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To the Committee on Graduate Study:

I am submitting to you a thesis written by Alvin Carr Blake entitled "Possibilities of Expanding the Market for Cottonseed Feed Products in West Tennessee." I recommend that it be accepted for eighteen quarter hours of credit in partial fulfillment of the requirements for the degree of Master of Science, with a major in Agricultural Economics.

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POSSIBILITIES OF EXPANDING THE MARKET
FOR COTTONSEED FEED PRODUCTS
IN WEST TENNESSEE

A THESIS

Submitted to
The Committee on Graduate Study
of
The University of Tennessee
in
Partial Fulfillment of the Requirements
for the degree of
Master of Science

by

Alvin C. Blake

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TABLE OF CONTENTS

CHAPTER	PAGE
I. INTRODUCTION	1
Purpose of the study	2
Importance of the study.	3
Scope of the study	5
Method of procedure and source of data	6
Characteristics of farm operators.	8
Age.	8
Education.	9
Tenure	9
Experience in feeding cottonseed hulls and meal.	10
Characteristics of farms	11
Size of farm	11
Major land use	11
Sources of farm income	13
Kinds and classes of livestock on farms.	13
Beef cattle.	13
Dairy cattle	16
Hogs	16
Sheep.	16
Workstock.	17
Chickens	17

I. (continued)

Livestock marketed	17
Hogs	17
Beef cattle.	17
Sheep.	18
General information.	18

II. PURCHASING PRACTICES AND THE MARKET POSSIBILITIES FOR HULLS

AND MEAL	19
Sources of cottonseed feed products.	19
Volume of production	22
Extent of use.	23
Types and forms of products used	23
Commercial feeds containing cottonseed meal.	23
Buying practices	26
Size of purchase	26
Number of purchases.	28
Effect of size of purchase on marketing practices.	30
Price and related factors.	31
Relationship of source to price.	31
Size of purchase related to price.	33
Cottonseed hulls	33
Cottonseed meal.	35
Availability	35
Comparison of related factors.	37

II. (continued)

Purchasing practices in relation to expanding the

market for hulls and meal 40

III. MARKET POSSIBILITIES FOR COTTONSEED FEED PRODUCTS IN

DAIRYING. 42

Volume consumed by dairy cattle 42

Proportion consumed by dairy cattle 42

Amount fed per cow. 42

Season of feeding 45

Length of feeding period. 46

Proportion of dairy herds fed hulls and meal. 46

Proportion of dairy cattle fed hulls and meal 49

Number of dairy cows on farms 52

The average daily ration. 52

Roughages in the dairy ration 57

Seasonal factors. 57

Location as a factor. 59

Feeding of hulls related to use of pastures 59

Winter pasture. 59

Summer pasture. 61

Concentrates in the dairy ration. 65

Seasonal factors. 68

Feeding of meal related to use of pastures. 68

Winter pasture. 68

CHAPTER

PAGE

III. (continued)

Summer pasture. 70

Other considerations. 70

IV. MARKET POSSIBILITIES FOR COTTONSEED FEED PRODUCTS IN THE

BEEF CATTLE INDUSTRY. 74

Volume consumed by beef cattle. 74

Proportion of beef cattle fed hulls and meal. 76

Proportion of beef cattle producers feeding hulls and meal. 77

Number of beef cattle on farms. 77

The daily ration. 79

Beef cows 79

Other beef cattle 82

Beef cattle fattened. 83

Pasture feeding 83

Dry lot feeding 87

Length of feeding period. 88

Beef cows and other beef cattle 88

Beef cattle fattened. 90

Amount of hulls fed per head related to use of pastures . . 93

Beef cows. 93

Other beef cattle 93

Beef cattle fattened. 94

Amount of meal fed per head related to use of pastures. . . 96

Beef cows 96

CHAPTER

PAGE

IV. (continued)

Other beef cattle. 99

Beef cattle fattened 99

V. POSSIBILITIES OF INCREASING THE CONSUMPTION OF COTTONSEED

FEED PRODUCTS BY HOGS AND OTHER CLASSES OF LIVESTOCK . . 102

Volume consumed by hogs. 102

Farmers producing hogs 102

Proportion of farmers feeding meal to hogs 102

Proportion of hogs fed meal. 103

Number of hogs on farms. 103

The daily ration for fattened hogs 103

Ratio of meal to other protein supplements 105

Length of feeding period 109

Methods of feeding 111

Meal fed to brood sows 113

Other classes of livestock as market possibilities for
cottonseed feed products 114

VI. ATTITUDES AND OPINIONS OF FARMERS TOWARD COTTONSEED

FEED PRODUCTS. 116

Cottonseed hulls 116

Why farmers fed hulls. 116

Why more hulls were not fed. 118

Why less hulls were not fed. 118

How farmers evaluate hulls 120

How farmers compared hulls to oat straw. 120

CHAPTER

PAGE

VI. (continued)

Opinions of farmers on ill-effects to livestock	
caused by feeding hulls.	123
Sources of information used by farmers relative	
to the feeding of hulls.	123
Information desired by farmers on the feeding of hulls	127
Attitudes toward encouraging more feeding of hulls	
to livestock	127
Cottonseed meal.	130
Why farmers fed meal	130
Why more meal was not fed.	133
Why less meal was not fed.	135
Cottonseed meal compared to soybean meal	135
Ill-effects to livestock believed to result from	
feeding meal	137
Sources of information used by farmers on feeding meal	141
Kinds of information desired by farmers on the	
feeding of meal.	143
Attitudes toward encouraging more feeding of meal to	
livestock.	145
VII. SUMMARY.	148
Purchasing practices	148
Dairying	149
Beef cattle.	151
Hogs	153

CHAPTER	PAGE
VII. (continued)	
Attitudes and opinions of farmers.	154
Cottonseed hulls	154
Cottonseed meal.	155
BIBLIOGRAPHY	157
APPENDICES	160
A. Survey schedule.	161
B. Appendix tables.	165

LIST OF TABLES

TABLE	PAGE
I. Distribution by Years of Experience in Feeding Cottonseed Hulls and Meal, 290 Farmers, Five West Tennessee Counties, 1948-49	12
II. Percentage of Farmland in Each Major Land Use, 290 Farms Where Cottonseed Hulls and Meal are Fed, Five West Tennessee Counties, 1948-49	14
III. Chief Source of Farm Income, 290 Farms Where Cottonseed Hulls and Meal are Fed, Five West Tennessee Counties, 1948-49	15
IV. Sources of Cottonseed Feed Products, 290 Farmers, Five West Tennessee Counties, 1948-49.	20
V. Volume of Cottonseed Feed Products, by Sources, 290 Farms, Five West Tennessee Counties, 1948-49.	21
VI. Type and Form of Cottonseed Feed Products Used, 290 Farmers, Five West Tennessee Counties, 1948-49	24
VII. Percentage Distribution of Farmers Using Commercial Feeds Containing Cottonseed Meal, 104 Farmers, Five West Tennessee Counties, 1948-49	25
VIII. Size of Purchase Related to Number of Purchases Per Farmer Buying Hulls, 171 Farmers, Five West Tennessee Counties, 1948-49	27

TABLE

PAGE

IX.	Size of Purchase Related to Number of Purchases Per Farmer Buying Meal, 287 Farmers, Five West Tennessee Counties, 1948-49	29
X.	Source and Price of Cottonseed Hulls and Meal, 290 Farmers, Five West Tennessee Counties, 1948-49.	32
XI.	Size of Purchase to Average Price Per Ton of Cottonseed Hulls, 171 Farmers, Five West Tennessee Counties, 1948-49	34
XII.	Size of Purchase Related to Average Price Per Ton of Cottonseed Meal, 287 Farmers, Five West Tennessee Counties, 1948-49	36
XIII.	Percentage Distribution of Farmers to Whom Hulls and Meal Were Readily Available to Purchase, 290 Farmers, Five West Tennessee Counties, 1948-49	38
XIV.	Comparison of Potential Supply, Extent of Use, Distance Hauled, and Price of Cottonseed Hulls and Meal, 290 Farmers Using Cottonseed Feed Products, Five West Tennessee Counties, 1948-49	39
XV.	Amount of Cottonseed Feed Products Fed Per Cow Annually, 137 Dairy Herds, Five West Tennessee Counties, 1948-49	44
XVI.	Percentage Distribution of Farmers Feeding Hulls and Meal by Length of Feeding Period and Season of Feeding, 137 Dairy Farmers, Five West Tennessee Counties, 1948-49.	48

TABLE

PAGE

XVII.	Average Daily Ration of Roughages Fed to Milk Cows, 137 Dairy Herds, Five West Tennessee Counties, 1948-49. . .	54
XVIII.	Average Daily Ration of Concentrates Fed to Milk Cows, 137 Dairy Herds, Five West Tennessee Counties, 1948-49.	55
XIX.	Percent Hulls Were of Total Roughages Fed Related to Use of Winter Pastures, 137 Dairy Herds, Five West Tennessee Counties, 1948-49.	60
XX.	Average Pounds of Hulls Fed Per Cow Related to Kind of Pasture, 137 Dairy Herds, Five West Tennessee Counties, 1948-49	62
XXI.	Use of Roughages Related to Kind of Summer Pasture Used, 137 Dairy Herds, Five West Tennessee Counties, 1948-49.	64
XXII.	Percent Meal Was of Total Concentrates Fed Related to Use of Winter Pastures, 137 Dairy Herds, Five West Tennessee Counties, 1948-49	69
XXIII.	Average Pounds of Meal Fed Per Cow, Related to Kind of Pasture Used, 137 Dairy Herds, Five West Tennessee Counties, 1948-49	71
XXIV.	Percent That Cottonseed Meal Was of Total Concentrates Fed Related to Kind of Summer Pasture Used, 137 Dairy Herds, Five West Tennessee Counties, 1948-49.	72
XXV.	Average Amounts of Roughages and Concentrates Fed Daily as Supplementary Ration to Beef Cows, 76 Herds, Five West Tennessee Counties, 1948-49.	81

TABLE

PAGE

XXVI. Average Amounts of Roughages and Concentrates Fed Daily as Supplementary Ration to Calves, Heifers, and Steers, 47 Beef Cattle Herds, Five West Tennessee Counties, 1948-49.	84
XXVII. Average Amounts of Roughages and Concentrates Fed Daily to Beef Cattle Fattened on Pasture, 38 Herds, Five West Tennessee Counties, 1948-49	86
XXVIII. Average Amounts of Roughages and Concentrates Fed Daily to Fatten Beef Cattle on Dry Lot, 31 Herds, Five West Tennessee Counties, 1948-49.	89
XXIX. Length of Feeding Period for Hulls and Meal, 74 Herds of Beef Cows and 49 Herds of Other Beef Cattle, Five West Tennessee Counties, 1948-49	91
XXX. Length of Feeding Period for Fattened Beef Cattle, by Method of Fattening, 69 Herds, Five West Tennessee Counties, 1948-49.	92
XXXI. Amount of Hulls Fed per Animal Related to Use of Pastures, 74 Herds of Beef Cows and 49 Herds of Other Beef Cattle, Five West Tennessee Counties, 1948-49.	95
XXXII. Amount of Hulls Fed per Animal Related to Use of Pastures, 69 Beef Herds Fattened, Five West Tennessee Counties, 1948-49.	97
XXXIII. Amount of Meal Fed per Animal Related to Use of Pastures, 74 Herds of Beef Cows and 49 Herds of Other Beef Cattle, Five West Tennessee Counties, 1948-49.	98

TABLE

PAGE

XXXIV. Amount of Meal Fed per Animal Related to Use of Pastures, 69 Beef Herds Fattened, Five West Tennessee Counties, 1948-49.	100
XXXV. Average Daily Ration per Hog, 65 Herds of Fattened Hogs, Five West Tennessee Counties, 1948-49.	106
XXXVI. Ratio of Cottonseed Meal to Other Protein Supplements Fed to 65 Herds of Fattened Hogs, Five West Tennessee Counties, 1948-49.	108
XXXVII. Number of Days Fattened Hogs Were Fed Meal, 65 Herds of Hogs, Five West Tennessee Counties, 1948-49.	110
XXXVIII. Age at Which Pigs Were Started on Cottonseed Meal, 65 Herds of Hogs Fattened, Five West Tennessee Counties, 1948-49. .	112
XXXIX. Replies to the Question: "Why Do You Feed Cottonseed Hulls?", 171 Farmers Who Fed Hulls, Five West Tennessee Counties, 1948-49.	117
XL. Replies to the Question: "Why Do You Not Feed More (or Less) Cottonseed Hulls?", 171 Farmers Who Fed Hulls, Five West Tennessee Counties, 1948-49.	119
XLI. Replies to the Question: "To What Other Feeds are Hulls Equivalent?", 290 Farmers, Five West Tennessee Counties, 1948-49.	121
XLII. Replies to the Question: "How Do you Think Hulls Compare as a Roughage to Oat Straw?", 290 Farmers, Five West Tennessee Counties, 1948-49.	122

