To the Graduate Council:

I am submitting herewith a thesis written by William Dan Ligon, entitled "Comparison of Pasture Versus Confinement Raising of Baby Pigs." I recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Science, with a major in Animal Science.

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COMPARISON OF PASTURE VERSUS CONFINEMENT RAISING OF BABY PIGS

A Thesis

Presented for the

Master of Science

Degree

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William Dan Ligon

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ABSTRACT

Data were collected on fifty-two sows and litters over a two trial farrowing period, April and July, 1974, at The University of Tennessee Agricultural Experiment Station, Knoxville, Tennessee, to determine the effect of pasture versus confinement raising of baby pigs. These two systems were compared as they are actually used in the hog industry today.

At day 14, post farrowing, one half of the sows and litters were moved to the field on the pasture treatment and the sows and litters on the confinement treatment remained in the farrowing crates. The litters remained in their respective locations until the pigs were weaned at eight weeks of age at which time they were moved to a pole type feeding barn and fed until they reached 12 weeks of age.

In Trial I, April farrowing, there was no significant difference in average daily gain or weight at 8, 9, 10, 11 and 12 weeks of age. However, in each weighing period, the pasture raised pigs outgained and outweighed the confinement raised pigs. In Trial II, July farrowing, the pasture raised pigs significantly ($P < .001$) outweighed the confinement reared pigs at 8, 9, 10, 11 and 12 weeks of age and outgained them from 2 to 8 (.76 vs .54) and 2 to 12 weeks (1.01 vs .79). Within the individual weekly weighings from 8 to 12 weeks, the average daily gains between the two treatments became less significant with time from a level of significance of $P < .01$ at 9 weeks to a level of non-significance at 12 weeks.

In a comparison of the sow and creep feed consumed per pig from 2 to 8 weeks and feed required per pound of gain from 8 to 12 weeks, there was no significant difference between either treatment in each trial.

In each trial, there was no significant difference in sow weight at 8 weeks, post farrowing, or feed consumed per sow from 2 to 8 weeks due to treatment. However in Trial II, the sows on the confinement treatment significantly ($P < .05$) outgained the sows on pasture from 2 to 8 weeks. There was a significant difference ($P < .001$) in feed consumed per sow in both trials due to litter size with the sows having larger litters consuming more feed.

The feed efficiencies from 8 to 12 weeks of the baby pigs in this experiment were combined to determine the most profitable weight range for marketing feeder pigs. Actual wholesale and retail feed costs and feeder pig prices were obtained at the time these pigs would have been sold as feeder pigs. Based on the additional cost and income to carry a feeder pig to increased weights, it was determined that a 56-60 pound pig is the most profitable weight range to market.

TABLE OF CONTENTS

LIST OF TABLES

TABLE PAGE

CHAPTER I

INTRODUCTION

Today more baby pigs are raised to weaning using some modification of a pasture system than any other system available. However, with an increased number of confinement systems, many producers are raising questions about changing from primarily a pasture system to total confinement raising of baby pigs.

Several factors are involved in a producer's decision to use a pasture or confinement system. These factors include: increasing cost of labor and capital, decreasing availability of land for grain production, and size of operation. Either system has certain advantages which can be summed up as follows. The advantages for confinement are:

1. Generally reduces labor.
2. Increased mechanization and automation potential.
3. Increased volume of production.
4. Minimize land usage.
5. Provide some environmental control.

The advantages for pasture are:

1. Lower investment costs in buildings.
2. Reduce nutritional and management problems.
3. Provides low cost protein, vitamins, and minerals.
4. Reduces possible disease problems such as the Mastitis - Metritis - Agalactia syndrone (MMA), E. coli infection

causing scours, feet and leg problems, tail biting, and methane gas poisoning.

5. Provides valuable exercise especially for the sows.
6. Manure is distributed over the field without hauling.

Very little research has been done in comparing the effects of these two systems on the growth, development, and feed requirements of baby pigs from birth to weaning. It appears that the manager's ability is as important as the type of system used. Data from research where management was held constant and the type of systems varied is non-existent at the present. For these reasons and the fact that Tennessee is largely a feeder pig producing state with over 608,000 (preliminary results) feeder pigs sold through organized sales in 1974, which accounted for over 40 percent of the feeder pig production (Emmit Rawls, personal communication), a study was undertaken at The University of Tennessee experimental farm to compare pasture versus confinement raising of baby pigs.

Objectives of the study were to compare (a) the weaning weights and feed consumption of baby pigs raised in confinement and on pasture, (b) the sow feed consumption and sow weight gain or loss between the two systems, and (c) the average daily gain and feed efficiency from weaning to 12 weeks of age between the two systems.

Information from this experiment can be used by producers to help them make decisions as to which type of system or combination of systems to use based on their availability of land, labor, and capital.

CHAPTER II

LITERATURE REVIEW

I. SOW PERFORMANCE

Forshaw et al. (1953) stated that the most important factor in the growth of baby pigs is the milk production of the sows. Allen and Lasley (1960) stated that the litter weight at weaning was significantly correlated with milk production with the sows producing the most milk weaning the heaviest litters. It was also noted that gilts with the thickest backfat produced the smallest amount of milk. Pigs from the sows that produced the most milk also consumed greater amounts of creep feed. They also indicated that those factors which cause a variation in milk production must also influence litter weights.

Allen and Lasley (1960) also found that sows which gave the most milk also lost the most weight during the lactation period. Omtvedt et al. (1966) reported that weight loss during lactation was associated with increased litter size and litter weaning weights.

Several experiments (Lidvall and Griffin, 1962; Libal et al. 1974; and Burger, 1952) were conducted correlating sow feed intake with sow weight loss and litter weaning weight.

Lidvall and Griffin (1962) fed four groups of sows in lactation: ad libitum confined to concrete, ad libitum on pasture, 8 pounds per day confined to concrete, and 6 pounds per day on pasture. The weight gain or loss was +50.1 pounds for confined, ad libitum; +64.2 pounds for

pasture, ad libitum; -5.2 pounds pasture, limit fed; and -32.4 pounds concrete, limit fed. There was no difference in the weaning weights of the pigs; however, the pigs from limit fed sows consumed slightly more creep feed.

Two groups of lactating sows were used by Libal et al. (1974). One group received ad libitum feed while the other received one pound per day per pig. At 21 days the ad libitum fed sows gained 3 pounds while the restricted fed sows lost 25.5 pounds. The pigs from the ad libitum fed sows weighed significantly ($P < .01$) more, 11.2 vs 10.8 pounds.

Burger (1952) found that sows which were suckling large litters and were milking well lost weight even under the best conditions of management with unlimited quantities of feed.

II. BIRTH WEIGHT

Weaver and Bogart (1943) reported an advantage of approximately 7 pounds at weaning for each pound increase in birth weight. According to Forshaw et al. (1953) there is a highly significant ($P < .01$) correlation of .46 between weaning and birth weight. On the average, a difference of 1 pound at birth was accompanied by 7.78 pounds difference at weaning. Winters et al. (1974) stated that an increase of 1 pound in average birth weight increased total weaning weight by 15.9 pounds.

III. FEEDING FRESH DIRT

Allied Mills, Inc., as reported by Wilson (1968) found that pigs fed fresh dirt increased in weight gains. Three groups of baby pigs

were used: group one received fresh soil on the floor seven times between 18 and 29 days of age; group two received autoclaved soil (heated to kill bacteria present) also seven times; and the third group received no soil. The weight gains were 20.1, 19.0 and 17.3 pounds, respectively.

IV. SPACE REQUIREMENTS

Hazen and Mangold (1960) listed the following recommended floor space allowances for swine in enclosed confinement: sow and litter, 35 square feet; 10 to 40 pound pigs, 4 square feet; and 40 to 80 pound pigs, 5 square feet.

Purdue University (1967) recommends one-half acre for a sow and her litter raised on pasture.

For growing-finishing hogs, Jensen (1973) found that the more square feet pigs are allowed in confinement the faster they grow, but different space allowances had no effect on feed efficiency. From 52 to 100 pounds, pigs given 5 square feet grew faster than the ones given 3 or 4 square feet; from 110 to 150 pounds, pigs given 8 square feet grew faster than ones given 4 or 6 square feet; and from 150 to 222 pounds, pigs given 10 square feet grew faster than ones given 6 or 8 square feet.

