

## **NUTRITIONAL RELATIONSHIPS FOR SOW PRODUCTIVITY AND LEAN GROWTH**

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### **SUMMARY**

A swine nutritional relationships study has been initiated to evaluate three nutritional areas of swine production. This new research initiative is directed toward swine production units that utilize semi-confinement rearing systems, which are common among 60-120 sow units in southwestern North Dakota. Industry response to consumer demand for leaner pork products have resulted in genetically leaner sow herds. Research emphasis in this project focuses on the response of leaner sows to varying gestation energy levels and the subsequent effect on farrowing, lactation and rebreeding performance. A second project objective further evaluates sow response to protein (lysine) and energy ration modifications during lactation, and the third objective is designed to develop dietary protein (lysine) and energy ratios for barrows and gilts developed to slaughter weights in sheltered outdoor facilities. Gilts in the first breeding cycle began farrowing in mid October. The first preliminary data will be available in the fall of 1995.

### **INTRODUCTION**

The swine industry is undergoing a significant amount of change nationally to maintain a strong market share. In a highly competitive environment, swine producers have adopted numerous technological advances. Relaxed corporate farming laws in some states are developing a mature swine environment paving the way for corporate swine farms that utilize vertical integration from conception to consumer.

By comparison to a national swine industry where corporate swine farms are becoming more prevalent, North Dakota's swine industry is immature with many farms utilizing hogs as a supplemental source of diversified income from herds of 60-120 sows. Systems for rearing range from very modest low input arrangements to total confinement. In western and southwestern portions of the state, a greater number of facilities are of the semi-confinement type in which farrowing, nursery, and in some cases the grower phase is completed in confinement, with breeding, gestation and growing/finishing completed in sheltered outdoor facilities. Since semi-confinement is a commonly used rearing method, this new swine research initiative has been developed around the needs of producers utilizing semi-confinement and genetically lean sows.

Review of nutritional scientific literature indicates that voids exist with respect to the genetically lean sow reared in the semi-confinement environment of North Dakota. The following three objectives have been identified for initial investigation:

1. To determine the effect of dietary energy intake during gestation on sow body condition, lactation weight change, and litter and rebreeding performance.

The carryover effect of winter gestation energy level on sow weight change and body condition, farrowing litter size post weaning estrus interval, and nonproductive sow days will be evaluated.

2. To determine the effect of modifying lysine to energy ratios during lactation weight change, and litter and rebreeding performance.

Sows receiving inadequate amounts of total protein and limiting amino acids experience substantial tissue depletion from muscle and organs. Negative protein and energy balance during lactation accelerates sow body weight loss and reduces total milk production. Maternal-line sows bred for higher milk production and larger litters require larger intakes of total protein and energy, but recommendations for the sow gestated outdoors needs to be evaluated and updated recommendations prepared. Data will be obtained by evaluating the impact of varying lactation protein (lysine)/energy ratios and their subsequent effect on sow weaning body condition, litter nursing performance, sow rebreeding performance, and nonproductive sow days.

3. To determine the effect of protein and lysine/energy ration modification on performance and carcass merit of growing/finishing pigs.

Pork producers responding to the packing industry's request for leaner pork are receiving lean premiums and yield margin payments for their hog carcasses when the genetic capability for lean gain and proper nutrient balance occur simultaneously. Nutritional guidelines for pigs developed to slaughter weights in total confinement are well documented. Feeding recommendations for pigs reared in the outdoor environment of North Dakota are currently extrapolated from research with totally confined pigs, but approximately 50-60% of the pigs marketed from southwestern North Dakota are developed outdoors. Therefore, intake response of barrows and gilts fed varying rations of protein (lysine) and energy during summer, winter and transition environments (spring and fall) are to be evaluated and recommendations prepared.

## MATERIALS AND METHODS

Parameters of this nutritional relationships study were initiated by depopulating the existing swine breeding herd and repopulating with Pig Improvement Company (PIC), Camborough-15 gilts, and PIC line 326-II boars. Using All In/All Out management, and three week weaning, four farrowing groups of 16 sows each will be used to conduct the three investigational objectives.

Objective one will be conducted during the winter months between November and March when weather conditions are most severe. Gestation energy levels to be fed are expressed in megacalories of metabolizable energy per head daily and are shown below. Diets will be fed once daily in individual feeding stalls. During non-winter months the medium gestation energy level will be fed.

WINTER MONTHS		NON-WINTER MONTHS
November - March		April - October
TREATMENT	Mcal ME	Mcal ME
Low	09	11

Medium	11	11
high	13	11

Sow weights, body condition score, and ultrasound measurements for backfat and loin eye muscle area will be taken at weaning, and days 40, 75 and 110 of gestation. Feed intake during lactation will be recorded for each sow. Once a sow has completed farrowing, she and her litters weights will be obtained within 12 hours. At weaning, each sow and litter will be weighed again and sow ultrasound measurements for loin eye area and fat depth taken. The post weaning first estrous interval, interval between weaning and pregnancy, and non productive sow days will be recorded for each sow. During lactation the sows will be fed a corn/barley lactation diet formulated to contain 17.0% protein, .80% lysine, and 1.33 Mcal of ME/lb of lactation diet.

Objective two will be conducted concurrently with objective one, and will utilize sows not assigned to objective one. Sows assigned will be gestated with the medium level of energy used in objective one and will be assigned to one of the following protein and energy levels:

TREATMENT	PROTEIN	LYSINE	ENERGY
Low	15.5%	.710%	16 Mcal ME
Medium	17.0%	.80%	16 Mcal ME
High	18.5%	.95%	16 Mcal ME

Daily feed intake during lactation as well as the same series of measurements outlined for objective one will be conducted for the sows assigned to objective two.

In objective three, several barley based growing/finishing diet response trials will be conducted using feeder pigs weighing 45-60 pounds that are produced in objectives one and two. Outdoor dirt lots equipment with frost-free waterers, self feeders, and portable wooden shelters will be used to evaluate animal response in a single grower (50-110 lbs.0 and two finisher (110-170 lbs and 170-240 lbs,) phases. Initial diets to be used will contain the lysine levels shown below:

GROWTH PHASE	LYSINE LEVEL	SEX
Grow er	.75%	Barrow
		Gilt
	.95%	Barrow
		Gilt
Finisher I	.70%	Barrow
		Gilt
	.85%	Barrow
		Gilt
Finisher II	.65%	Barrow
		Gilt
	.80%	Barrow
		Gilt

Diet response criteria to be measured will include: feed intake by period (28 day), feed intake by season, digestible energy (DE) intake, DE:amino acid intake by season, weight gain by period (28 day), weight gain:amino acid intake ratio, ultrasound fat depth and loineye area, and calculated percent lean. Commercial marketing response for percent lean and carcass yield will be obtained through grade and yield marketings at the John Morrell and Company plant in Sioux Falls, South Dakota.

## RESULTS AND DISCUSSION:

The first group of summer gestated gilts in cycle one will begin farrowing October 15<sup>th</sup>, which will mark the beginning

of farrowing in this study. Preliminary data will be summarized for this report in the fall of 1995.

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