TABLE

XLIII. Harmful Effects Believed to be Caused by Feeding Cottonseed Hulls to Cattle, 20 Farmers, Five West Tennessee Counties, 1948-49.	125
XLIV. Sources of Information Used by Farmers Who Fed Cottonseed Hulls, 229 Farmers, Five West Tennessee Counties, 1948-49. .	126
XLV. Information Desired by 184 Farmers on the Use of Cottonseed Hulls as a Feed for Livestock, Five West Tennessee Counties, 1948-49.	128
XLVI. Replies to the Question: "Do You Think More Feeding of Hulls and Meal to Livestock Should Be Encouraged?", 290 Farmers, Five West Tennessee Counties, 1948-49.	129
XLVII. Reasons Why the Use of Cottonseed Hulls by Livestock Feeders Should Be Encouraged, 158 Farmers, Five West Tennessee Counties, 1948-49.	131
XLVIII. Reasons Why the Use of Cottonseed Hulls as a Feed for Livestock Should Not be Encouraged, 81 Farmers, Five West Tennessee Counties, 1948-49.	132
XLIX. Replies to the Question: "Why Do You Feed Cottonseed Meal?", 287 Farmers, Five West Tennessee Counties, 1948-49	134
L. Replies to the Question: "Why Do You Not Feed More (or Less) Cottonseed Meal?", 287 Farmers, Five West Tennessee Counties, 1948-49.	136

TABLE

PAGE

LI. Replies to the Question: "How Does Cottonseed Meal Compare to Soybean Meal as a Feed for Each Kind of Livestock You Raised:", 290 Farmers, Five West Tennessee Counties, 1948-49.	138
LII. Number of Farmers Reporting Harmful Effects That May Result to Livestock From Feeding Cottonseed Meal, by Class of Livestock Affected, Five West Tennessee Counties, 1948-49. .	139
LIII. Sources of Information Used on the Feeding of Cottonseed Meal, 287 Farmers, Five West Tennessee Counties, 1948-49	142
LIV. Information Desired by 271 Farmers on Cottonseed Meal as a Feed for Livestock, Five West Tennessee Counties, 1948-49. .	144
LV. Reasons Why the Use of Cottonseed Meal by Livestock Feeders Should Be Encouraged, 277 Farmers, Five West Tennessee Counties, 1948-49.	146
Appendix	
Table	
I. Age Distribution of 290 Farmers, Five West Tennessee Counties, 1948-49.	166
II. Distribution by Years of School Completed, 290 Farmers, Five West Tennessee Counties, 1948-49	167
III. Distribution by Tenure, 290 Farmers, Five West Tennessee Counties, 1948-49. , ,	168
IV. Size Distribution, by Acres, 290 Farms, Five West Tennessee Counties, 1948-49.	169

APPENDIX
TABLE

PAGE

V.	Kinds and Classes of Livestock on Farms, 290 Farms, Five West Tennessee Counties, 1948-49.	170
VI.	Livestock on Farms Where Cottonseed Feed Products Were Used, 290 Farms, Five West Tennessee Counties, 1948-49. .	171
VII.	Distribution of Farmers Marketing Livestock, by Kind of Livestock Marketed, 290 Farmers, Five West Tennessee Counties, 1948-49.	172
VIII.	Livestock Marketed from Farms Where Cottonseed Feed Products Were Used, 290 Farms, Five West Tennessee Counties, 1948-49	173
IX.	Disposition of Cottonseed Hulls Purchased by 171 Farmers, Five West Tennessee Counties, 1948-49	174
X.	Disposition of Cottonseed Meal Purchased by 287 Farmers, Five West Tennessee Counties, 1948-49	175
XI.	Kinds and Amounts of Roughages and Concentrates Fed to 137 Dairy Herds, Winter Feeding Period, Five West Tennessee Counties, 1948-49.	176
XII.	Kinds and Amounts of Roughages and Concentrates Fed to 137 Dairy Herds, Summer Feeding Period, Five West Tennessee Counties, 1948-49.	177
XIII.	Distribution of Livestock Fed Cottonseed Feed Products, by Counties, 290 Farms, Five West Tennessee Counties, 1948-49.	178

APPENDIX
TABLE

PAGE

XIV. Distribution of 137 Dairy Farmers Feeding Roughages on Summer Pasture, by Type of Pasture, Five West Tennessee Counties, 1948-49.	181
--	-----

LIST OF FIGURES

FIGURE	PAGE
1. Location of the Five West Tennessee Counties Studied, 1948-49.	7
2. Percent of Total Volume of Hulls and Meal Purchased and Fed to 137 Dairy Herds, Five West Tennessee Counties, 1948-49.	43
3. Percent of the Year That Hulls and Meal Were Fed, 137 Dairy Herds, Five West Tennessee Counties, 1948-49	47
4. Percent of Dairy Cattle Fed Cottonseed Feed Products, by Class of Dairy Cattle, Five West Tennessee Counties, 1948-49.	50
5. Percentage Distribution of Roughages Fed to 137 Dairy Herds, by Season of Feeding, Five West Tennessee Counties, 1948-49.	58
6. Percent of 137 Dairy Herds Fed Roughages on Summer Pasture, by Kind of Pasture, Five West Tennessee Counties, 1948-49.	63
7. Percentage Distribution of Concentrates Fed to 137 Dairy Herds, by Period of Feeding, Five West Tennessee Counties, 1948-49.	66
8. Percent of Hulls and Meal Purchased for Beef Cattle, 184 Beef Cattle Herds, Five West Tennessee Counties, 1948-49 .	75
9. Percentage of Beef Cattle Fed Cottonseed Feed Products, 184 Beef Cattle Herds, Five West Tennessee Counties, 1948-49.	78

FIGURE

PAGE

10. Percent of All Hogs Fattened That Were Fed Cottonseed

Meal, 199 Farms Producing Market Hogs, Five West

Tennessee Counties, 1948-49. 104

CHAPTER I

INTRODUCTION

This study is part of the Regional Project SM-1 Regional Marketing of Cotton (including cottonseed and cottonseed products) which is supported by funds appropriated under authorization of the Research and Marketing Act of 1946.

Preceding studies of cottonseed and cottonseed products have dealt with the various aspects of cottonseed marketing, prices, farm and gin disposition,¹ in the various processes and functions of cotton oil mills,² and the marketing of cottonseed feed products by oil mills, wholesalers, and retailers.³

This study is the fourth in a series on cottonseed marketing. It deals with costs and methods of procuring and handling cottonseed feed products, their use as a feed for livestock, and the attitudes of farmers toward their use. It must of necessity also include some of the technical aspects of feeding livestock, because feeding schedules for different classes and types of livestock must be used to determine rates of consumption.

¹E. L. Lebrun and M. L. Downen, Marketing Cottonseed in Tennessee, Knoxville, Tennessee: Agricultural Experiment Station, The University of Tennessee, Monograph No. 233, May 14, 1948.

²B. D. Raskopf, Marketing Practices, Facilities and Processes of Cotton Oil Mills in Tennessee and United States, Knoxville, Tennessee: Agricultural Experiment Station, The University of Tennessee, Monograph No. 247, August 15, 1949.

³B. D. Raskopf and F. R. Robertson, Marketing Cottonseed Feed Products in Tennessee, Knoxville, Tennessee: Agricultural Experiment Station, The University of Tennessee, Monograph No. 240, January 10, 1949.

Purpose of the Study

The objectives of this study were, (1) to determine the possibilities of expanding the market for cottonseed hulls and meal, (2) to determine improvements which might be made in the marketing of these products, (3) to provide a basis for the recommendation of improved feeding practices by livestock and dairy farmers, and (4) to determine the factors affecting the purchasing and feeding practices of livestock and dairy farmers.

The extent to which other roughages and concentrates affect the use of cottonseed feed products were carefully examined with the purpose of determining the future role of cottonseed hulls and meal in livestock and dairy feeding enterprises in the area included in this study.⁴ It is logical to assume that the extent to which any feed is used is to some degree determined by the kinds and amounts of all feeds available in relation to their price. The extent to which this generalization is true will be examined.

There are several possible means whereby the use of cottonseed feed products may be expanded. Among these possibilities are (1) to increase the rate of feeding per animal fed, (2) to increase the length of the feeding period per animal fed, (3) to feed hulls and meal to animals not fed (on farms where some animals are fed hulls and meal and on farms where none are fed hulls and meal), and (4) to increase the numbers of livestock on farms where these products are used. Data were

⁴Throughout this study, the terms "hulls" and "meal" refer to cottonseed hulls and cottonseed meal unless otherwise designated.

not obtained to fully determine all of the possibilities listed; however the rate of feeding, the length of the feeding period, and the proportion of livestock fed on farms where hulls and meal were fed was examined.

It is probable that the market for hulls and meal may also be expanded by (1) assuring farmers a constant supply when it is needed, (2) by offering economies in purchasing, and (3) by selling farmers on an economically sound feeding program.

Furthermore, the type-of-farming within the area of study, and the location of feeders in respect to the supply of cottonseed feed products may have a definite effect on the use of these products.

The effects of the various educational institutions, such as the Tennessee Agricultural Extension Service and Experiment Stations, the National Cottonseed Products Association, and similar agencies on practices relative to purchasing and feeding these feed products were examined.

Importance of the Study

Cotton is the most important cash crop grown in Tennessee, with a total revenue in recent years in excess of \$100 million. Cottonseed contributes from 15 to 18 percent of the total income from cotton.⁵

There are 13 cotton oil mills in the state, each crushing over

⁵Tennessee Department of Agriculture, Agricultural Trends in Tennessee, Nashville, Tennessee, December 1948, p. 14.

10,000 tons of cottonseed annually.⁶ While oil is the most valuable product of cottonseed crushing, cottonseed cake or meal and cottonseed hulls are important by-products. The principle utilization of these by-products is for livestock feeding.

Cottonseed meal has been an important high-protein content feed since before the Civil War. Its importance as a feed has increased, and today it is still the most important source of vegetable protein for livestock in the areas in which it is produced as well as for some other regions. The standard product has a minimum protein content of 41 percent and ranges up to 43 percent or higher. Sub-standard grades contain considerably less protein, but still are more valuable as a protein supplement than many other feeds on the market.

The principal competitor of cottonseed meal is soybean meal, which is produced largely in the North Central States. The soybean meal industry was developed in the later 1930's and today its production is from $1\frac{1}{2}$ to two times that of cottonseed meal.⁷ While the areas of production of these two sources of oil meal do not overlap to any considerable degree, there is considerable overlapping of their respective markets in some livestock producing regions. One important result of the development of the soybean oil industry is that it largely replaced cottonseed meal as a feed in the Corn Belt States. This restricted the

⁶Raskopf, op. cit., p. 4.

⁷Bureau of Agricultural Economics, Feed Statistics, United States Department of Agriculture, Washington, D. C.: December 1949, Statistical Bulletin No. 85, p. 60.

market outlets for cottonseed meal resulting in the need for the development of a new market for cottonseed hulls and meal.

Cottonseed hulls are another by-product of the cottonseed crushing industry that are used as a livestock feed. They are widely used in the cotton producing states chiefly as a roughage and filler for livestock. They have a protein content averaging 2.9 percent and are about equal in feeding value to average grade grass-hay. It is the general opinion of agricultural colleges and similar agencies that cottonseed hulls have a definite place in a livestock feeding program if used wisely.⁸

A study made by Raskopf of the Tennessee Agricultural Experiment Station showed that only 33 percent of the hulls in 1947 and 53 percent in 1948 were fed in the area of production of hulls. Also, in both 1947 and 1948 less than half of the total production of cottonseed meal was consumed in the Tennessee locality in which it was produced.⁹

Since many farmers who grow cotton in West Tennessee are also livestock and dairy farmers, they would be serving their best interest feeding as much of these cottonseed feed products they produce as is economically feasible.

Scope of the Study

This study is limited to the purchasing and feeding practices of

⁸F. B. Morrison, Feeds and Feeding, 21st Edition (Ithaca, New York: The Morrison Publishing Company, 1949), p. 361.

⁹Raskopf, op. cit., p. v.

farmers who fed cottonseed hulls and meal in its various forms to livestock.

The area studied is the geographical division of Tennessee, known as West Tennessee. This study indicates the purchasing and feeding practices of farmers in the area designated and is not claimed to be representative of such practices in other sections of the state or in other states. While cottonseed hulls and meal are used extensively in other areas, some of which may be similar to West Tennessee, regional variations in the agricultural economy should be taken into consideration if the information found in this study should be applied elsewhere.

Method of Procedure and Source of Data

Information on the purchasing and feeding practices of farmers feeding hulls and meal was obtained by personal interview. The counties of Obion, Dyer, Gibson, Madison, and Shelby were selected as the area for study (Figure 1). They were selected as representative of different types-of-farming areas in West Tennessee. Consideration was also given to the location of the cottonseed crushing industry in that region. Although there is no oil mill in Obion County, Dyer and Gibson Counties have one each, Madison has two, and seven are located at Memphis in Shelby County. One is also located in Lake County from which some hulls and meal were purchased by the farmers interviewed.