Heitman et al. (1961) also proved that growing-finishing hogs given more space allotment grew faster. Faster gains were recorded from pigs in pens with 20 square feet per pig than pigs given either 10 or 5 square feet per pig. The number of pigs per pen did not affect the average daily gain.

V. DISEASE AND INJURY

According to Fox (1969), confinement has produced man made diseases; tail biting, knee abrasions, and localized abscesses. Errors in establishing proper environment might bring about production and inhalation of excessive quantities of methane gas, which can result in poisoning. Improper ventilation can result in the accumulation of excessive moisture that might encourage proliferation of Escherichia coli resulting in colibacillosis or the buildup of other bacterial organisms. MMA was also found to be more frequent in confinement.

Daniel (1967) also reported possible odor and ventilation problems from liquid manure systems under slatted floors which resulted from the release of ammonia, hydrogen sulphide, and other gases by the anaerobic decomposition of liquid manure.

In comparing individual, bedded, outdoor houses with enclosed confinement farrowing houses, Daniel (1967) found that the slatted floor systems had a 2 percent serious injury rate due to skinned knees and infected hocks while the individual houses had a zero percent injury rate. He also noted less udder and feet and leg problems in individual houses.

According to Purdue University (1967), the smaller the space allotted per pig in confinement, the more the hock swellings.

VI. TYPE OF HOUSING

Daniel (1967) compared individual, outdoor farrowing houses, having a pen in front of each house, with five enclosed confinement

farrowing systems from birth to 21 days of age. Significantly ($P \leq .10$) more pigs were lost due to overlay in the individual houses but significantly ($P \leq .05$) less pigs were lost to starvation and weakness with most of the death losses occurring the first week. However, some of the losses to overlay were a result of weak pigs, that would have been lost to starvation, not being able to get out of the way of the sow.

At 21 days the baby pigs in the individual houses were significantly heavier ($P \leq .05$), weighing one pound more per pig. Sows in the individual houses consumed an average of two pounds more feed per day which resulted in higher feed costs but there was no sow weight difference.

Sprouse et al. (1973) compared three farrowing systems: enclosed confinement farrowing system with a solid concrete floor where the sows were fed on a platform twice daily, enclosed confinement farrowing system with partial slats with the sows fed in the farrowing pen, and individual outdoor houses with a pen in front of each house.

Baby pig mortality was similar for all three systems (9 to 11 percent). The individual outdoor houses had the lowest labor requirement, investment cost, and total production cost per sow and litter. The enclosed houses had more uniform temperatures. They stated that the individual outdoor houses could be used for producers with limited capital and need for flexibility where climatic conditions are not extreme.

Hazen and Mangold (1960) reported that in the summer there was no significant loss of pigs in the individual houses, but in the winter

these houses had a significant ($P \leq .05$) increasing affect upon the number of pigs lost.

VII. GROWTH RATE

In comparing a conventional farrowing unit (mechanically ventilated, solid floor, and wood shavings), with a farrow to finish structure (completely enclosed building designed to maintain a relatively controlled environment with slats at the end of the farrowing crate), Sherritt et al. (1972) found that baby pigs grew significantly ($P \leq .01$) faster (1.72 vs 1.45 pounds per day) in the conventional farrowing system. However, Wahlstrom et al. (1971) found no consistent effect of housing types on daily gain using open fronted versus environment controlled buildings on growing-finishing hogs.

In an experiment comparing confinement versus alfalfa pasture for growing-finishing hogs, Danielson et al. (1969) found no significant difference in feed conversion. However, hogs raised in confinement significantly ($P \leq .01$) outgained (1.78 vs 1.67 pounds per day) the ones on pasture.

According to Purdue University (1967), growing-finishing hogs raised on a conventional system, pole building in winter and portable houses in the summer on pasture, had a faster rate of gain and required less feed per pound of gain than did hogs raised in enclosed insulated houses. The enclosed houses with partial or total slats reduced the manual labor but increased the level on quality of management needed.

In a summary of the results of 12 different experiments conducted by six universities involving 948 growing-finishing hogs,

Giesler (1961) reported that pigs fed on concrete gained 2.6 percent faster than pigs fed on pasture. However, pasture feeding saved 3.1 percent of the feed required per 100 pounds gain.

CHAPTER III

EXPERIMENTAL PROCEDURE

This experiment was set up as a general overall management study. By comparing the two systems, pasture and confinement, based on the way these two systems are actually used in the hog industry today, the data would be more practical. For this reason, sows were fed according to condition, litter size, and type of system which research has shown to be most effective. Also, the baby pigs in the field had access to the sow's feed as does normally happen in a pasture situation.

Since it was felt that less pigs would be lost to overlay, all sows were allowed to farrow in a farrowing crate. The experiment was not started until the litters were 14 days of age, at which time the baby pigs moved to the field on the pasture treatment would be strong enough to cope with changing weather conditions and stay out of the sow's way.

I. GENERAL PROCEDURE

Fifty-two sows and litters were used over a two trial-farrowing period, April and July, 1974, using 26 sows and litters in each trial. At the beginning of each trial the sows were randomly allotted to two treatments, pasture versus confinement, based on breed and age of sow and breed of offspring. In the April farrowing 23 Duroc and 3 Duroc X Yorkshire sows were used. The offspring consisted of 20 Duroc, 3 Duroc X Yorkshire, and 3--3/4 Duroc and 1/4 Yorkshire litters. In the

July farrowing, 24 Duroc and 2 Hampshire sows were used. The offspring consisted of 24 Duroc and 2 Hampshire X Yorkshire litters.

Litters that were assigned to the pasture treatment were moved to the field when the litter became 14 days of age. The remaining 13 litters were assigned to the confinement treatment and remained in the farrowing barn until weaning at approximately 56 days of age.

The baby pigs were individually weighed at 14, 56, 63, 70, 77, and 84 days of age. The feed fed, feed efficiency, and average daily gain were computed between each of these weighing periods.

The sows were weighed when their litters became 14 and 56 days of age. Sow feed was recorded in three segments: from farrowing to 14 days, from 15 to 56 days, and from 56 days to weaning. A combined total of creep and sow feed was recorded from 14 to 56 days.

The pigs were weaned as near 56 days of age as possible based on all the litter ages. After weaning the pigs were moved into a pole type finishing barn with each litter assigned to a different pen and fed until they were 12 weeks of age.

II. MANAGEMENT

The sows were washed, disinfected with an iodine solution, and placed in farrowing crates approximately three days before farrowing.

After farrowing each sow received 10 cc of penicillin. If signs of MMA were present the sow received 10 cc of penicillin twice daily for three succeeding days plus 1/2 cc of oxytocin if the baby pigs showed signs of starvation.

After farrowing, the pigs had their needle teeth clipped, birth weight taken, teat count recorded for possible later replacement boars and gilts, and were ear-notched. The litters were evened up depending on number of pigs farrowed per litter and sow's ability to raise a certain number of pigs.

At three, four, and five days of age the baby pigs received a medication as a possible scour preventive. This medication was specially formulated by a veterinarian. At day five, the pigs received intramuscular iron. At 14 days of age, the pigs that remained in the farrowing barn on the confinement treatment were given another iron shot.

The pigs were vaccinated against erysipelas and castrated at approximately four weeks of age.

The pigs from the July farrowing were wormed with piperzine at weaning. The pigs from the April farrowing were not wormed.

III. FACILITIES

The farrowing barn had 24 farrowing crates that were 7 feet long and 6 feet wide with 2-1/2 feet of aluminum slats at the end. The crate was 2 feet wide for the sow with an additional 2 feet on each side for the pigs. The slat openings were 1 inch wide behind the sow and 3/8 inch wide on the pigs' side of the crate. An automatic waterer and feed trough was located in front of the sow. A four-holed, 25 pound capacity, aluminum creep feeder was nailed to the side partition. At least twice a week and more often if needed the old feed was removed from the feeder and replaced with fresh feed.

The crates were cleaned daily by manual labor to prevent manure buildup on the front concrete portion and rear slat portion. The waterers were cleaned once a week. In the winter, the farrowing barn was heated by heat lamps and cooled in the summer by fans.

