST/P	4	2	4	Y
36	4	Y	N	168	FS	TMR	3	Y/C&P	48.8	29.0	HD5	10	1	4	Y
37	4	Y	N	180	FS	TMR/HAY	2	Y/P	48.8	27.1	HD5	10	2	4	Y
38	2	Y	Y	1	TS	TMR	3	N	1.2	121.9	ST/P	6	2	4	Y
39	1	Y	N	70	FS	TMR/HAY	2	N	21.3	30.5	HD6	12	2	4	Y
40	2	Y	Y	79	TS	SEPARATE	2	Y/P	1.2	1.5	ST/P	4	1	4	Y
41	2	N	N	71	FS	SEPARATE	2	Y/C	42.7	60.1	HD4	8	1	4	Y
42	3	Y	N	101	FS	TMR	2	N	42.7	42.2	HD8	16	2	2	Y
44	1	Y	N	54	FS	TMR	2	Y/C	48.8	90.3	SO6	6	1	2	Y

[a] N = no; Y = yes
[b] FS = free stall; TS = tie-stall
[c] SEPARATE = fed separately; TMR = total mixed ration; TMR/HAY = TMR with baled hay
[d] C = computer feeder; P = parlor or while milking
[e] HD5 = herringbone, double 5; SO10 = side opening, 10 stalls; ST/P = stanchion with pipeline; TRN17 = turnstyle rotary, 17 stalls

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