A random sampling method was used in selecting the farmers from which data were obtained. Only farmers in each of the selected counties who fed cottonseed hulls and (or) cottonseed meal to 10 or more cows or

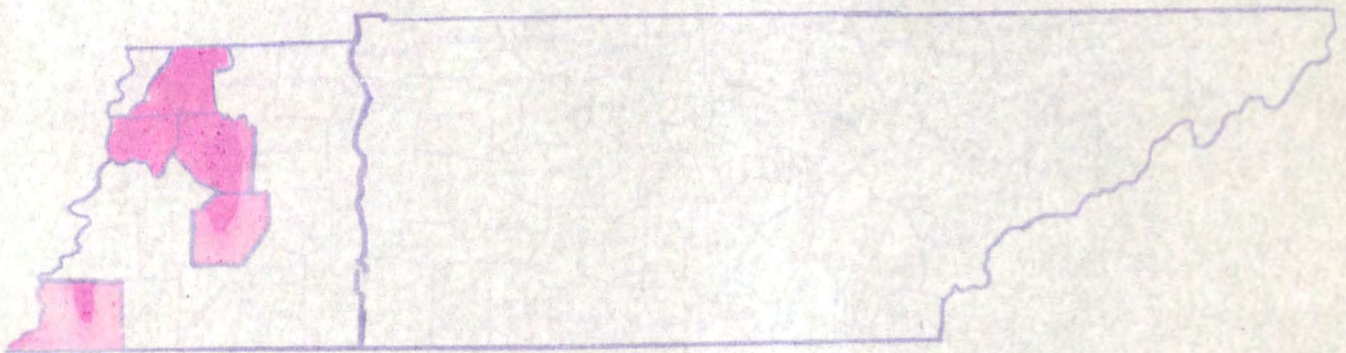


Figure 1

Location of the five West Tennessee Counties studied, 1948 - 49

their equivalent in animal units were included. This procedure eliminated those farmers who milked only two or three cows or fattened only a few hogs for home-use.

Sixty farmers in each of the counties selected furnished information, except in Shelby County where only 50 schedules were obtained because of the smaller number of livestock farms within the limitations specified. This included approximately 30 percent of the farmers in each county that kept the equivalent of 10 animal units. A comparison was made with 1945 census data and it was found that 2.2 percent of all farms were included in this sample.

Some use was made of secondary data, such as text-books, agricultural experiment station bulletins and publications, census data, and other government publications to provide background material and for comparison purposes.

Data were tabulated and classified on the basis of important factors related to purchasing and feeding practices. Suggestions were made for improving marketing practices by oil mill operators. Also, recommendations for improving purchasing practices by farmers were made. The possibility of increasing the consumption of hulls and meal by each class of livestock was the basis of this analysis.

Characteristics of Farm Operators

Age

The average age of all farmers included in this study was 48 years. There was little variation in the average ages of farmers in the five

counties. The largest percentage of younger farmers was in Obion and Dyer Counties, where thirty percent of the farmers were in the 35-44 age group. In this study Madison and Shelby Counties had the largest percentage of older farmers. The average ages of farmers was only one year above that of all farmers in the five counties (Table I, Appendix B).

Education

The farmers included in this study averaged completing two years of high school. This was unusually high for any farm group and compared favorably with most urban groups. The median years school completed by the total rural-farm population in these counties was slightly over seven years.¹⁰

Variation of the average years of formal schooling of the farmers among the five counties was very small, none of them deviating more than one year from the average. Shelby County had the largest percentage (10 percent) of college graduates, while five percent was the minimum of college graduates for any county. Only two persons reported having no formal schooling and only 5.5 percent attended school for less than five years. Over 25 percent had a high school education and 40 percent had 12 or more years of formal schooling (Table II, Appendix B).

Tenure

The farm operators in this survey were divided into four classes — landlords, owner-operators, tenants, and farm managers. The tenant class

¹⁰United States Department of Commerce, Bureau of the Census, Population, Volume II, Part 6, 1940, pp. 640-643.

included all types of tenants from sharecropper to cash renter. Owner-operators comprised the largest group, with 73 percent of the total. Tenants consisted of 19 percent of the total while managers and landlords together made up about eight percent (Table III, Appendix B). The percentage of owner-operators in this study was considerably higher than that for all farms.¹¹ Also, the percentage of farm managers in this group was above the average for all farms.

Experience in Feeding Cottonseed Hulls and Meal

Farmers who fed cottonseed feed products averaged about 15 years experience in feeding hulls, and 19 years experience in feeding meal. Forty-eight percent of the farmers had 20 or more years experience in feeding meal, and 35 percent had fed hulls for over 20 years. This indicates an extensive familiarity with the products with which this study is concerned. Less than one percent of the farmers interviewed had no experience in feeding meal. However, 21 percent had never used hulls (Table I).

Obion County presented the only important deviation in years experience with cottonseed feed products. Obion farmers had an average of only 9 years experience feeding hulls compared with a range of from 16 to 22 years for the other counties. These farmers also had about three years less experience in feeding meal than did the farmers in the

¹¹United States Census of Agriculture, 1945, Tennessee, Statistics for Counties, Volume I, Part 20, pp. 142-148.

other four counties (Table I),

This variation in experience in using cottonseed feed products is probably because Obion County is located farther from the point of production of hulls and meal than the other counties. Since there is no cotton oil mill in Obion County, cottonseed feed products must be obtained either from local retailers or from oil mills at Trenton, Tiptonville, Dyersburg, or Jackson. The latter include distances ranging from 20 to 50 miles.

Characteristics of Farms

Size of Farm

The average size of farm was 31½ acres, which was several times the average size of all farms in the five counties or in the state. This is not particularly significant however, as the method of sampling excluded the large number of small farms which go into census averages. It should also be kept in mind that livestock and dairy farming tends to require large acreages.

There was considerable variation in size of farm. Among the five counties, size ranged from 30 to over 10,000 acres. The average size of farms ranged from 472 acres in Dyer County to 193 acres in Gibson and Obion Counties (Table IV, Appendix B).

Major Land Use

Nearly 44 percent of the farm acreage in the five counties was in cropland and 43 percent in pasture (Table II). There were, however,

TABLE I

DISTRIBUTION BY YEARS OF EXPERIENCE IN FEEDING COTTONSEED HULLS AND MEAL
290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Years of Experience	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	Hulls	Meal	Hulls	Meal	Hulls	Meal	Hulls	Meal	Hulls	Meal	Hulls	Meal
	(Percent of Farmers)											
0	30.0	0.0	15.0	0.0	28.2	0.0	18.3	0.0	12.0	4.0	21.0	0.7
1 - 9	33.3	33.3	15.0	18.3	11.7	21.7	10.0	11.7	26.0	24.0	19.0	21.7
10 - 19	15.0	33.3	33.3	36.7	20.0	21.7	31.6	35.0	16.0	18.0	23.4	29.3
20 - 29	16.7	20.0	21.7	26.6	20.0	28.2	21.7	33.3	28.0	30.0	21.4	27.6
30 - 39	3.3	5.0	8.3	10.0	6.7	11.7	5.0	5.0	8.0	12.0	6.2	8.6
40 - 49	0.0	5.0	5.0	6.7	6.7	10.0	11.7	13.3	8.0	10.0	6.2	9.0
50 and Over	1.7	3.4	1.7	1.7	6.7	6.7	1.7	1.7	2.0	2.0	2.8	3.1
Total	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Average Years	9.0	16.1	15.7	18.4	16.1	21.7	16.4	20.3	16.8	19.4	14.8	19.2

considerable differences in acreages in cropland and pasture among the five counties. The farms in Gibson and Shelby Counties each had nearly 53 percent of the farmland in pasture and 40 percent in cropland. On the other hand, Madison County had 51 percent of the farmland in crops and only 32 percent in pasture. Obion County approximates the average for the five counties, while Dyer County had about 7 percent more land in crops than in pasture (Table II).

Sources of Farm Income

Dairying was the most important source of farm income on 35 percent of 290 farms using cottonseed meal and hulls (Table III). Cotton was a close second, with 33 percent of the farmers reporting it in first place. Beef cattle and hogs followed in that order. About three percent of the farmers reported miscellaneous items such as field crops, field seeds, and flowers as their most important source of farm income.

Dairying was of greatest importance in Shelby, Gibson, and Obion Counties. Cotton was rated most important in Madison and Dyer Counties, while in Obion County more farmers rated hogs in first place. Miscellaneous sources were also more important in Obion than in other counties.

Kinds and Classes of Livestock on Farms

Beef cattle. Beef cattle were reported on 184 of the 290 farms (Table V, Appendix B) and averaged 56 head per farm including all age classes (Table VI, Appendix B). More farmers reported cows than any other kind of beef cattle, although nearly as many farmers reported calves and two-year old steers.

TABLE II

PERCENTAGE OF FARMLAND IN EACH MAJOR LAND USE, 290 FARMS WHERE COTTONSEED
HULLS AND MEAL ARE FED, FIVE WEST TENNESSEE COUNTIES, 1948-49

Major Land Use	County					Total
	Obion	Dyer	Gibson	Madison	Shelby	
	(Percent of Total Acres)					
Cropland	45.1	45.2	36.9	50.7	36.9	43.7
Pasture	48.4	38.2	52.7	32.0	52.6	42.9
Woodland	6.5	16.6	10.4	17.3	10.5	13.4
Total	100.0	100.0	100.0	100.0	100.0	100.0

TABLE III

CHIEF SOURCE OF FARM INCOME, 290 FARMS WHERE COTTONSEED HULLS AND MEAL
ARE FED, FIVE WEST TENNESSEE COUNTIES, 1948-49

Source of Farm Income	County					Total
	Obion	Dyer	Gibson	Madison	Shelby	
	Percent of farms					
Dairying	38.2	11.7	46.7	26.7	54.0	34.8
Cotton	11.7	41.7	33.3	51.6	28.0	33.4
Beef Cattle	26.7	33.3	10.0	16.7	10.0	19.7
Hogs	16.7	13.3	8.3	1.7	4.0	9.0
Other ^a	6.7	0.0	1.7	3.3	4.0	3.1
Total	100.0	100.0	100.0	100.0	100.0	100.0

^aIncludes field crops, field seeds, flowers, truck crops, and walking horses.

Beef farming apparently followed a different production pattern in Obion and Dyer Counties than in the other counties. In Dyer County, 53 farmers had beef cattle, however only 26 reported cows and calves (Table V, Appendix B). The balance was made up of yearlings, two-year olds, and other classes. This was also true to a lesser degree in Obion County. In the other three counties nearly as many farmers had beef cows and calves as beef cattle of all age groups. This indicates that more farmers in Obion and Dyer Counties were only feeders of beef cattle, while more farmers in the other counties raised their own feeding stock.

Dairy cattle. Commercial dairy herds were an enterprise on 49 percent of the farms (Table V, Appendix B). Grade A milk was produced on 93 percent of these farms while the remainder produced milk for cream or cheese plants. Both the largest proportion of dairy herds and the largest average size herds were in Shelby County serving the Memphis market area (Table VI, Appendix B). Dairying was of least importance in Dyer County. The Yorkville area of Gibson County and the eastern section of Obion County produce Grade A milk for Secondary milksheds and for processing plants.

Hogs. Sixty-seven percent of the farmers reported brood sows and averaged five sows per farm. Obion County was highest with an average of 6.7 sows per farm, while Shelby County was lowest with only 2.4 sows per farm (Table VI, Appendix B).

Sheep. Only 26 farmers reported sheep. The flocks averaged 49 ewes which produced an average of 45 lambs for market. Ten of these flocks were in Obion County and averaged 60 ewes. Shelby County had only one flock. This was a purebred flock which produced no market

lambs (Tables V, VI, Appendix B).

Workstock. There was an average of 4.8 head of workstock on the 246 farms reporting horses and mules. Madison County ranked highest in number of farms with workstock and in number per farmer reporting. Obion County farms had only 2.5 head per farm (Tables V, VI, Appendix B).

Chickens. Ninety-six percent of the farms had chickens and averaged 110 chickens per flock (Tables V, VI, Appendix B). This comparatively high average was probably due to the fact that the farms were well above the average in size and many of them supported more than one family.

Livestock Marketed

Hogs. More farmers sold hogs than any other kind of livestock. Sixty-nine percent of the farmers marketed hogs (Table VII, Appendix B). An average of 91 hogs were marketed per farm producing hogs (Table VIII, Appendix B).

Obion County farmers were the most important producers of hogs. The 51 hog producers in Obion County marketed nearly 7,000 hogs or 38 percent of the hogs produced by the farmers in this study (Table VIII, Appendix B). The number of hogs marketed, the proportion of farmers reporting hogs, and the average number of hogs per farm steadily decreased southward from Obion to Shelby County.

Beef cattle. One hundred forty-nine farmers marketed an average of 41 head of beef cattle each. One hundred twenty-four of these farmers fattened their cattle on pasture while 35 fattened theirs on dry-lot.¹²

¹²The two numbers total over 149 because a few farmers fattened cattle on both pasture and dry-lot.

Dyer County farmers sold an average of 48 head for each of the 55 farmers who marketed beef cattle. Most of the cattle marketed were two-year old steers, although some of all age classes were fattened and sold. While dry lot feeders were fewer in number they fed almost twice as many head per farm as those fattening on pasture (Table VIII, Appendix B).

Sheep. Only 24 farmers reported fat lambs marketed. Nine of these were in Obion and the remainder distributed among Dyer, Gibson, and Madison Counties, (Table VII, Appendix B). The one flock in Shelby County was a purebred herd and the lambs were marketed as breeding stock.