The pastures were 1/2 acre in size and sowed in fescue and bermuda grass with some ladino clover. One sow and litter was assigned per lot. The houses were 10 feet long and 9-1/2 feet wide with concrete floors and walls. The houses were open to the south and the north end could also be opened in the summer for additional air circulation. The houses were bedded with straw.

The sows were fed on a 14 by 9-1/2 feet concrete platform with an automatic float type waterer at one end. The waterers were cleaned once a week. A four-holed, 100 pound capacity, aluminum creep feeder was placed in one corner for the baby pigs.

After weaning the pigs were fed in a pole type barn open to the south with the north end closed during the winter and open for ventilation during the summer. The pens were five feet wide and 20 feet long with an automatic waterer in the south end and one, two-holed self feeder under the roof at the north end. One litter was assigned per pen. The floor was solid concrete with a slight slope to the outside gutter to provide drainage. The pens were scraped daily.

IV. FEEDING

All the sows were fed a 16 percent protein ration the first two weeks after farrowing. The composition of this ration is listed in Table 1. The sows that were on the confinement treatment remained on

TABLE 1. Sow Ration in Confinement.

Ingredient	Pounds
No. 2 Yellow Corn (9 percent)	575
SBOM (44 percent)	100
Meat Scraps (50 percent)	50
Dehydrated Alfalfa Meal (17 percent)	150
Wheat Bran	100
Dicalcium Phosphate	14
Salt	5
Trace Mineral Premix[a]	.5
Vitamin Premix[b]	3.5
Antibiotics	
$Neomix_{100}$[c]	1
TM_{50}[d]	1
TOTAL	1,000

[a]Provides an addition to the ration of 50 ppm of Mu, .5 ppm Ca, 50 ppm Fe, 5 ppm Cu, and 100 ppm Zn.

[b]Provides an addition to the ration of 2 gm riboflavin, 4 gm panothenic acid, 9 gm niacin, 10 gm choline, 10 gm B_{12}, 500,000 I.U. Vitamin A, and 250,000 I.U. Vitamin D.

[c]Contains 100 gm neomycin sulfate per pound.

[d]Contains 50 gm oxytetracycline per pound.

this ration until the pigs were weaned. The basic ration was bulked up with 100 pounds of bran to give a laxative effect. However, from the time the sows entered the farrowing barn until about one week after farrowing, the ration contained as much as 175 pounds of bran to further give a laxative effect in order to help prevent MMA. The sows were not fed 12 hours before or 24 hours after farrowing to hold down the stress from farrowing to further help prevent MMA. Also at this time the antibiotic level in the ration was doubled.

Beginning when the sows that were on the pasture treatment were moved to the field at 14 days, they were fed a 16 percent protein ration by mixing three parts corn with one part supplement, 37 percent protein. The composition of the supplement is listed in Table 2.

The sows in both groups were hand fed twice daily. The pounds fed depended on the condition of the sow and number of pigs per litter. The sow ration was gradually built up until they were on full feed at about day 14 post farrowing.

At day 14 the baby pigs were put on a 20 percent protein ration which contained 50 pounds of dried molasses to increase flavor and palatability. The composition of this ration is listed in Table 3. At least twice a week and more often if needed the feed in the creep feeders of the pigs on the confinement treatment was removed and replaced by fresh feed to insure that the pigs had access to fresh feed at all times.

At seven weeks of age the creep feed was changed to an 18 percent protein ration (Table 3). At this time the 50 pounds of dried molasses was replaced with 50 pounds of dehydrated alfalfa meal with the antibiotics being reduced to one pound per 1,000 pounds. The pigs

TABLE 2. Supplement.[a]

Ingredient	Pounds
SBOM (44 percent)	500
Meat Scraps (50 percent)	250
Dehydrated Alfalfa Meal (17 percent)	150
Dicalcium Phosphate	50
Ground Limestone	16
Salt	30
Antiobiotics	
$Neomix_{100}$[b]	1
TM_{50}[c]	1
Trace Mineral Premix[d]	2
TOTAL	1,000

[a]This ration mixed with No. 2 yellow corn at a rate of three parts corn and one part supplement to give a 16 percent protein ration.

[b]Contains 100 gm neomycin sulfate per pound.

[c]Contains 50 gm oxytetracycline per pound.

[d]Provides an addition to the ration of 50 ppm of Mu, .5 ppm Ca, 50 ppm Fe, 5 ppm Cu, and 100 ppm Zn.

TABLE 3. Creep Rations.

Ingredient	20 Percent Baby Pig Feed Pounds	18 Percent Protein Ration Pounds
No. 2 Yellow Corn (9 percent)	619	680
SBOM (44 percent)	250	200
Meat Scraps (50 percent)	60	50
Dried Molasses (6.5 percent)	50	--
Dehy. Alf. Meal	--	50
Dical. Phos.	10	10
Salt	5	5
Trace Min. Premix[a]	1	.3
Vitamin Premix[b]	3.5	3.5
Antiobiotics		
$Neomix_{100}$[c]	.75	.5
TM_{50}[d]	.75	.5
TOTAL	1,000	1,000

[a]Provides an addition of 100 ppm Mn, 1 ppm Ca, 100 ppm Fe, 10 ppm Cu, and 200 ppm Zn to the 20 percent protein ration and .3 of each of the before mentioned amounts for the 18 percent protein ration.

[b]Provides an addition to the ration of 2 gm riboflavin, 4 gm panothenic acid, 9 gm niacin, 10 gm choline, 10 mg B_{12}, 500,000 I.U. Vitamin A, and 250,000 I.U. Vitamin D.

[c]Contains 100 gm neomycin sulfate per pound.

[d]Contains 50 gm oxytetracycline per pound.

remained on this ration until the experiment was complete.

V. STATISTICAL ANALYSIS

The experimental data were analyzed by Statistical Analysis System (SAS). Average daily gains, weights at different ages, total creep and sow feed, and feed efficiency from 8 to 12 weeks of the baby pigs was analyzed using the following model:

$$Y_{ijk} = \mu + t_i + sow_j/t_i + e_{ijk}$$

where, Y_{ijk} is the kth pig in the jth sow of the ith treatment,

μ is Mu, the overall mean,

t_i is treatment, pasture or confinement,

sow_j/t_i is the jth sow within the ith treatment,

e_{ijk} is the error term.

Sow weight at two and eight weeks and average daily gain and feed consumed from two to eight weeks was analyzed by the following two models:

$$Y_{ij} = \mu + t_i + e_{ij}$$

where, Y_{ij} is the jth sow within the ith treatment,

μ is Mu, the overall mean,

t_i is treatment, pasture or confinement,

e_{ij} is the error term,

and, $Y_{ijk} = \mu + t_i + l_j + e_{ijk}$

where, Y_{ijk} is the kth sow having the jth litter size of the ith treatment,

μ is Mu, the overall mean,

t_i is treatment, pasture or confinement,

l_j is litter size,

e_{ijk} is the error term.

Significant differences between means were determined by significant F values (Steele and Torrie, 1960).

Feed efficiency within an individual week was determined by:

$$Y = .658455 + .026056\ W$$

where, Y is feed efficiency,

.658455 is the y intercept,

.026056 is the weight regression value.

This model was very reliable explaining 82 percent of the variation.

CHAPTER IV

RESULTS AND DISCUSSION

The results from the two trials conducted in April and July, 1974, varied drastically. Therefore, the data were not combined and will be reported separately as Trial I (April farrowing) and Trial II (July farrowing).

I. EFFECT OF TREATMENT ON NUMBER OF PIGS AND DEATH LOSSES

The litter averages at two and eight weeks of age and the number of pigs at each phase of the experiment are listed in Table 4.

In Trial I, the pasture treatment had an average of 8.69 pigs per litter at two weeks of age versus 8.00 pigs per litter for the confinement treatment. At eight weeks of age, four pigs had died on the pasture treatment, two from overlay and two from starvation, which reduced the average to 8.38. The confinement litter average remained unchanged. Two pigs, one from each treatment, are listed as dying between eight and nine weeks. Actually, these two pigs were killed before eight weeks of age. The pig on the pasture treatment was run over by a car when he got under the fence and the pig on the confinement treatment was mashed. Since these two pigs were six weeks of age at the time of their deaths, it was felt that they influenced the sow's milking ability and the pounds of sow and creep feed consumed. Therefore, these pigs' weights were adjusted to an eight week weight and included in the data.