General Information

The summarization of livestock on farms and livestock marketed revealed important variations among the counties studied. Dairying was shown to be very important in all counties except Dyer, however it was most predominant in Shelby County. Hogs were of greatest importance in Obion County and gradually decreased in importance southward from Obion County. Dyer County was the greatest producer of beef cattle, but beef was also of considerable importance in the other counties. Gibson and Madison Counties presented a fairly well balanced livestock production program combining dairying, beef cattle, and hogs. Sheep were of little importance.

CHAPTER II

PURCHASING PRACTICES AND THE MARKET POSSIBILITIES FOR HULLS AND MEAL

Analysis of purchasing practices by farmers using hulls and meal suggests that improvements in the marketing methods of these products would be to the mutual advantage of the cottonseed crushing industry and to livestock feeders. This analysis indicates also that the local consumption of hulls and meal could be increased by the adoption of suggested marketing and purchasing practices.

Sources of Cottonseed Feed Products

Most of the cottonseed hulls and meal were purchased directly from cotton oil mills by the various livestock feeders. About 92 percent of the farmers using hulls and 80 percent of the farmers using meal purchased directly from the oil mill (Table IV). The volume purchased at the mill-door amounted to an even greater proportion, 95 percent of the hulls and 91 percent of the meal being purchased in this manner (Table V).

Local oil mills (mills within the county) were the most important single source of supply for both hulls and meal purchased by farmers. The next most important source was from both local oil mills and from mills outside of the home county. Retailing agencies as a whole accounted for only a small volume of both kinds of products in areas where farmers lived relatively close to the oil mills.

Regional variations in both the number of farmers buying and the relative amounts bought from each source were evident. As mentioned previously, Obion County farmers either hauled hulls and meal a relative-

TABLE IV

SOURCES OF COTTONSEED FEED PRODUCTS, 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Sources of Cottonseed Feed Products	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Pct. No.	Pct. No.	Pct. No.	Pct. No.	Pct. No.	Pct. No.	Pct. No.	Pct. No.	Total
	Number and percent of farmers buying									
Cottonseed Hulls	0	0.0	27	81.8	16	53.3	35	85.4	39	95.2
Local oil mill	20	76.9	3	9.1	8	26.7	1	2.4	1	2.4
Other oil mills	0	0.0	1	3.0	5	16.7	1	2.4	0	0.0
Both local & other oil mills	6	23.1	2	6.1	1	3.3	4	9.8	1	2.4
Retailers & other agencies	26	100.0	33	100.0	30	100.0	41	100.0	41	100.0
Total	26	100.0	33	100.0	30	100.0	41	100.0	41	100.0
Cottonseed Meal	0	0.0	52	86.7	35	58.3	50	84.7	41	85.4
Local oil mill	26	93.3	3	5.0	10	16.7	1	1.7	1	2.1
Other oil mills	0	0.0	3	5.0	7	11.7	1	1.7	0	0.0
Both local & other oil mills	34	56.7	2	3.3	8	13.3	7	11.9	6	12.5
Retailers & other agencies	60	100.0	60	100.0	60	100.0	59	100.0	48	100.0
Total	60	100.0	60	100.0	60	100.0	59	100.0	48	100.0

TABLE V

VOLUME OF COTTONSEED FEED PRODUCTS PURCHASED, BY SOURCES,
290 FARMS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Sources of Cottonseed Feed Products	County																	
	Obion			Dyer			Gibson			Madison			Shelby			Total		
	Volume and percent of hulls or meal purchased																	
	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.		
Cottonseed Hulls																		
Local oil mills	*	*	540.6	86.0	161.4	31.0	858.8	84.5	1494.1	96.1	3049.9	72.8						
Other oil mills	362.5	76.0	33.1	5.2	147.5	28.3	25.0	2.5	53.1	3.4	621.2	14.8						
Both local & other oil mills	*	*	6.0	1.0	200.5	38.5	93.6	9.3	-	0.0	300.1	7.2						
Retailers & other agencies	114.5	24.0	49.0	7.8	11.2	2.2	37.8	3.7	7.2	0.5	219.7	5.2						
Total	477.0	100.0	628.7	100.0	520.6	100.0	1015.2	100.0	1549.4	100.0	4190.0	100.0						
Cottonseed Meal																		
Local oil mills	*	*	379.7	90.3	252.7	65.1	385.3	86.0	434.8	90.7	1452.5	70.8						
Other oil mills	185.3	59.7	9.3	2.3	62.8	16.7	8.0	1.8	5.4	1.1	270.8	13.5						
Both local & other oil mills	*	*	23.4	5.8	51.8	13.8	21.6	4.8	-	-	96.8	4.8						
Retailers & other agencies	125.0	40.3	6.5	1.6	16.7	4.4	33.1	7.4	38.3	8.2	219.6	10.9						
Total	310.3	100.0	418.9	100.0	384.0	100.0	448.0	100.0	478.5	100.0	2039.7	100.0						

* No local oil mill

ly long distance or bought from retail sources. The majority of Obion County farmers using hulls obtained them from oil mills, hauling them an average distance of over 25 miles. The relative volume of hulls obtained directly from oil mills is approximately the same as the percent of farmers buying. More Obion County farmers bought meal from retail sources than from oil mills but those who patronized oil mills accounted for 60 percent of the volume purchased.

The only important difference in sources of supply among the other counties studied occurs in Gibson County. This county is located between Dyer and Madison Counties, consequently Gibson County farmers have more alternative sources of hulls and meal. It was evident that the farmers from this county made use of this situation, in that nearly half of them patronized oil mills located in adjoining counties (Table IV).

Volume of Production

The production trend of cottonseed feed products in Tennessee has remained fairly stable in recent years. This is in contrast to a general decline in production as a whole. The average annual production of meal and cake in Tennessee averaged 151,077 tons for the period 1937 to 1947. The average annual production of hulls was 89,154 tons for the same period.¹

¹Bureau of the Census, Facts for Industry, Series M17-3-58, United States Department of Commerce, Washington, D. C., 1948.

Robertson's study² showed that approximately 10 percent of the annual production of meal and cake was sold locally. Also, over 10 percent of the meal produced was sold to ginners for local consumption. About 35 percent of the hulls were sold locally and nearly 30 percent were sold to ginners for the local trade. The above facts indicate that about 20 percent of the meal and nearly two-thirds of the hulls produced in Tennessee are consumed locally.

Extent of Use

Types and Forms of Products Used

Fifty-nine percent of the farmers interviewed used cottonseed hulls in various amounts during the year. The percent of farmers using hulls tended to follow a definite pattern, showing a steady increase moving southward from Obion to Shelby County (Table XIV).

All but three of the 290 farmers used cottonseed meal. Over 85 percent of the farmers feeding meal used it in the ground form; the remainder used various forms of cottonseed cake or pellets. Most of the cake or pellets were used by beef cattle feeders, although some use of pellets was reported by hog feeders (Table VI).

Commercial Feeds Containing Cottonseed Meal

Many of the dairy farmers used commercial dairy feeds in addition to cottonseed meal and other protein supplements. The cottonseed meal

²Fred R. Robertson, Jr., Marketing of Cottonseed Feed Products in Tennessee, unpublished thesis, Knoxville: The University of Tennessee, 1948, pp. 19-42.

TABLE VI

TYPE AND FORM OF COTTONSEED FEED PRODUCTS USED, 290 FARMERS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Type and Form of Cottonseed Feed Products Used	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
	Number and percent of farmers									
Cottonseed Hulls										
Farmers using	26	43.3	33	55.0	30	50.0	41	68.3	41	82.0
Farmers not using	34	56.7	27	45.0	30	50.0	19	31.7	9	18.0
Total	60	100.0	60	100.0	60	100.0	60	100.0	50	100.0
Cottonseed Meal										
Farmers using meal	54	90.0	41	68.4	57	95.0	50	83.3	46	92.0
Farmers using cake or pellets	6	10.0	19	31.6	3	5.0	9	15.0	2	4.0
Farmers using neither form	0	0.0	0	0.0	0	0.0	1	1.7	2	4.0
Total	60	100.0	60	100.0	60	100.0	60	100.0	50	100.0

TABLE VII

PERCENTAGE DISTRIBUTION OF FARMERS USING COMMERCIAL FEEDS CONTAINING
COTTONSEED MEAL, 104 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kind of Commercial Feed	County					Total
	Obion	Dyer	Gibson	Madison	Shelby	
	Percent of farmers					
11% dairy (calf & heifer)	0.0	0.0	0.0	0.0	6.1	1.9
16% dairy feed	59.3	33.3	31.6	45.5	21.2	38.5
18% dairy feed	14.8	33.3	15.8	31.8	60.6	33.7
20% dairy feed	3.7	0.0	15.8	13.6	9.1	9.6
24% dairy feed	0.0	0.0	10.5	0.0	0.0	1.9
32-34% dairy feed	14.8	33.4	5.3	0.0	0.0	5.8
40-45% hog feed	7.4	0.0	21.0	9.1	3.0	8.6
Total	100.0	100.0	100.0	100.0	100.0	100.0

content of these feeds was not available, as manufacturers were reluctant to disclose the formulae for their various feeds. It is generally known that cottonseed meal and soybean meal are used in varying proportion to supply most of the protein supplement in commercial feeds.

Dairy feeds fed were an 11 percent protein-feed for dairy heifers and from 16 to 34 percent protein-feeds for dairy cows. The 16 and 18 percent dairy feeds accounted for most of the commercial feeds used (Table VII).

Nine percent of the farmers fed commercial hog feeds with a protein content ranging from 40 to 45 percent. These feeds contained more soybean meal than cottonseed meal, but the exact proportions of these oil meals were not available.

Buying Practices

Size of Purchase

Farmers purchased both cottonseed hulls and meal in fairly large quantities. The median figure for hulls purchased was 3.5 tons and for meal was 1.0 ton. Thus the average purchase of cottonseed feed products amounts to approximately a truck load, if it is assumed that a 1-ton or larger sized truck was used.

Only a few farmers bought cottonseed hulls in lots of less than one ton. Approximately 85 percent of the farmers bought in lots varying from one to 10 tons (Table VIII). However, the 15 percent who bought in lots greater than 10 tons accounted for a relatively larger proportion of the hulls used. Some farmers purchased in lots of up to

TABLE VIII

SIZE OF PURCHASE RELATED TO NUMBER OF PURCHASES PER FARMER BUYING HULLS,
171 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Size of Purchase	County											
	Obion			Dyer			Gibson			Madison		
	Average number of purchases and percent of farmers purchasing			Average number of purchases and percent of farmers purchasing			Average number of purchases and percent of farmers purchasing			Average number of purchases and percent of farmers purchasing		
(Tons)	No.	Pct.		No.	Pct.		No.	Pct.		No.	Pct.	
1 - 1.9	5.8	15.4	-	-	0.0	10.2	36.7	21.3	31.7	9.0	9.8	14.6
2.0 - 3.9	5.4	19.2	4.1	42.4	7.4	36.7	36.7	9.6	34.2	10.8	31.7	7.7
4.0 - 9.9	4.4	54.0	2.1	30.3	3.8	13.3	13.3	5.4	34.1	8.0	34.1	5.2
10.0 and over	1.3	11.4	2.5	27.3	1.8	13.3	13.3	-	0.0	3.7	24.4	2.4
Total	4.4	100.0	3.2	100.0	7.2	100.0	11.8	100.0	100.0	7.8	100.0	7.3
Average size of purchase (tons)	6.3		8.3		4.2			3.1		9.5		6.3

50 tons.

Regional variations did not deviate much from the average sized purchase (Table VIII). However, farmers in Dyer and Shelby Counties tended to purchase hulls in larger quantities than farmers in the other three counties. This is because large numbers of beef cattle are produced in Dyer County, while commercial dairying is a major enterprise in Shelby County.

Farmers bought cottonseed meal in lots averaging about one ton; however, the size of purchases ranged from 100 pounds to 30 tons (Table IX). Almost all of the farmers who patronized retailers bought in small quantities, usually less than 1000 pounds. While some purchases of less than 1000 pounds were made at oil mills, the usual quantity bought was one ton or more in order to receive a price discount.

Obion County farmer purchases differed somewhat from the average size of purchase in that more farmers bought meal from retail sources. The most frequent size purchase was only 200 pounds. On the other hand, purchases tended to be considerably larger than average in Dyer County. Approximately 38 percent of the farmers bought over two tons at each purchase. The feeding of relatively large herds of beef cattle was the principal reason for this difference.

Number of Purchases

The number of purchases of both hulls and meal tended to be inversely related to the size of the purchases (Table VIII and IX). There were minor inconsistencies in this general relationship within individual counties, but the relationship was true for the area as a whole.

TABLE IX

SIZE OF PURCHASE RELATED TO NUMBER OF PURCHASES PER FARMER BUYING MEAL,
287 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Size of Purchase	County															
	Obion			Dyer			Gibson			Madison			Shelby			Total
	Average number of purchases and percent of farmers purchasing															
(Tons)	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
.1 or less	19.2	20.0	-	0.0	6.0	1.7	29.1	13.6	5.0	2.1	21.6	7.7				
.2	11.7	16.8	5.0	1.7	11.7	10.0	24.5	10.2	10.0	10.4	13.9	9.7				
.3 - .9	7.8	10.0	7.7	20.0	10.4	23.3	10.5	13.5	17.4	14.6	10.4	16.4				
1.0 - 1.9	3.8	20.0	4.6	40.0	6.7	53.3	8.1	44.1	8.9	43.7	6.7	40.1				
2.0 - 3.9	4.2	18.3	3.3	16.6	4.5	10.0	5.0	13.5	4.8	18.8	4.2	15.3				
4.0 and over	2.2	15.0	1.7	21.7	4.0	1.7	3.3	5.1	3.8	10.4	2.5	10.8				
Total	8.4	100.0	4.4	100.0	7.8	100.0	12.3	100.0	8.9	100.0	8.3	100.0				
Average size of purchase (tons)	1.6		2.6		1.0		1.1		1.5		1.6					

Farmers who bought hulls in lots of less than one ton made an average of 17 purchases in order to meet their feeding requirements. Farmers who bought in lots of 30 tons or more usually made only one or two purchases. The number of times farmers purchased hulls averaged about seven times per farmer per year for the 171 farmers feeding hulls.

Farmers bought cottonseed meal under the same general conditions as they did hulls, and the same relationship holds in regard to frequency and size of purchase. Farmers who bought 200 pounds or less of meal averaged nearly 22 purchases to supply their annual needs. Those who bought in lots of five tons or more made only two or three purchases. The average number of annual purchases for the 287 farmers using meal was slightly over eight.

Dyer County farmers made the smallest number of purchases, averaging only 4.4 per year for the 60 farmers in that county. The most frequent buying occurred in Madison County where farmers averaged 12.3 purchases to supply their annual needs.

Effect of Size of Purchase on Marketing Practices

A question of importance is whether economic advantages could be gained by oil millers or livestock feeders by moving hulls and meal on the market in relatively larger quantities. This could be effected by offering discounts in price for progressively larger lots.

Hulls especially are bulky and require considerable storage space. During the heavy milling season when much space must be used to store whole cottonseed, it may be to the miller's advantage to stimulate the movement of hulls by allowing discounts on quantity purchases,

especially if they move more slowly than normal.

Farmers could save by purchasing in larger quantities if they become more familiar with the price behavior of hulls and meal. Both the production and use of cottonseed feed products are seasonal in nature, and their use corresponds very closely to production.³ The prices of these products fluctuate considerably, and an adequately financed buyer could probably gain an advantage by opportune buying. Adequate storage space, financing, and proper market information are limiting factors determining whether buyers could gain by purchasing in large quantities.

Price and Related Factors

Relationship of Source to Price

It was found that in general cottonseed feed products bought at the mill-door cost less than those purchased from retail sources. This was true for both hulls and meal. There was some variation within individual counties, especially in Dyer County. However, there was such a small number of observations on retail buyers in this county that the results in this particular case were not conclusive.

Farmers who bought from home-county oil mills paid less for both hulls and meal. Farmers buying hulls solely from other oil mills paid slightly more than the price paid at local oil mills. The next highest

³Alton E. Bailey, Cottonseed and Cottonseed Products, New York: Interscience Publishers, Inc., 1948, p. 672.

TABLE X

SOURCE AND PRICE OF COTTONSEED HULLS AND MEAL, 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Sources of Cottonseed Feed Products	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	Hulls	Meal	Hulls	Meal	Hulls	Meal	Hulls	Meal	Hulls	Meal
	Dollars per ton									
Local oil mills	*	*	11.32	65.94	14.06	68.29	12.03	64.80	11.43	68.83
Other oil mills	13.35	74.00	9.75	64.33	13.12	67.70	12.00	68.00	7.00	67.00
Both local and other oil mills	*	*	10.00	63.00	13.00	69.57	16.00	70.00	-	-
Retailers and other agencies	16.17	77.94	10.00	64.00	16.00	73.38	12.75	60.14	18.00	69.50
Total	14.00	76.67	11.09	65.65	13.70	69.10	12.44	64.39	11.44	68.88

* No local oil mill

price was paid by farmers who patronized both local and other oil mills. The highest prices paid for both hulls and meal was paid by farmers buying from retail sources (Table X).

There was some regional variation in prices paid at the various sources of supply. One significant variation was noted in the price of cottonseed hulls at the local oil mill in Gibson County. The comparatively high price was probably due to an increased demand for hulls in that county during the summer months when the supply of hulls was relatively short. Gibson County dairymen fed more cottonseed hulls during the summer months than at any other time. This situation was not true in the other counties. Since dairying is of major importance in Gibson County, the demand for hulls probably reflected in the local price.

Size of Purchase Related to Price

Cottonseed Hulls. Generally, the more cottonseed hulls purchased at one time, the less they cost. This relationship was true for purchases of less than 15 tons. Beyond this point many inconsistencies occurred. There was some evidence of opportune buying by livestock feeders in lots greater than 15 tons. In all cases, the price per ton in lots of 5 tons or over was less than the average price paid for the area as a whole. Despite the fact that most of the purchases of less than one ton were made from retail outlets, the general downward trend of price as the amount purchased increased was evident (Table XI).

Livestock feeders would find it economical to purchase hulls in fairly large quantities, say five tons or more at one time. Since the average farmer who fed hulls usually bought over 24 tons per year, there

TABLE XI

SIZE OF PURCHASE RELATED TO AVERAGE PRICE PER TON OF COTTONSEED HULLS,
171 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Size of Purchase	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.
Dollars per ton and percent of farmers buying												
(Tons)	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.
0.1 - 1.9	17.65	15.4	-	0.0	13.54	36.7	11.61	31.7	14.75	9.8	13.44	18.7
2.0 - 3.9	13.40	19.2	11.68	42.4	14.54	36.7	12.78	34.2	11.38	31.7	12.59	33.3
4.0 - 9.9	13.15	54.0	9.60	30.3	13.00	13.3	12.14	34.1	11.64	34.1	12.27	32.7
10.0 and over	14.50	11.4	11.17	27.3	12.51	13.3	-	0.0	9.95	24.4	11.20	15.3
Total	14.00	100.0	11.09	100.0	13.70	100.0	12.44	100.0	11.44	100.0	12.40	100.0

is ample justification for adopting such a practice.

Cottonseed Meal. The same general price relationship held true for meal as that for hulls. Farmers who bought meal in lots of less than one ton consistently paid more than those who bought in quantities of one ton or more. All but three percent of the farmers buying in lots of one ton or more paid less than the average price reported paid by the farmers using meal (Table XII).

There were many variations from this general relationship within the individual counties. In some cases farmers buying in large quantities paid well above the average price paid in their county. In others, farmers buying at retail paid substantially less than the average price. However, in an average situation the relationship held true.

Approximately two-thirds of the farmers using meal bought in lots of one ton or more. Over 25 percent bought in lots of two tons or more. Many farmers took advantage of savings enjoyed by purchasing in fairly large quantities. Since the usual farmer who fed meal bought about seven tons per year, this amount could be purchased at one time when the price was favorable, providing that meal was available at that time.

Availability

Approximately 82 percent of the farmers who bought hulls and 85 percent of the farmers who bought meal reported that they could purchase these products any time they desired. Several reported some difficulty in obtaining one or both of these products during World War II and immediately

TABLE XII

SIZE OF PURCHASE RELATED TO AVERAGE PRICE PER TON OF COTTONSEED MEAL,
287 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Size of Purchase	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.	Dol.	Pct.
(Tons)	Dollars per ton and percent of farmers buying											
.1 or less	77.08	20.0	-	0.0	75.00	1.7	61.88	13.6	64.00	2.1	70.86	7.7
.2	80.00	16.8	70.00	1.7	69.00	10.0	66.67	10.2	70.60	10.4	72.75	9.7
.3 - .9	80.00	10.0	69.83	20.0	70.86	23.3	61.38	13.5	72.43	14.6	70.38	16.4
1.0 - 1.9	76.58	20.0	69.96	40.0	68.09	53.3	67.92	44.1	66.38	43.7	68.18	40.1
2.0 - 3.9	74.27	18.2	64.40	16.6	66.83	10.0	63.25	13.5	71.67	18.8	68.48	15.3
4.0 and over	72.11	15.0	61.85	21.7	79.00	1.7	68.00	5.1	68.60	10.4	67.06	10.8
Total	76.67	100.0	65.65	100.0	69.10	100.0	64.39	100.0	68.88	100.0	68.92	100.0

afterward, but the general concensus was that they could be obtained at any time if the buyer was willing to pay the prevailing price (Table XIII).

Madison County was an exception to the above statements. Only 54 percent of the farmers reported that hulls were readily available to purchase and 55 percent that meal could be readily obtained. If Madison County was not considered, the degree of availability would be over 90 percent for hulls and about 93 percent for meal. One reason for this situation is that, despite the fact that there are two cotton oil mills in Madison County, they serve a wider area and a larger livestock population in relation to their total production than some of the other milling areas in this study. A more important reason is that the rate of feeding of cottonseed feed products to most classes of livestock was higher than in the other counties. Further, the average price of meal was also lower than in the other counties (Table XIV).

Comparison of Related Factors

The number of oil mills within an area apparently had a close relationship to the amount of hulls and meal fed by farmers. Supply was also directly related to the percent of farmers using hulls (Table XIV).

There was little variation in the amount of hulls used per farmer in Obion, Dyer, and Gibson Counties. They had virtually the same sources of supply, approximately the same percentage of the farmers fed hulls, and the average amount of hulls fed per farmer was about the same. The potential supply, as represented by the number of oil mills, increased

TABLE XIII

PERCENTAGE DISTRIBUTION OF FARMERS TO WHOM HULLS AND MEAL WERE READILY AVAILABLE
FOR PURCHASE, 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

County	Hulls				Meal							
	Available	Not Available	Don't Use	Available	Not Available	Don't Use	Available					
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.				
Number and percent of farmers*												
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.				
Obion	23	88.5	3	11.5	34	56.7	54	90.0	6	10.0	0	0.0
Dyer	30	90.9	3	9.1	27	45.0	56	93.3	4	6.7	0	0.0
Gibson	28	93.3	2	6.7	30	50.0	58	96.7	2	3.3	0	0.0
Madison	22	33.7	19	46.3	19	31.7	32	55.0	27	45.0	1	1.7
Shelby	37	90.2	4	9.8	9	18.0	46	95.8	2	4.2	2	4.0
Total	140	81.9	31	18.1	119	41.0	246	84.8	41	14.2	3	1.0

* Farmers using hulls or meal

TABLE XIV

COMPARISON OF POTENTIAL SUPPLY, EXTENT OF USE, DISTANCE HAULED, AND PRICE OF COTTONSEED HULLS AND MEAL, 290 FARMERS USING COTTONSEED FEED PRODUCTS, FIVE WEST TENNESSEE COUNTIES, 1948-49

County	Number of		Tons Used per Farmer		Percent of Farmers Using Hulls	Average Distance Hulls & Meal Were Hauled (Miles)	Average Price Paid per Ton (Dollars)	
	Local Oil Mills (In County)	Others Patronized	Hulls	Meal			Hulls	Meal
Obion	0	3	17.2	5.17	43.3	22.5	14.00	76.67
Gibson	1	2	17.4	6.27	50.0	10.6	13.70	69.10
Dyer	1	2	19.0	6.73	55.0	8.5	11.09	65.65
Madison	2	2	24.6	7.59	68.3	9.6	12.44	64.39
Shelby	6	1	37.5	9.76	82.0	12.2	11.44	68.88
Average	-	-	24.2	7.10	59.0	11.3	12.40	68.92

from Dyer to Madison to Shelby Counties, and the percent of farmers using hulls and the amount of hulls they fed increased accordingly (Table XIV).

Practically the same situation was true for meal as it was for hulls. While nearly all of the farmers fed meal, the average amount used per farmer tended to increase as the potential supply increased.

The distance to supply sources was a limiting factor to farmers using cottonseed hulls. While definite limits are difficult to define, there is a distance beyond which farmers apparently will not haul cottonseed hulls. Obion County farmers who used hulls hauled them about twice the average distance that farmers hauled hulls in the five counties. Many farmers in Obion County would have to haul hulls from 30 to 35 miles; consequently, fewer farmers used hulls in that county. A distance of from 15 to 25 miles seems to be the practical limit for the general widespread use of hulls, although individuals reported hauling them as far as 50 miles. However, most of these extreme cases were farmers who used hulls as an emergency feed.

Purchasing Practices in Relation to Expanding the Market for Hulls and Meal

What effect do purchasing practices have on expanding the market for hulls and meal? Several conclusions can be reached that have a direct or indirect effect upon the possibility of expanding the market for cottonseed feed products. The most significant factor is the potential supply of both hulls and meal. The evidence is conclusive that farmers tend to buy these products for feed in direct proportion to the potential amount

available to them. Both the proportion of farmers who used hulls and the amount they used increased as the potential supply increased. Also, the amount of meal fed by farmers tended to increase with the potential supply.

The factor of convenient availability should be considered jointly with potential supply. While no definite limits as to distance can be delineated, there is a point beyond which farmers will not go directly to oil mills to buy cottonseed feed products, especially hulls. The presence of a cotton oil mill within a farmer's home county seemed to have a strong influence upon the type and amount of protein supplement he fed. Also, the number of oil mills he has to purchase from has a definite bearing upon the amount of these products he uses.