TABLE 4. Number of Pigs at 2, 8, 9, 10, 11 and 12 Weeks and Average Litter Size at 2 and 8 Weeks.

	Av. Litter Size 2 Wks.	Av. Litter Size 8 Wks	Total Pigs 2 Wks.	Total Pigs 8 Wks.	Total Pigs 9 Wks.	Total Pigs 10 Wks.	Total Pigs 11 Wks.	Total Pigs 12 Wks.
Pasture April 1974 Farrowing	8.69	8.38	113	109	108	107	107	107
Confinement April 1974 Farrowing	8.00	8.00	104	104	103	102	101	101
Combined Total April 1974	8.35	8.19	217	213	211	209	208	208
Pasture July 1974 Farrowing	8.46	8.15	110	106	105	105	105	105
Confinement July 1974 Farrowing	9.31	8.38	121	109	107	107	107	107
Combined Total July 1974	8.88	8.27	231	215	212	212	212	212

The pig that died on the confinement treatment between nine and ten weeks of age, died from pneumonia. The pigs listed as dying between nine and ten weeks on the pasture treatment and ten and eleven weeks on the confinement treatment showed signs of weakness and dehydration. The actual cause of death was unknown.

In Trial II, the litter average at two weeks was smaller on the pasture treatment, 8.46 versus 9.31 in confinement. At eight weeks of age the litter average on the pasture treatment had been reduced to 8.15. Four pigs died, two from overlay and two from starvation. However, on the confinement treatment twelve pigs died, nine from starvation and three from overlay, which drastically reduced the litter average to an 8.38. The pig reported as dying between eight and nine weeks of age on the pasture treatment actually died before eight weeks. As in Trial I, this pig was mashed at six weeks of age, but his weight was adjusted and included in the data at eight weeks. Two pigs were mashed on the confinement treatment between eight and nine weeks because their legs got hung between the aluminum slats behind the sow.

The death losses in this experiment were not compared with Hazen and Mangold (1960), Daniel (1967), and Sprouse et al. (1973) because the majority of their losses occurred the first week after farrowing.

II. EFFECT OF TREATMENT ON PIG WEIGHTS AND GAINS

Baby pig weights and average daily gains at different ages are listed in Tables 5 and 6, respectively.

TABLE 5. Pig Weights at 2, 8, 9, 10, 11 and 12 Weeks of Age.

	Av. Wt. 2 Wks.	Av. Wt. 8 Wks.	Av. Wt. 9 Wks.	Av. Wt. 10 Wks.	Av. Wt. 11 Wks.	Av. Wt. 12 Wks.
Pasture April 1974 Farrowing	7.53	37.62	45.52	55.02	64.64	76.09
Confinement April 1974 Farrowing	7.84	36.77	43.89	52.27	61.88	72.81
Combined Average April 1974	7.69	37.11	44.61	53.60	63.30	74.54
Pasture July 1974 Farrowing	7.37	*** 39.34	*** 48.15	*** 57.54	*** 67.46	*** 78.21
Confinement July 1974 Farrowing	6.93	29.70	36.58	43.37	51.80	61.96
Combined Average July 1974	7.17	34.27	41.98	50.15	59.44	69.85

***Significant at the $P < .001$ level.

TABLE 6. Average Daily Gains at 8, 9, 10, 11 and 12 Weeks of Age.

	ADG 2-8 Wks.	ADG 8-9 Wks.	ADG 9-10 Wks.	ADG 10-11 Wks.	ADG 11-12 Wks.	ADG 2-12 Wks.	ADG 8-12 Wks.
Pasture April 1974 Farrowing	.72	1.13	1.33	1.37	1.64	.98	1.37
Confinement April 1974 Farrowing	.69	1.02	1.19	1.32	1.56	.93	1.28
Combined Average April 1974	.70	1.07	1.26	1.35	1.60	.95	1.33
Pasture July 1974	***	**	**	*		***	**
Farrowing	.76	1.26	1.34	1.42	1.53	1.01	1.39
Confinement July 1974 Farrowing	.54	.99	.97	1.20	1.45	.79	1.15
Combined Average July 1974	.65	1.11	1.17	1.33	1.49	.90	1.27

*Significant at the $P < .05$ level.

**Significant at the $P < .01$ level.

***Significant at the $P < .001$ level.

In Trial I there was no significant difference in average daily gain or weight at any of the different ages measured. However, in each weighing period, except the two-week beginning test weight, the pasture raised pigs outgained and outweighed the confinement raised pigs.

In Trial II the opposite effect was observed. The pasture raised pigs significantly ($P < .001$) outweighed the confinement raised pigs at all different ages recorded, except the two-week beginning test weight. The baby pigs raised on pasture outgained the confinement raised pigs from two to eight weeks (.76 vs .54) and from two to twelve weeks (1.01 vs .79). Within the individual weekly weighings from eight to twelve weeks, the average daily gains between the two treatments became less significant with time from a level of significance of $P < .01$ at nine weeks to a level of non-significance at twelve weeks.

In agreement with the results from Trial II were Purdue University findings (1967) that growing-finishing hogs raised on a conventional system, pole building in winter and portable houses on pasture in summer, outgrew hogs raised in enclosed insulated houses. Similar results to Trial II were reported by Daniel (1967), who compared pigs raised in individual outdoor houses with pigs raised in confinement. Sherritt et al. (1972) also found that pigs raised in a conventional farrowing unit (mechanically ventilated, solid floor, and wood shavings) outgained pigs raised in a farrow to finish structure (completely enclosed building with slats at the end of the farrowing crate). Wilson (1968), also in agreement with the results of Trial II, stated that fresh dirt increased gain in baby pigs. However,

Wahlstrom et al. (1971) agrees with the results from Trial I, as they found no consistent effect of housing type on daily gains.

On the other hand, in disagreement with the results from both trials was Giesler (1961), who reported that pigs fed on concrete grew 2.6 percent faster than pigs raised on pasture. Danielson et al. (1969) also found that growing-finishing hogs raised on confinement significantly ($P < .01$) outgained the ones on pasture.

Some of the non-significance in the first trial may be explained by the fact that the pigs from three of the litters on the pasture treatment showed signs of stunted growth; long noses, dehydration, and frame with no corresponding weight. Combined average weight at eight and twelve weeks of age for these litters was 29.54 and 64.76 pounds, respectively, which was 8 and 11 pounds, respectively, below the mean of all the pigs in the field. Atrophic rhinitis and/or dust in the houses may have been a possible source of some of the reduced growth. The growth rate of these three litters remained suppressed throughout the experiment and these pigs were the last ones to reach market weight at 220 pounds.

The high degree of significance between the gains of the two groups on the second trial may be explained by the fact that the sows on the confinement treatment converted their feed to backfat instead of milk, as will be explained in a later section.

At eight weeks of age when the pigs were weaned, they were put on a concrete feeding floor in 20 by 5 feet pens. A question that was raised at this time was: Would concrete affect the gains of the pasture raised pigs? Even though the average daily gain became less

significant with time between the two treatments in Trial II, no noticeable effect in either trial was observed.

III. EFFECT OF TREATMENT ON TOTAL FEED AND OVERALL FEED EFFICIENCY

In comparing the feed consumed from two to eight weeks, both sow and creep feed was combined because the pigs in the field had access to the sow's feed. In obtaining this figure, the total feed consumed by the sow and litter was combined and divided by the litter size. The results are listed in Table 7. In both trials there was no significant difference between the treatments.

This is in agreement with Danielson et al. (1969), who found no significant difference in feed conversion of growing-finishing hogs on pasture and in confinement. However, Giesler (1961) and workers at Purdue University (1967) found that growing-finishing hogs on pasture required less feed per pound of gain.

The pasture raised pigs in Trial II required the most feed per pig from two to eight weeks, but this was expected as they weighed the most at eight weeks.

In both trials, the baby pigs in the field began eating noticeable amounts of creep feed at about three weeks of age, whereas, the confined pigs did not start until about four weeks of age. Possibly, the pigs' access to the sow's feed in the pasture lots influenced their earlier start. Another possible explanation is that the confinement raised pigs were constantly dunging, stepping, and rooting manure in the trough of the creep feeder. However, the old creep feed and manure

TABLE 7. Total Feed and Overall Feed Efficiency from 2 to 8 and 8 to 12 Weeks of Age.