A definite pricing policy for cottonseed feed products on which local buyers are well informed would be desirable. While no direct information was obtained on pricing policy or consumer preference as to size of purchase, the purchasing habits of these farmers indicate what they prefer to do. The evidence is that cottonseed feed products purchased in quantity are bought at a lower than average price. The majority of farmers followed this method of purchasing. Continuance of mill-door sales with discounts based on quantity would have a definite effect on expanding the market for cottonseed feed products.

CHAPTER III

MARKET POSSIBILITIES FOR COTTONSEED FEED

PRODUCTS IN DAIRYING

Volume Consumed by Dairy Cattle

Proportion Consumed by Dairy Cattle

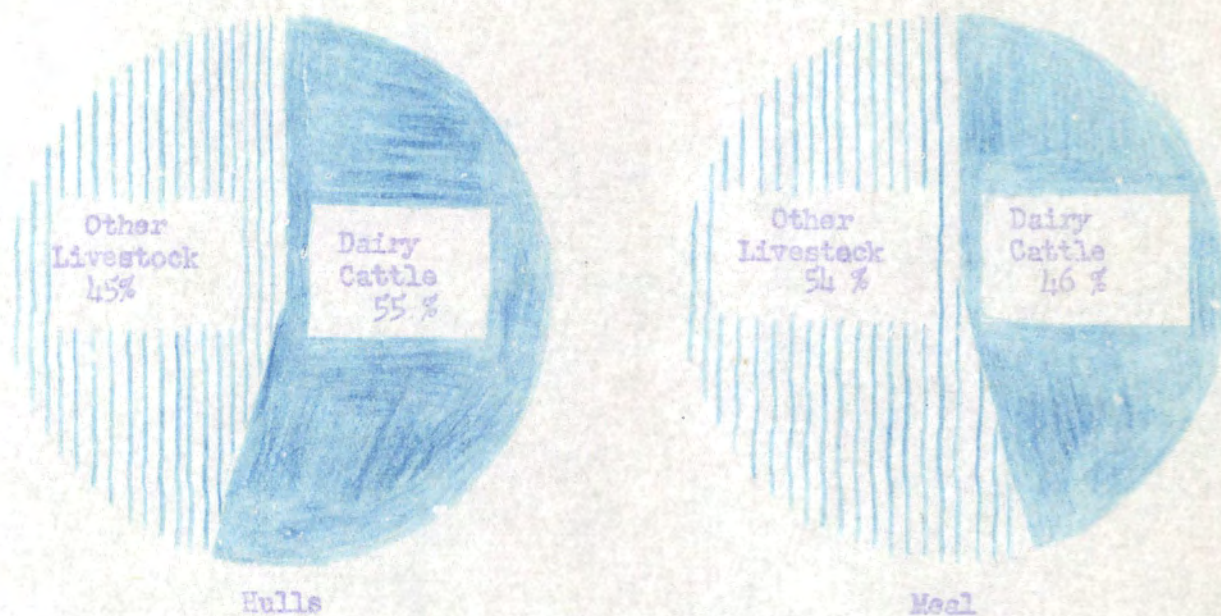
Dairy Cattle ranked as the most important consumers of hulls and meal, accounting for 55 percent of the hulls and 46 percent of the meal purchased (Figure 2). Practically all of this amount was fed to dairy cows in commercial dairy herds.

Dairy herds consumed much less hulls and meal in Obion and Dyer Counties than in the other three counties. The importance of beef cattle in these two counties helps to explain this difference. In Madison County, the proportion of hulls and meal consumed by dairy cattle was almost equal to the proportion consumed by beef cattle. Dairy cows consumed more of both products in Gibson County than did beef cattle. In Shelby County, 85 percent of the hulls and over 80 percent of the meal purchased was fed to dairy cows. The milk market in Memphis is an important factor accounting for the large proportion of dairy herds in this county.

Amount Fed per Cow

The average amount consumed per cow that was fed each product was 2060 pounds of hulls and 588 pounds of meal for the one-year period (Table XV).

The amount of hulls fed ranged from 220 pounds fed per cow in



Source: Tables IX and X, Appendix B

Figure 2

Percent of total volume of hulls and meal purchased and fed to dairy cattle, 137 dairy herds, five West Tennessee Counties, 1948 - 49

TABLE XV

AMOUNT OF COTTONSEED FEED PRODUCTS FED PER COW ANNUALLY,
137 DAIRY HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Item	County					Total
	Obion	Dyer	Gibson	Madison	Shelby	
Hulls						
Tons of hulls fed to dairy cows	70.6	71.5	350.3	455.8	1234.7	2182.9
Number of cows fed hulls	114	65	314	388	1232	2113
Pounds per cow fed hulls	1238	2200	2240	2340	2000	2060

Meal						
Tons of meal fed to dairy cows	77.7	54.5	198.5	220.9	368.4	920.0
Number of cows fed meal	448	180	574	529	1399	3130
Pounds per cow fed meal	346	604	692	836	526	588

one herd in Shelby County to 3700 pounds fed per cow in a herd in Madison County. Herds in Madison County also had the highest average amount fed. Herds in Obion County showed the lowest average.

The range in pounds fed per cow among herds fed meal was 95 pounds for one herd in Obion County to 1780 pounds for a herd in Madison County. Again, Madison and Obion Counties had the highest and lowest average amounts of meal fed per cow.

While Shelby County dairy herds were the most important consumers of hulls and meal, the average amounts fed annually per cow was almost equal to the average of the five counties for hulls, and somewhat below the average for meal.

Season of Feeding

About 80 percent of the hulls fed to dairy cows were fed during the winter season.¹ Also, about 60 percent of the meal fed to dairy cows was fed during the winter time (Tables IX and X, Appendix B).

While there was some variation in the amount of feeding each product in all of the counties, the only notable exception was in Gibson County where 40 percent of the hulls were fed in the winter, and 60 percent during the summer while the cows were on pasture. The most important factor affecting this variation was the relatively high amount of leguminous pasture in Gibson County. Hulls were frequently used to control bloat and scours induced by lush pastures. Also, less hulls

¹The winter and summer seasons are defined, for purposes of this study, by the length of time the ration fed during the periods indicated was in use, and the rate of feeding was the same. The two seasons or periods make up the whole year, but there is some overlapping in each case.

were used in winter because of the relatively high amounts of good quality hay produced in this county.

Length of Feeding Period

A possible means of increasing the consumption of hulls and meal by dairy cattle is to increase the length of the period during which these products are fed. Analysis of the data indicates that there is considerable room for the expanded use of these products on the farms where hulls and meal are used. Hulls were fed approximately one-third of the days they could have been fed, and meal was fed about three-fourths of the total possible days for the one-year period covered by the data (Figure 3).

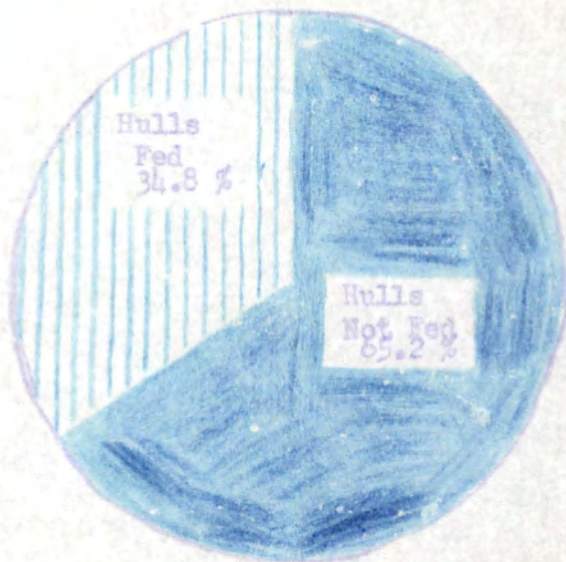
The amount and kinds of other feeds available are the chief limiting factors in the use of hulls and meal. Subsequent analysis gives some indication of the future possibilities of lengthening the feeding period of cottonseed feed products.

Proportion of Dairy Herds Fed Hulls and Meal

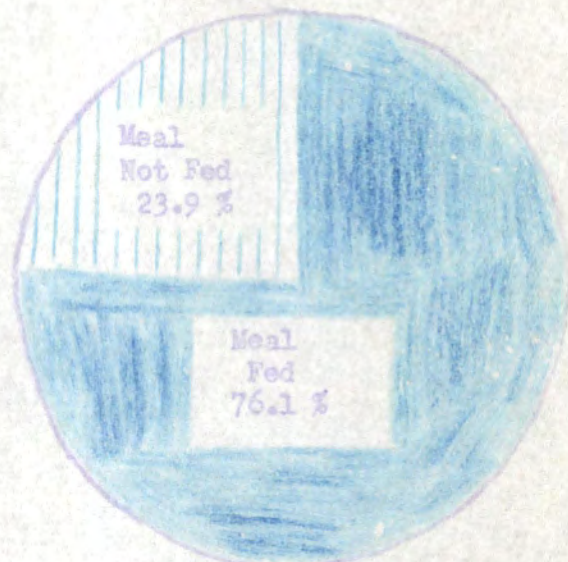
All but three of the 137 dairy herds in this survey were fed meal at some time during the year, while 83 herds were fed hulls at some time during the year. Thirty-nine percent of the dairy herds were not fed hulls at any time (Table XVI).

Over 19 percent of the dairy herds were fed hulls the year-round, 33 percent were fed hulls only during the winter months, and seven percent were fed hulls only during the summer (Table XVI).

Sixty percent of the herds were fed meal the year-round, 39 per-



Percent of year that
hulls were fed



Percent of year that
meal was fed

Source: Calculated from Table XVI.

Figure 3

Percent of the year that hulls and meal were fed, 137 dairy
herds, five West Tennessee Counties, 1948 - 49

TABLE XVI

PERCENTAGE DISTRIBUTION OF FARMERS FEEDING HULLS AND MEAL BY LENGTH OF FEEDING PERIOD AND SEASON OF FEEDING, 137 DAIRY FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Length of Feeding Period (Days)	Hulls		Meal	
	Number and Percent of Farmers Feeding		Number and Percent of Farmers Feeding	
	Number	Percent	Number	Percent
Winter feeding only				
Up to 90	9	10.8	3	2.2
91 - 120	9	10.8	5	3.7
121 - 150	6	7.2	14	10.5
151 - 180	17	20.2	23	17.2
181 - 300*	5	6.0	8	5.9
Total	46	55.0	53	39.5
Percent of Total Farmers	46	33.5	53	38.7
Summer feeding only				
Up to 90	2	2.4	-	-
91 - 120	-	-	1	0.8
121 - 150	1	1.2	-	-
151 - 180	6	7.2	-	-
181 - 300*	1	1.2	-	-
Total	10	12.0	1	0.8
Percent of total farmers	10	7.3	1	6.7
Year round feeding	27	33.0	80	59.6
Percent of total farmers	27	19.7	80	58.4
Total farmers feeding	83	60.6	134	97.8
Total farmers not feeding	54	39.4	3	2.2

*While these periods are longer than the season indicated, they show that the rate of feeding was unchanged for the length of the period.

cent were fed meal only during the winter months, and one herd was fed meal during the summer months only.

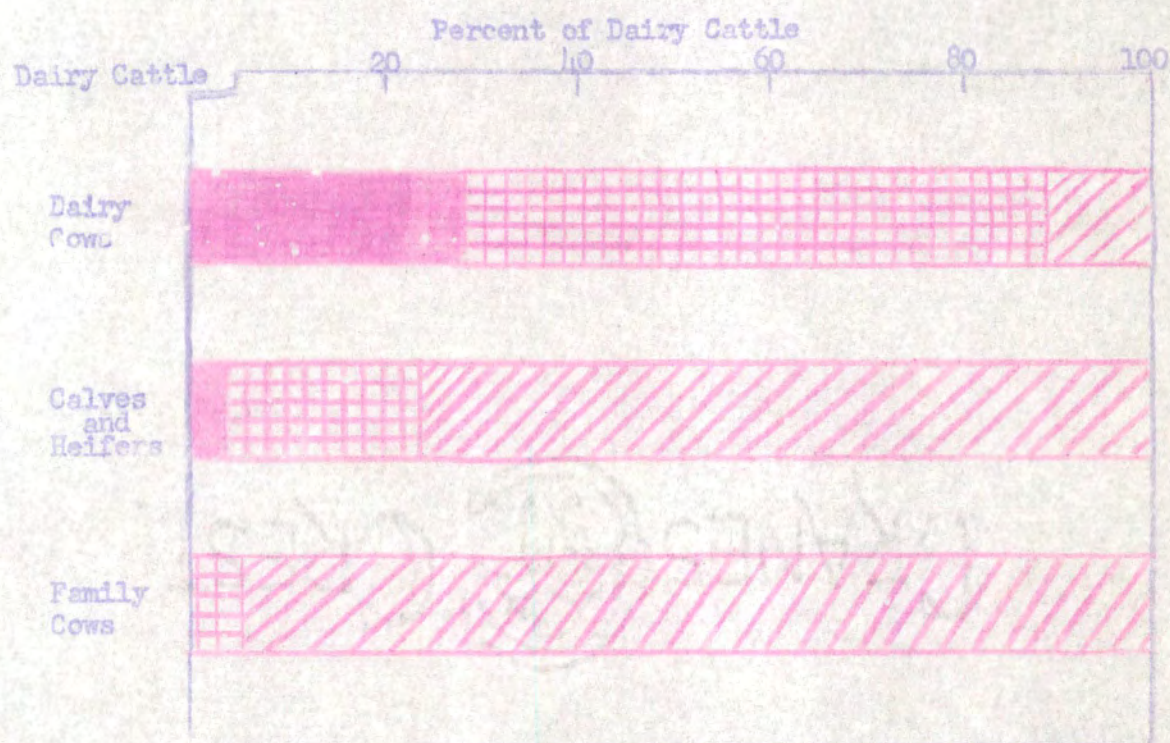
It was apparent that hulls and meal had a very wide degree of acceptance by dairy farmers. Hulls apparently had a rather unstable place in the feeding program, while meal was fed by most dairy farmers. The need for a high-protein concentrate, especially during the winter months when pasture is either short or not available, is clearly indicated. However, the quality of pasture during the summer months tends to determine whether or not meal is fed and also the proportion of meal in the total concentrate fed.