	Total Feed Per Pig 2-8 Weeks Creep and Sow Feed	Feed Efficiency 8-12 Weeks
Pasture April 1974 Farrowing	84.17	2.01
Confinement April 1974 Farrowing	81.97	2.06
Combined Average April 1974	81.45	2.05
Pasture July 1974 Farrowing	94.50	2.07
Confinement July 1974 Farrowing	85.32	1.96
Combined Average July 1974	88.02	2.00

was removed and replaced by fresh feed at least twice a week, and more often if needed, to try to help remedy this problem.

Feed required per sow and litter on pasture may possibly have been less if a more palatable pasture such as orchard grass, alfalfa, or clover had been available. The lots used in this experiment were predominately fescue and bermuda grass with very little ladino clover.

In comparing the feed efficiency from eight to twelve weeks, again there was no significant difference between the two treatments in either trial. The pigs that required the least amount of feed per pound of gain were the confinement pigs in Trial II. However, they were also smaller in weight. At this time both groups were on concrete, so the pasture raised pigs were not able to utilize pasture for feed, which may explain some of the non-significance in feed efficiency.

Feed efficiency was compared on a week to week basis between eight and twelve weeks. However, because of differences in shrink and fill, changing of weather conditions, possible error in weighing, and individual pig differences, the results over a one week period would not give a true feed efficiency.

IV. EFFECT OF TREATMENT AND LITTER SIZE ON SOW PERFORMANCE

Average sow weight, total feed consumed, and average daily gain from two to eight weeks are listed in Table 8.

In Trial I there was no significant difference in the sows' weights at two weeks, based on either treatment or litter size. In Trial II, treatment did not affect the sow weight, but there was a significant difference in the sow weight based on litter size. This

TABLE 8. Sow Weight, Feed, and Average Daily Gain at 2 and 8 Weeks Post-Farrowing.

	Sow Wt. 2 Wks.	Sow Wt. 8 Wks.	Sow Feed per Sow 2-8 Wks.	Sow ADG 2-8 Wks.
Pasture April 1974 Farrowing	347	387	*** 506	.95
Confinement April 1974 Farrowing	344	374	475	.71
Combined Average April 1974	346	380	490	.83
Pasture July 1974 Farrowing	* 398	401	*** 573	* .075
Confinement July 1974 Farrowing	405	443	595	.88
Combined Average July 1974	402	422	584	.48

*Significant at the $P < .05$ level.

***Significant at the $P < .001$ level; subscript in upper left hand corner represents significance due to treatment; and subscript in the upper right hand corner represents significance between the sows due to litter size.

can be explained by the fact that older sows which weighed more had more pigs at two weeks of age than first litter gilts or second litter sows.

In both trials there was no significant difference in the sow's weight at eight weeks as a result of either treatment or litter size. However, in Trial II, the effect of treatment and litter size on weight at eight weeks approached significance at the $P < .05$ level.

In both trials, the sows in both treatments gained weight, which is in contrast to Burger (1952) who found that sows which were suckling large litters and milking well, lost weight with unlimited quantities of feed, and Omtvedt et al. (1966), who reported that weight loss during lactation was associated with increased litter size and litter weaning weights. However, Lidvall and Griffin (1962) found that sows fed ad libitum gained weight whether on pasture or concrete, but sows which were limit fed lost weight whether on pasture or concrete.

In Trial I, neither treatment nor litter size affected the average daily gain from two to eight weeks. In Trial II litter size again did not affect average daily gain, however, there was a significant ($P < .05$) treatment effect on average daily gain (.88 vs .075) in the confinement group. This is evidenced by the fact that the sows on pasture only gained three pounds per sow while the confinement sows averaged 38 pounds.

In both trials there was no significant difference in sow feed consumed based on treatment. In Trial I, the sows on the pasture treatment ate more feed per sow, which agrees with Daniel (1967) who stated that sows in individual, outside houses ate two pounds more feed per

day than sows in confinement with no sow weight difference. However, in Trial II, the sows in confinement ate more feed which disagrees with Daniel (1967).

Total feed per sow was highly ($P < .001$) correlated in both trials with the number of pigs per litter with sows having larger litters receiving more feed.

In both trials it was observed that the sows on the pasture treatment gave more milk, as it took the sows' udders approximately two days longer to dry up after weaning.

In Trial II the sows on the pasture treatment gained very little weight (three pounds), had larger udders, and had significantly ($P < .001$) larger pigs at eight weeks. This agrees with Forshaw et al. (1953) and Allen and Lasley (1960), who found that milk production of the sow was the most important factor in the growth of the baby pigs.

On the other hand, the sows on the confinement treatment in Trial II lost more pigs to starvation; gained an average of 38 pounds; were noticeably fatter; and weaned significantly ($P < .001$) lighter pigs, 29.70 versus 39.34 pounds. This corresponds to Allen and Lasley (1960), who noted that gilts with the thickest backfat produced the smallest amount of milk. They also indicated that those factors which cause a variation in milk production must also influence litter weights.

V. EFFECT OF TREATMENT ON DISEASE AND INJURY

Several pigs on the confinement treatment showed signs of knee abrasions, hock swellings, stiff legs, and abscesses, while the pigs on the pasture treatment showed very few of these symptoms, which is in

agreement with Daniel (1967), Purdue University (1967), and Fox (1969).

Abnormal quantities of methane gas and other fumes were seldom detected during these two trial periods, probably because most of the time, the windows and doors were open with the fans running. However, during the other two farrowings of the year, October and January, the accumulation of gases in the farrowing barn was very pronounced and could possibly affect the gains. Daniel (1967) and Fox (1969) observed that improper barn construction increased accumulation of gases, which may be the case in the barn used in this experiment.

During the first trial, scours affected to some degree eight litters, five of which had as much as a 50 percent death loss. The beta hemoragic strain of Escherichia coli was detected as the cause. It was believed that the manure buildup on the slats was also a contributing factor. After the outbreak, all litters were vaccinated against comparable strains of E. coli. Also, to help prevent reoccurrence of the scours, all manure was manually scraped from the pens each day. No reoccurrence was noted.

On several occasions, about one day after the creep feed on the confinement treatment was removed and replaced by fresh feed, the feces of the baby pigs became loose and had a very light, yellow color. A possible explanation is that the pigs ate too much of the highly palatable feed at one time.

VI. EFFECT OF TREATMENT ON LABOR

Although a record was not kept comparing the hours of labor between each treatment, the hogs on the confinement treatment required a greater amount of time consuming labor. Similar results were reported by Sprouse et al. (1973), who compared individual houses with confinement. However, this is in contrast with Daniel (1967), who compared individual houses with confinement, and Purdue University (1967), who compared a conventional system, pole barn in winter and pasture in summer with partial or total slats for growing-finishing hogs.

In the actual feeding of the hogs, it required more time to feed the sows and pigs in the field. However, the largest amount of labor was involved in the daily cleaning of the farrowing barn.

On many occasions the manure behind the sow did not work its way through the slats which then had to be manually removed. It was observed that the baby pigs did not start rooting the sow's manure until the pigs were at least three and sometimes four weeks of age. Also, on very few occasions was it noticed that the baby pigs rooted their own feces through the slats. Very often the pigs dunged in the front corners on the solid concrete portion and in the corners on the rear of the pen, which added further labor in the removal of manure. A few construction changes, such as widening the openings in the slats on the pigs' side and lowering the front and end partitions to the floor, would probably reduce some of the labor.

VII. EFFECT OF ALLOTTED SPACE ON GROWTH

One-half acre lots were used on the pasture treatment, which is sufficient as reported by workers at Purdue University (1967).

The confinement pens had a total of 42 square feet minus a small amount for the waterer, feed trough, and creep feeder, which was still above the 35 square feet requirement for a sow and litter reported by Hazen and Mangold (1960).

When the pigs were moved to the pole type feeding barn, they had an average of about 12 square feet per pig for an 8.5 average litter, which was in excess of the requirements reported by Hazen and Mangold (1960) of 4 square feet for 10 to 40 pound pigs and 5 square feet for 40 to 80 pound pigs, and Jensen (1973) who said pigs from 52 to 100 pounds needed 5 square feet, but below recommendations by Heitman et al. (1961), who stated that growing-finishing hogs grew faster with 20 square feet per pig.

VIII. A FEW OBSERVATIONS AND EXPLANATIONS

In taking an overall look at the two trials, there were contrasting differences. In Trial I there was no significant difference at all in the baby pig weights or gains, while in Trial II, many of the weights and gains were highly significant ($P < .001$) in favor of the pasture treatment.

What was observed was that the confinement sows converted their feed to backfat and not milk in Trial II. The reason for this is unexplainable. No concrete answer as to why, only a few theories can be

given. One possible source is that the pigs had the lowest, even though not significant, beginning two week weight. As reported by Weaver and Bogart (1943), Winters et al. (1947), and Forshaw et al. (1953), there is a direct correlation between increased birth weights and increased weaning weights. Possibly the pigs did not suckle enough milk the first few weeks and the sows partially dried up.

Consistently the pigs did not eat very much creep feed in the early weeks because they constantly dunged, stepped, and rooted manure in their creep feed which may have caused them to be slightly anemic from lack of iron. Perhaps the pigs did not drink enough water because the sows would take a bite of feed, get a drink of water, drop part of the feed in the water trough, and the water would sour. Then, too, the pigs may have gotten a good infestation of worms and E. coli from the manure in the pens. Furthermore, the gains of the pasture raised pigs in Trial I were suppressed because three of the litters were well below average as discussed earlier. Possibly a combination of all or none of the above factors caused the contrasting differences in the two trials.

CHAPTER V

ADDITIONAL PROFIT OR LOSS BY TAKING FEEDER PIGS TO INCREASED WEIGHTS

In 1974 the preliminary reports from organized Tennessee feeder pig sales showed that over 608,000 (Emmit Rawles, personal communication) pigs were sold with weights ranging from 20 to 100 pounds. According to Jim O'Neal (personal communication), thousands of feeder pigs that are sold each year at the extreme ends of the weight scale would have been more profitable if sold near a range of 40 to 55 pounds. For this reason, this chapter deals with determining the most profitable weight to market feeder pigs.

The feed efficiencies from eight to twelve weeks in Trials I and II (Figure 1) were combined, using a total of over 400 pigs, to give a more accurate estimate of the true feed efficiency. The feed efficiency was plotted on a linear regression against weight using a range of 35 to 70 pounds. On this particular group of pigs, as the weight increased 1 pound, the feed required to produce this pound of gain increased .026056 pounds, with a feed efficiency of 1.57 for a 35 pound pig to 2.48 pounds of feed per pound of gain for a 70 pound pig.

The actual feed prices paid by The University of Tennessee for each individual ingredient at the time the pigs were fed, May through October, 1974, are listed in Table 9. A grinding-mixing charge of $1.50 per 1,000 pounds was accessed. Labor was figured at $2.00 per hour with it taking approximately 30 minutes to grind and mix 1,000

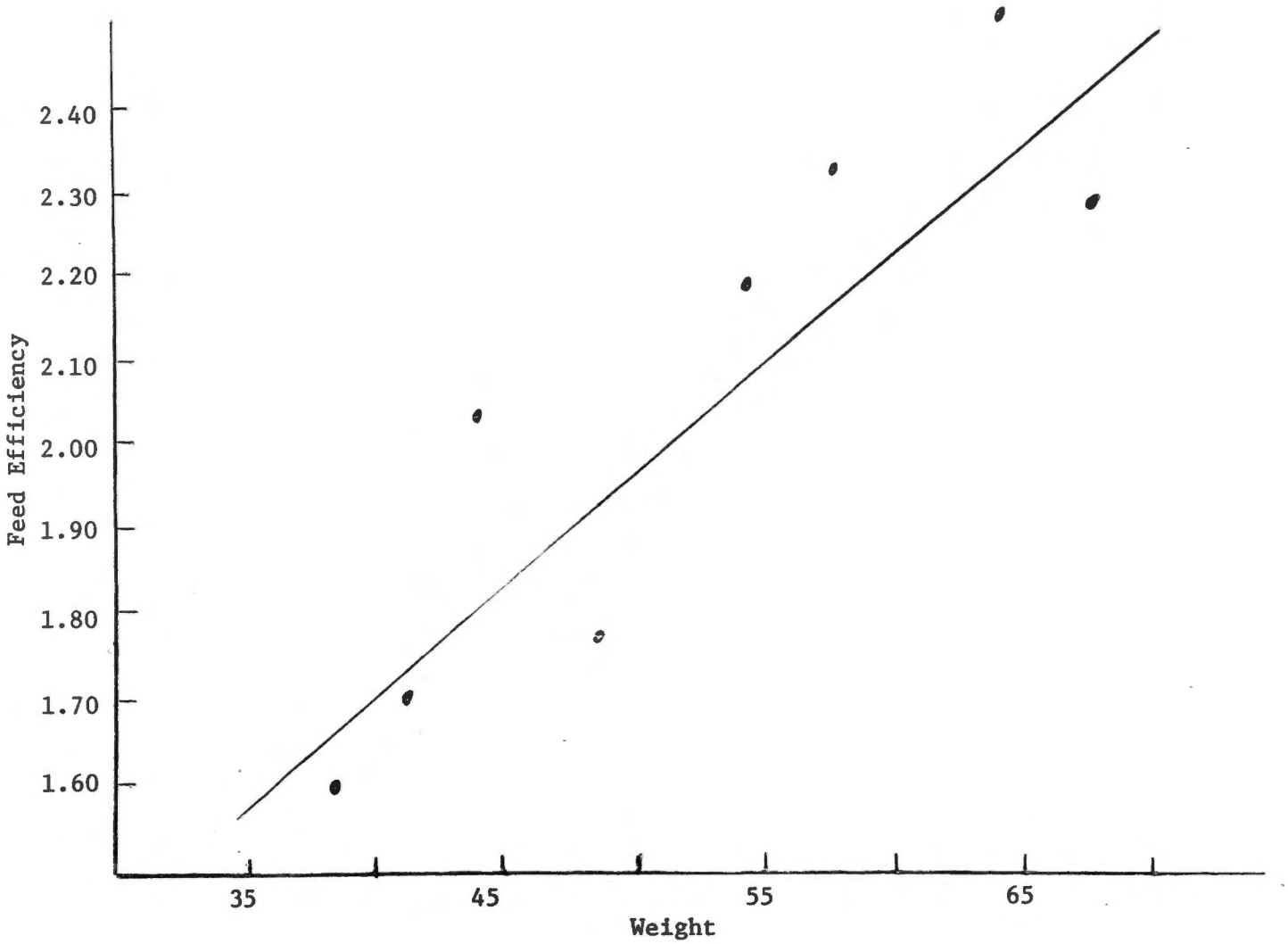

FIGURE 1. Feed efficiency by weight.

TABLE 9. Ration Costs.

Ingredient	Pounds	18 Percent Protein Ration Price Per Unit	Total Cost
No. 2 Yellow Corn	680	$ 3.51/bu	$42.62
SBOM	200	180.10/ton	18.00
Meat Scraps	50	212.50/ton	5.31
Dehy. Alf. Meal	50	124.00/ton	3.10
Dical. Phos.	10	174.00/ton	.87
Salt	5	44.00/ton	.11
Vitamin Premix	3.5	.285/lb	1.00
Trace Mineral Premix	.3	.20/lb	.06
Antibiotics			
Neomix 100	.5	306.00/100 lb	1.53
TM 50	.5	137.50/100 lb	.69
Grinding and Mixing		1.50/1000 lb	1.50
Labor		2.00/hr	1.00
Corn Storage		27.7¢/bu	3.36
TOTAL	1,000		$ 79.15
Cost per pound			.07915

pounds. A corn storage fee of 27.7 cents per bushel (Charles Farmer, personal communication) was charged based on buying corn every three months and storing in a 3,500 bushel steel bin. Total cost of the 18 percent protein ration was $79.15 per 1,000 pounds or 7.915 cents per pound.

Actual retail prices were obtained from Davidson County Farmer's Cooperative for an 18 percent protein ration from May through October. The average cost per ton delivered to the farm between this period was $103.93 per 1,000 pounds or 10.393 cents per pound.