One question of importance is, what are the possibilities of increasing the proportion of dairy herds that are fed cottonseed feed products in the area studied and in similar areas? Nearly 75 percent of the dairy herds studied were fed no hulls at all during the summer months. Can at least part of this market be claimed for hulls? Also, nearly 40 percent of the dairy herds were fed no meal during the summer months. Does this situation offer a potential market that can be claimed? These possibilities are examined in this section of the study.

Proportion of Dairy Cattle Fed Hulls and Meal

Eleven percent of the dairy cows included in this study were fed neither hulls nor meal at any time. Further, 29 percent were fed meal but no hulls, making a total of 40 percent that were not fed hulls at any time (Figure 4).

The 11 percent of dairy cows that were not fed hulls or meal can



LEGEND:

- Fed Meal Only
- Fed Hulls and Meal
- Hulls or Meal Not Fed

Source: Table XIII, Appendix B.

Figure 1.

Percent of dairy cattle fed cottonseed feed products, by class of dairy cattle, five West Tennessee Counties, 1948 - 49

largely be accounted for by the fact that they were dry cows and were not fed the same ration as the cows being milked. Also, the three herds not fed meal account in part for this figure. Only 24 percent of the dairy calves and heifers reported were fed cottonseed feed products and only six percent of the cows, classified as family milk cows, were fed hulls and meal.

The increased use of hulls seems to offer greater possibilities on farms where cottonseed feed products are not used at the present time. The 39 percent of cows not fed hulls at any time offers a substantial potential market for hulls if the factors affecting the use of hulls are favorable on the farms where these cows are located.

The feeding of hulls and meal to dairy calves and heifers was indicated to offer considerable opportunity for expanding the market for hulls and meal in the dairy industry, if the proper conditions exist on the farms having this class of livestock. The use of protein concentrates for older calves and heifers is generally recommended by recognized authoritative agencies.

Cottonseed meal may be used satisfactorily in a concentrate mixture for calves, if the mixture does not contain more than about 20 percent of cottonseed meal and if the calves are supplied with good roughage, high in Vitamin A.² Cottonseed meal is a good supplement to use when there is plenty of well-cured legume or mixed hay in the ration. Heifers over 3 to 4 months of age may even be fed cottonseed meal as the only concentrate without injury, if roughage is fed which supplies plenty of vitamins and if there is ample calcium in the ration.³

²Morrison, op. cit., p. 599.

³Ibid., p. 613.

In addition to the above recommendations, practically every agricultural experiment station states that meal is a satisfactory feed for dairy calves and heifers. Since only 24 percent of this class of dairy cattle was fed meal, the possibility for increasing the feeding of meal to calves and heifers is evident.

Possibly the greatest potential market for hulls and meal in the dairy industry is those dairy herds that are not fed either hulls or meal. Field workers who collected the data for this study found that there were many dairy herds that were fed no cottonseed feed products. Unofficial estimates indicated that from one-third to two-thirds of the dairy herds in the five counties are possible markets for hulls and meal.

Number of Dairy Cows on Farms

To increase the number of dairy herds and dairy cows is another logical way to increase the potential market for hulls and meal. The supply and price of milk are important determining factors affecting the number of milk cows in production. The price of dairy feeds in relation to the price of milk is also an important factor to be considered.

The dairy industry in Tennessee has experienced rapid growth in recent years, and is still increasing. Trends and changes within the dairy industry are possible indicators of the potential market for hulls and meal.

The Average Daily Ration

The milk cows in this study were fed an average of 29.5 pounds of

roughages and 9.2 pounds of concentrates daily per cow during the winter feeding period. Rates of feeding during the summer months were not as great, with a consumption per cow of 12 pounds of roughages and seven pounds of concentrates daily (Tables XVII and XVIII).

Meal was fed at an average rate of two pounds daily per cow during the winter months and 1.7 pounds per cow per day during the summer months. The amount fed per dairy cow daily in the winter ranged from 1.6 pounds in Obion County, to 2.5 pounds in Dyer, Gibson and Madison Counties. During the summer months, the amount fed daily per cow ranged from one pound in Obion County to two pounds in Gibson and Madison Counties. The amount of meal fed per cow in any individual case ranged from one-half pound (fed on several farms in all counties) to six pounds in one or two cases.

Whether the amount of meal fed daily can be increased is a question of importance because annual volume is based on the average amount fed daily. Technically there are no practical limits upon the amount of meal which can be safely fed to a dairy cow under the proper conditions. Many agricultural colleges have conducted intensive experiments with the general findings that, with sufficient quantities of Vitamin A in the ration, up to 17 pounds of meal daily can be safely fed to a dairy cow. Over 10 pounds of meal has been fed daily per cow for up to three years with prairie hay as the only roughage and meal as the only concentrate.⁴

None of the dairymen approached the maximum amounts of meal that

⁴Morrison, op. cit. p. 531.

TABLE XVII

AVERAGE DAILY RATION OF ROUGHAGES FED TO MILK COWS,
137 DAIRY HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kinds of Roughages	County											
	Obion			Dyer			Gibson			Madison		
	Lbs.	Pct.	Lbs.	Lbs.	Pct.	Lbs.	Lbs.	Pct.	Lbs.	Lbs.	Pct.	Total
Average pounds and percent of roughages fed daily												
Winter												
Hulls	1.4	5.8	3.0	11.4		2.8	9.3		5.8	20.7	12.5	6.5
Legume Hay	11.5	47.4	11.8	45.3		13.4	44.7		10.6	37.8	10.2	10.9
Silage	9.9	40.9	11.3	43.3		10.7	35.8		10.4	37.0	11.1	10.3
Other	1.5	5.9	-	-		3.0	10.2		1.3	4.5	2.1	1.8
Total	24.3	100.0	26.1	100.0		29.9	100.0		28.1	100.0	35.9	29.5
Summer												
Hulls	1.0	15.4	4.5	42.0		4.6	32.4		5.7	45.7	3.2	4.3
Legume Hay	5.7	84.6	6.2	55.0		7.0	49.2		3.2	25.9	4.7	5.7
Silage	-	-	-	-		1.9	13.3		-	-	-	.7
Other	-	-	-	-		.8	5.1		3.6	28.4	.7	1.3
Total	6.7	100.0	10.7	100.0		14.3	100.0		12.5	100.0	8.6	12.0
												100.0

TABLE XVIII

AVERAGE DAILY CONCENTRATE RATION FED TO MILK COWS,
137 DAIRY HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kinds of Concentrates	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	Lbs.	Pct.	Lbs.	Pct.	Lbs.	Pct.	Lbs.	Pct.	Lbs.	Pct.	Lbs.	Pct.
Average pounds and percent of concentrates fed daily												
Winter												
C. S. meal	1.6	17.0	2.5	20.7	2.5	22.8	2.5	34.1	1.9	19.1	2.0	21.6
Corn	5.1	52.6	5.8	48.1	5.7	52.6	3.2	42.6	.2	1.8	2.3	25.5
Comm. mixed feed	1.9	20.4	1.3	10.7	1.3	12.0	1.3	17.2	6.7	68.6	3.9	42.1
Small grains	.6	6.6	1.8	10.5	.7	6.1	.2	2.2	.2	2.4	.4	4.0
Other	.3	3.4	.7	6.0	.7	6.5	.3	3.9	.8	8.1	.6	6.0
Total	9.5	100.0	12.1	100.0	10.9	100.0	7.4	100.0	9.8	100.0	9.2	100.0
Summer												
C. S. meal	1.0	14.8	1.9	16.1	2.0	32.0	2.0	31.4	1.5	20.0	1.7	24.3
Corn	4.5	65.6	5.3	44.9	3.0	49.2	3.0	46.9	.2	2.9	2.2	31.2
Comm. mixed feed	.3	4.4	1.1	9.7	.4	6.0	.9	14.8	3.4	45.9	1.7	24.0
Small grains	.6	9.1	2.4	20.1	.2	2.6	.2	2.8	.6	7.8	.5	6.9
Other	.4	6.1	1.1	9.2	.6	10.2	.3	4.1	1.7	23.4	.9	13.6
Total	6.8	100.0	11.8	100.0	6.2	100.0	6.4	100.0	7.4	100.0	7.0	100.0

can safely be fed per cow daily. Since corn and commercial mixed feeds were the other important components of the ration, it is reasonable to assume that a combination of these feeds (including meal) is the most economical ration that these farmers can use. Further, the price of commercial feeds versus the cost of producing home-grown feeds in relation to the returns from each, determines in the long-run which feeds will be used. If the relative price of meal should become cheap enough for it to be the only concentrate fed, it is theoretically possible for the rate of feeding meal to be increased approximately four and one-half times during the winter feeding period (based on an average of 9.2 pounds of concentrates fed daily). On the same assumption, the rate of feeding meal in the summer period could be increased about four times (with an average of seven pounds of concentrates fed daily).

The possibility of increasing the amount of hulls in the daily ration poses a different problem compared with that of meal. While many farmers fed hulls as the only roughage, this use as a roughage can be safely recommended only when some well-cured hay or good pasture is fed in addition. Hulls lack Vitamin A and are very low in calcium and phosphorous.⁵

All of the dairy herds had access to pasture during the summer months, but only half had access to some winter pasture. In all but 10 herds, other roughages were fed with hulls. Seven of these 10 herds were fed hulls as the only roughage on farms without winter pasture (Table XIX).

⁵Morrison, op. cit., p. 545

If economic factors were favorable, there seems to be no reason why the amount of hulls fed daily, could not be increased two to three times the amount now fed on 30 percent of farms that have winter pasture.

Roughages in the Dairy Ration

Cottonseed hulls, legume hay, and silage were the principal roughages fed to the 137 dairy herds. Grass hay, corn stover, and corn shucks constituted the remainder of roughages in the ration and amount to slightly more than five percent of the total roughages fed (Figure 5).

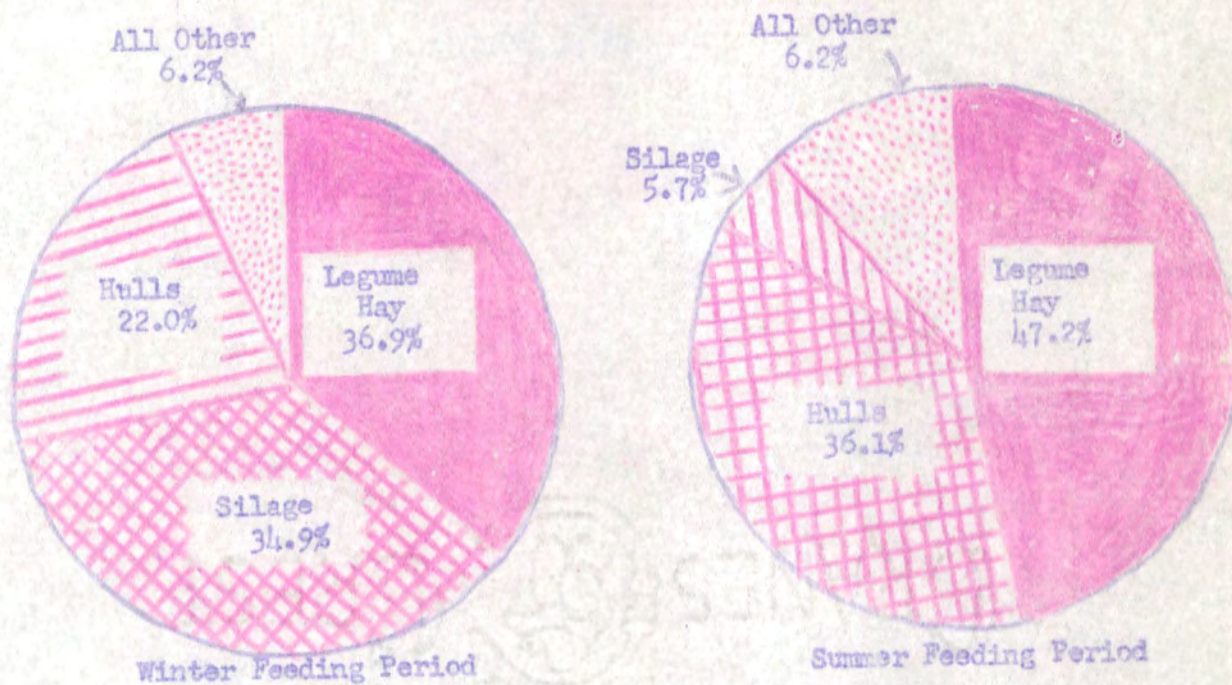
Legume hay and silage were considerably more important as a roughage in Obion, Dyer, and Gibson Counties, while hulls were more important in Madison and Shelby Counties. There was a general tendency for the proportion of hulls in the ration to increase in the heavier production areas of hulls. The amount of roughages which would be fed depends upon the available supply of all types of roughages which could be used in relation to the feed value and the price of each.