By using both retail and wholesale feed prices, a farmer can get an idea of what it costs to take his feeder pigs to higher weights whether he mixes his own feed (Table 10) or buys complete feed (Table 11). Table 10 deals with determining which weight range would be most profitable using the feed costs from The University of Tennessee Blount Farm, while Table 11 uses the feed costs from Davidson County Farmers Cooperative. Both tables are figured the same way.

Feeder pig prices of docked, USDA number 1's and 2's were obtained from the Cookeville, Carthage, and Woodbury feeder pig sales at the time these pigs would have been sold, May through October. The weights were divided into five pound weight ranges. The total number of pigs, price per pound within each weight range, and total price per head from these three sales were averaged together and listed in columns B, D, and E of Tables 10 and 11, respectively.

Column C is an average weight within each weight range. Column F is the difference in total price received per pig at the price per pound and weight in columns C and D, respectively. The feed efficiency

TABLE 10. Additional Profit or Loss by Taking Feeder Pigs to Higher Weights Using On the Farm Grinding and Mixing[a]

Col. A Wt. Range	Col. B No. of Pigs in Wt. Range	Col. C Av. Weight	Col. D Av. Price Per Pound	Col. E Total Price Per Head[b]	Col. F Difference in Total Price	Col. G Feed Eff.	Col. H Additional Pounds of Feed[c]	Col. I Addi-tional Feed Cost[d]	Col. J Addi-tional Income[e]
31-35	5,477	33	.50	$16.50					
36-40	5,570	38	.4992	18.97	2.47	1.65	8.25	.65	+ $1.82
41-45	9,639	43	.4660	20.05	1.07	1.78	8.90	.70	+ .37
46-50	10,030	48	.4468	21.45	1.41	1.91	9.55	.76	+ .65
51-55	13,848	53	.4280	22.68	1.23	2.04	10.20	.81	+ .42
56-60	2,418	58	.4110	23.84	1.16	2.17	10.85	.86	+ .30
61-65	4.879	63	.3868	24.37	.53	2.30	11.50	.91	- .38
66-70	365	68	.3651	24.83	.46	2.43	12.15	.96	- .50
71-75	1,726	73	.3583	26.16	1.33	2.56	12.80	1.01	+ .32

[a]Cost based on the actual feed prices at The University of Tennessee Blount Farm.

[b]Column C x Column D.

[c]Column G x five pounds.

[d]Column H x 7.915 cents.

[e]Column F minus Column I.

TABLE 11. Additional Profit or Loss by Taking Feeder Pigs to Higher Weights Using Purchased Complete Feed.[a]

Col. A Wt. Range	Col. B No. of Pigs in Wt. Range	Col. C Av. Weight	Col. D Av. Price Per Pound	Col. E Total Price Per Head[b]	Col. F Difference in Total Price	Col. G Feed Eff.	Col. H Additional Pounds of Feed[c]	Col. I Additional Feed Cost[d]	Col. J Additional Income[e]
31-35	5,477	33	.5000	16.50					
36-40	5,570	38	.4992	18.97	2.47	1.65	8.25	.86	+ $1.61
41-45	9,639	43	.4660	20.05	1.07	1.78	8.90	.92	+ .15
46-50	10,030	48	.4468	21.45	1.41	1.91	9.55	.99	+ .42
51-55	13,848	53	.4280	22.68	1.23	2.04	10.20	1.06	+ .17
56-60	2,418	58	.4110	23.84	1.16	2.17	10.85	1.13	+ .03
61-65	4,879	63	.3868	24.37	.53	2.30	11.50	1.19	- .66
66-70	365	68	.3651	24.83	.46	2.43	12.15	1.26	- .80
71-75	1,726	73	.3583	26.16	1.33	2.56	12.80	1.33	± .00

[a]Cost based on the retail feed prices at the Davidson County Farmers Cooperative.

[b]Column C x Column D.

[c]Column G x five pounds.

[d]Column H x 10.393 cents.

[e]Column F minus Column I.

required to take a pig to an additional five pounds is listed in column G. Column H is the additional pounds of feed required to increase a pig's weight by five pounds, determined by multiplying five pounds by the feed efficiency within each range. The additional feed cost is listed in column I. This was determined by multiplying the additional pounds of feed in column H by 7.915 cents or 10.393 cents per pound in Tables 10 or 11, respectively. Column J is the additional income determined by subtracting column I from column F.

The most profitable weight range, whether retail or wholesale feed prices were used, is the 56-60 pound range. Thus, it is more profitable to feed a feeder pig to increased weights from weaning to a weight range of 56-60 pounds. However, since there was only an additional three cents profit in going from the 51-55 pound weight range to the 56-60 pound weight range using purchased complete feed, it would probably be more profitable to sell the pigs between 51 and 55 pounds thereby, preventing possible loss due to death or injury.

In figuring the additional profit by going to heavier weights in Tables 10 and 11, note that there is an additive effect. That is, an extra 30 cents (Table 10, page 41) additional income is realized by going from the 51-55 pound weight range to the 56-60 pound weight range. This means that a 56-60 pound pig is worth $3.56 ($1.82 + .37 + .65 + .42 + .30) more than a 31-35 pound pig.

Based on the weights in Trials I and II, if a feeder pig weighs 35 pounds at an eight week weaning, a farmer will need to feed his pigs an additional 2-1/2 to 3 weeks to reach the 56-60 pound range.

The price per pound in the 66-70 pound range is probably not representative of the true price because only 365 pigs were sold. This accounts for the additional profit of 32 cents in the 71-75 pound range above the 66-70 pound range in Table 10, page 41.

CHAPTER VI

SUMMARY

Data were collected on fifty-two sows and litters over a two trial farrowing period, April and July, 1974, at The University of Tennessee Agricultural Experiment Station, Knoxville, Tennessee, to determine the affect of pasture (fescue, bermuda grass and some ladino clover) versus confinement raising of baby pigs. These two systems were compared as they are actually used in the hog industry today.

At day 14, post farrowing, one half of the sows and litters were moved to the field on the pasture treatment and the sows and litters on the confinement treatment remained in the farrowing crates. The litters remained in their respective locations until the pigs were weaned at eight weeks of age at which time they were moved to a pole type feeding barn and fed until they reached twelve weeks of age.

In Trial I, April farrowing, there was no significant difference in average daily gain or weight at 8, 9, 10, 11 and 12 weeks of age. However, in each weighing period, the pasture raised pigs outgained and outweighed the confinement raised pigs. In Trial II, July farrowing, the pasture raised pigs significantly ($P < .001$) outweighed the confinement reared pigs at 8, 9, 10, 11 and 12 weeks and outgained them from 2 to 8 (.76 vs .54) and 2 to 12 weeks (1.01 vs .79). Within the individual weekly weighings from 8 to 12 weeks, the average daily gains between the two treatments became less significant with time from a

level of significance of $P < .01$ at 9 weeks to a level of non-significance at 12 weeks.

In a comparison of the sow and creep feed consumed per pig from two to eight weeks and feed required per pound of gain from eight to twelve weeks, there was no significant difference between either treatment in each trial.

In each trial, there was no significant difference in sow weight at eight weeks, post farrowing, or feed consumed per sow from two to eight weeks due to treatment. However, in Trial II, the sows on the confinement treatment significantly ($P < .05$) outgained the sows on pasture from two to eight weeks. There was a significant difference ($P < .001$) in feed consumed per sow in both trials due to litter size with the sows having larger litters consuming more feed.

The feed efficiencies from eight to twelve weeks of the baby pigs in this experiment were combined to determine the most profitable weight range for marketing feeder pigs. Actual wholesale and retail feed costs and feeder pig prices were obtained at the time these pigs would have been sold as feeder pigs. Based on the additional cost and income to carry a feeder pig to increased weights, it was determined that a 56-60 pound pig is the most profitable weight range to market.

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APPENDIX

TABLE 12. Individual Sow Weight, Average Daily Gain, Litter Size at Birth, and Feed Consumed, Trial I, Pasture Treatment.

Sow	Litter Size at Birth	Weight at 2 Weeks	Weight at 8 Weeks	ADG 2-8 Weeks	Feed from Farrowing to 14 Days	Feed from 15-56 Days	Feed from 57 Days to Weaning	Total Sow and Creep Feed Per Litter 2-8 Weeks
3-1	13	373	452	1.88	134	641	104	872
28-8	9	380	428	1.14	127	574	94	798
39-1	15	320	375	1.31	131	696	208	867
66-2	8	343	406	1.50	116	423	72	610
72-1	13	310	363	1.26	128	443	60	659
15-1	8	300	356	1.33	114	489	82	613
70-1	11	325	368	1.02	136	518	48	724
9-2	10	320	363	1.02	136	510	24	578
70-4	10	305	360	1.31	140	513	24	807
1-1	9	287	328	.98	110	470		548
8-4	10	301	330	.69	131	450		565
6-1	10	490	457	-.79	122	337		620
2-3	13	462	448	-.33	134	510		737

TABLE 13. Individual Sow Weight, Average Daily Gain, Litter Size at Birth, and Feed Consumed, Trial I, Confinement Treatment.

Sow	Litter Size at Birth	Weight at 2 Weeks	Weight at 8 Weeks	ADG 2-8 Weeks	Feed from Farrowing to 14 Days	Feed from 15-56 Days	Feed from 57 Days to Weaning	Total Sow and Creep Feed Per Litter 2-8 Weeks
17-2	11	346	423	1.83	120	594	98	739
5-4	13	450	474	.57	122	452		709
96-1	7	368	413	1.07	130	563	41	772
77-1	15	270	316	1.10	151	672	109	816
60-4	10	319	350	.74	120	426	70	540
81-3	10	293	275	-.43	144	467	90	663
17-3	7	495	462	-.79	139	485	80	714
5-1	11	320	350	.71	138	498	36	690
66-1	10	312	373	1.45	142	571	56	706
48-3	8	332	368	.86	107	339	24	468
15-4	6	325	366	.98	106	373		572
14-1	5	300	337	.88	101	255		309
4-2	10	338	351	.31	98	483		653

TABLE 14. Individual Sow Weight, Average Daily Gain, Litter Size at Birth, and Feed Consumed, Trial II, Pasture Treatment.

Sow	Litter Size at Birth	Weight at 2 Weeks	Weight at 8 Weeks	ADG 2-8 Weeks	Feed from Farrowing to 14 Days	Feed from 15-56 Days	Feed from 57 Days to Weaning	Total Sow and Creep Feed Per Litter 2-8 Weeks
43-2	10	450	484	.81	111	597	141	802
31-2	9	293	284	-.21	94	510	152	641
106-2	10	518	506	-.29	120	578	116	793
32-3	9	338	336	-.05	119	570	112	713
43-3	11	402	397	-.12	130	667	198	912
17-5	11	356	357	.02	124	623	176	784
102-1	10	394	373	-.50	132	667	180	861
42-3	13	404	393	-.26	148	739	144	902
52-2	3	442	441	-.02	105	510	84	749
106-1	12	479	496	.40	121	614	113	798
36-2	9	301	370	1.64	123	543		630
31-4	6	410	402	-.19	105	343	28	459
45-4	5	383	472	-.26	118	490		655

TABLE 15. Individual Sow Weight, Average Daily Gain, Litter Size at Birth, and Feed Consumed, Trial II, Confinement Treatment.

Sow	Litter Size at Birth	Weight at 2 Weeks	Weight at 8 Weeks	ADG 2-8 Weeks	Feed from Farrowing to 14 Days	Feed from 15-56 Days	Feed from 57 Days to Weaning	Total Sow and Creep Feed Per Litter 2-8 Weeks
47-3	9	440	444	.10	118	735	199	941
27-3	11	372	386	.33	121	649	128	765
28-2	11	328	352	.57	66	450	120	460
83-3	13	447	466	.45	129	548	132	640
46-2	11	375	494	2.83	129	552	156	662
107-4	14	453	505	1.24	132	625	119	777
39-2	13	509	549	1.00	146	697	182	848
35-2	12	362	396	.81	116	586	154	631
27-2	9	486	513	.64	131	597	112	805
28-1	9	301	467	3.95	98	395	54	477
32-2	6	338	335	-.07	121	598	112	660
22-1	10	365	366	.02	116	618	216	719
41-7	15	494	480	-.33	130	688	179	841

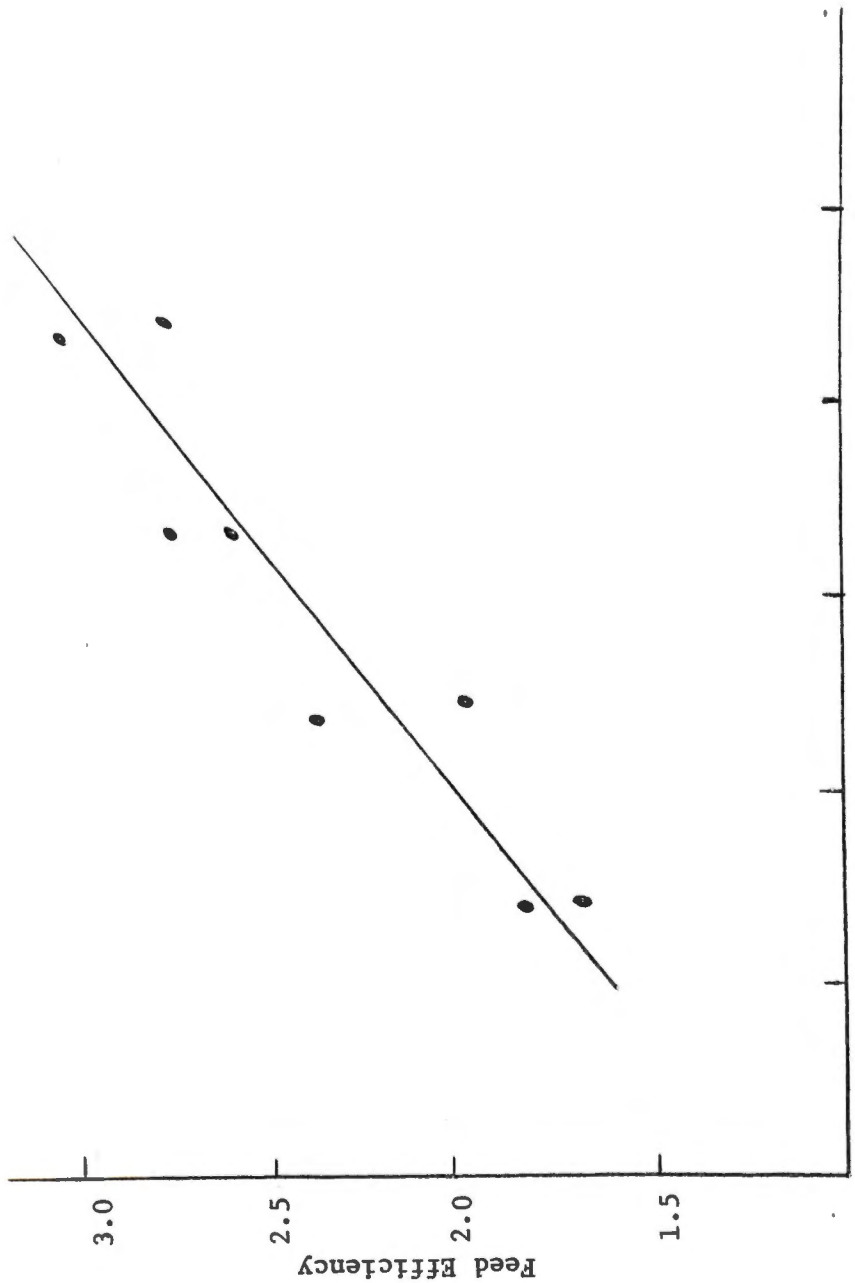

FIGURE 2. Feed efficiency by age.

VITA

William Dan Ligon was born in Nashville, Tennessee, on November 18, 1950, to Mr. and Mrs. Herschel C. Ligon. He attended Mt. Juliet Elementary School and graduated from Mt. Juliet High School, Mt. Juliet, Tennessee, in 1968. In September, 1968, he entered The University of Tennessee at Knoxville and received a Bachelor of Science degree in Animal Husbandry and Agricultural Education in 1973.

Upon graduation, he was commissioned a Second Lieutenant in the United States Army Reserves and completed his active duty for training in the Quartermaster Corps at Fort Lee, Virginia.

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