Seasonal Factors

Hulls accounted for 22 percent of all roughages fed during the winter season, and 36 percent during the summer (Figure 5).

While all herds were fed roughages during the winter season, only 63 herds were fed roughages during the summer, and only 37 of these were fed hulls. Also, 10 herds were fed hulls during the summer but not in the winter.

The kind and amount of pasture available undoubtedly was a determining factor as to whether or not roughages were fed during the



Source: Tables XI and XII, Appendix B.

Figure 5

Percentage distribution of roughages fed to 137 dairy herds, by season of feeding, five West Tennessee Counties, 1948 - 49

summer season, and also how much roughages were fed. The same condition also probably would affect the amount of roughages necessary in the winter ration.

Hulls formed a larger portion of the roughages fed during the summer months. Many of the farmers who fed hulls stated that the sole purpose for their use was as a carrier for meal or other concentrates. This fact would no doubt account for a considerable part of the hulls fed in both seasons, especially in the summer season.

Location as a Factor

Location in respect to supply had a pronounced effect on the volume of hulls consumed. When it is remembered that Madison and Shelby Counties are advantageously located with respect to the cotton-seed crushing industry, the high degree of importance of hulls in the dairy ration in these counties can be partly explained (Table XIV).

Feeding of Hulls Related to Use of Pastures

Winter Pasture

Approximately one-half of the 137 dairy herds had access to some kind of winter pasture, usually consisting of crimson clover, small grains or ryegrass, and fescue.

Herds without winter pasture were fed a somewhat higher proportion of hulls than the herds with winter pasture. Also, more herds were fed hulls where the winter pastures were not available (Table XIX).

The amount of hulls fed per cow for the entire feeding period on winter pasture was almost the same as that fed per cow without winter

TABLE XIX

PERCENT HULLS WERE OF TOTAL ROUGHAGES FED RELATED
TO USE OF WINTER PASTURES, 137 DAIRY HERDS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Percent Hulls Were of Total Roughages Fed	Winter Pasture		No Winter Pasture	
	Number and percent of dairy herds		Number and percent of dairy herds	
	Number	Percent	Number	Percent
Hulls not fed	35	51	28	41
1 - 19	5	8	6	9
20 - 39	11	16	10	14
40 - 59	10	15	15	22
60 - 79	3	4	3	4
80 - 99	1	2	0	0
100	3	4	7	10
Total	68	100	69	100

pasture (Table XX). There was little consistency in this relationship within the five counties. Some dairymen fed more hulls on winter pasture and others fed more without winter pasture. In many cases hulls were used to control the bloating and scouring effect of certain feeds, such as clover pastures, while in others they were used definitely to supplement a shortage of roughages. While the latter group tended to feed more hulls per cow daily, the former group fed hulls for longer periods. Regional variations in the use of winter pastures caused the amount fed per cow to approximately balance out.

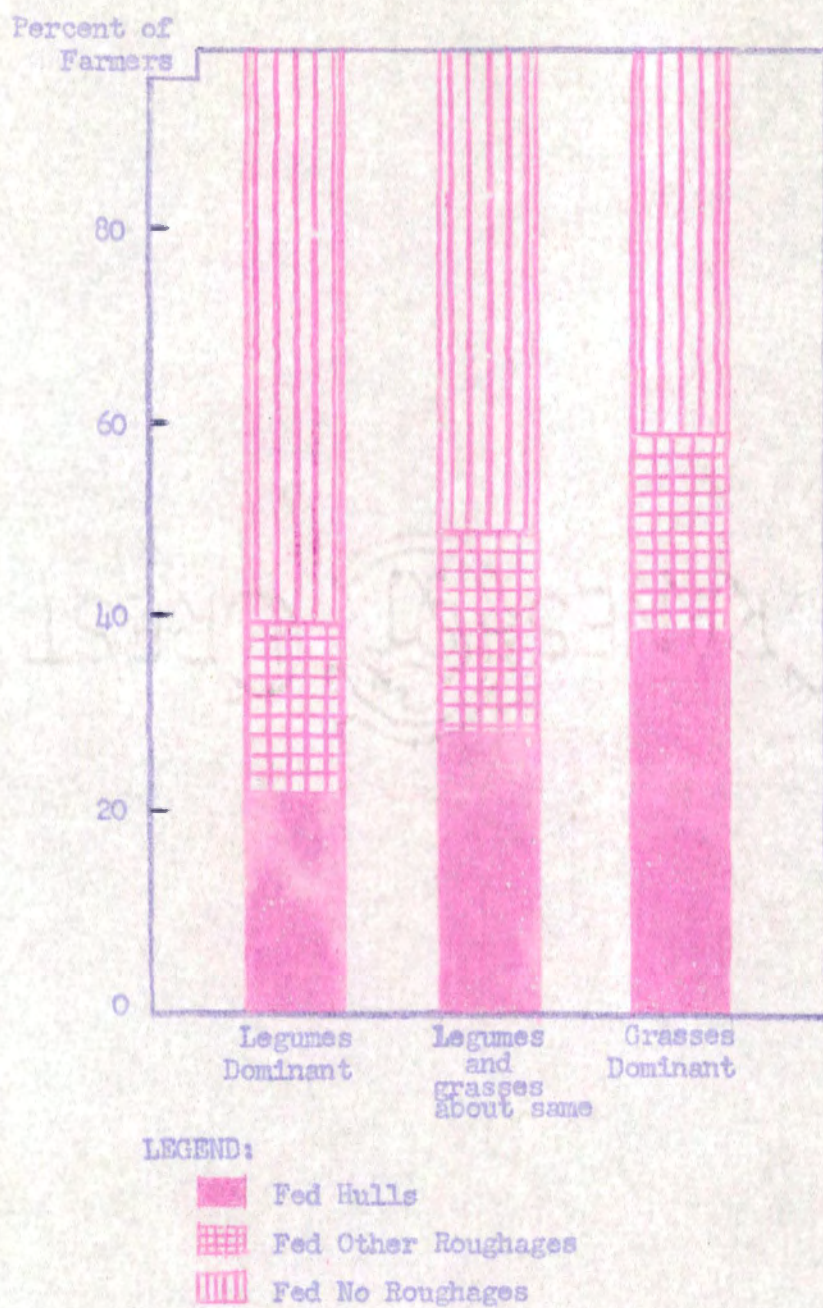
Summer Pasture

The proportion of herds fed hulls on summer pasture appeared to decrease as the proportion of legumes in the pasture increased. Fewer herds were fed hulls or other roughages on pastures with a high proportion of legumes. More herds were fed hulls and other roughages where the ratio of legumes and grasses in the pasture was about the same. On the 20 pastures where grasses were dominant, the proportion of herds fed roughages again tended to increase (Figure 6).

The kind of pasture did not appear to have any significant effect on the proportion of hulls in the roughages fed during the summer. In 27 of the 37 cases where hulls were fed, hulls were the only roughage fed and about the same proportion of hulls was fed on each kind of pasture (Table XXI).

Regional variations in the above situation were not strongly evident.

The amount of hulls fed per cow was definitely less where the



Source: Table XIV, Appendix B.

Figure 6

Percent of 137 dairy herds fed roughages on summer pasture, by kind of pasture, five West Tennessee Counties, 1948 - 49

TABLE XXI

USE OF ROUGHAGES RELATED TO KIND OF SUMMER PASTURE USED, 137 DAIRY HERDS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

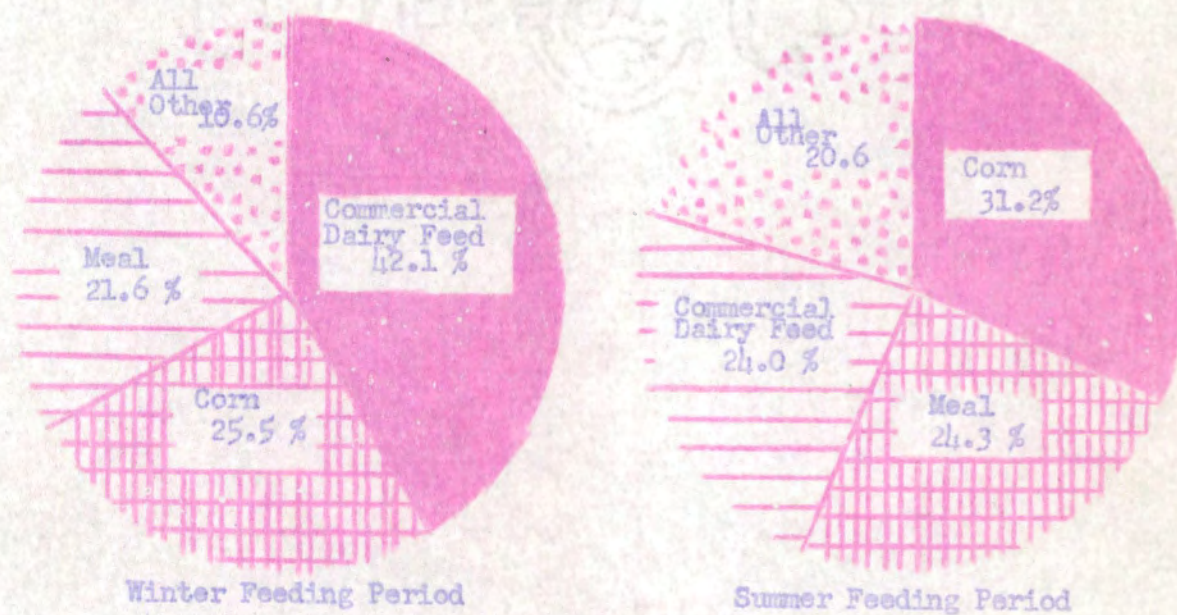
Item	Kind of Pasture					
	Legumes Dominant		Legumes and Grasses about Equal Proportions		Grasses Dominant	
	Number	Percent	Number	Percent	Number	Percent
Hulls not fed	61	77	27	71	12	60
Both hulls and other roughages fed	5	6	2	5	3	15
Hulls only roughage fed	13	17	9	24	5	25
Total	79	100	38	100	20	100

summer pasture consisted of legumes (Table XX). As in the case of winter pastures, the counteracting purposes of feeding probably affected the rate of feeding. Since hulls would be more likely to be fed on leguminous pasture to prevent bloat or scours, the rate of feeding would tend to be less than in cases where there was a definite need for roughages in the ration.

Concentrates in the Dairy Ration

Cottonseed meal, corn, and commercial mixed dairy feeds accounted for 89 percent of the concentrates fed to the 137 dairy herds during the winter feeding period, and for 79 percent of the concentrate fed during the summer (Figure 7). The remainder of the ration was made up of small grains, wheat bran, and miscellaneous protein feeds, such as soybean meal, linseed meal, and corn bran.

Cottonseed meal accounted for 22 percent of the total concentrates fed in the winter feeding period and for 24 percent during the summer months (Figure 7). There was considerable variation within the individual counties. Generally, the proportion of meal in the concentrate ration tended to increase southward from Obion County to Madison County. The proportion in Shelby County declined to only 19 percent. Examination of the facts revealed that, while in the other four counties substantial quantities of corn were fed, the amount of corn fed to dairy cows in Shelby County was negligible. This indicated that most of the concentrates fed to dairy cows in Shelby County must be obtained from commercial sources. The extensive use of commercial mixed dairy feeds was apparently



Source: Tables XI and XII, Appendix B.

Figure 7

Percentage distribution of concentrates fed to 137 dairy herds, by period of feeding, five West Tennessee Counties, 1948 - 49

more economical than the purchase of corn or other grains to be supplemented with cottonseed meal or other high-protein feeds.

Corn and small grains are important crops in the four northernmost counties in this study, but are of minor importance in Shelby County. A general review of the types-of-farming in the area shows the importance of various crops used for livestock feeds.⁸ The general situation in this area is one of general farming, livestock and dairy farming, and cotton farming. Cotton tends to be the most important crop in particular localities where it is adapted. However, livestock and general farming tend to be more important where grains and forage crops can be produced more economically than cotton or other cash crops. In Shelby County, dairying is one of the most important agricultural enterprises because of the major milk market at Memphis.

Since cotton is produced in all of the five counties and cotton oil mills are distributed throughout the area, cottonseed feed products may be considered to be home-produced products. It is reasonable to expect that in general most feeds can be obtained in their area of production in greater quantity and at lower cost than they would elsewhere. This should account in part for the relatively high rate of feeding of cottonseed meal.

Study of the relative importance of various concentrates fed to milk cows by states,⁹ showed that the consumption of any home-grown

⁸B. H. Luebke, et al, Types of Farming in Tennessee, The University of Tennessee, Agricultural Experiment Station, Knoxville, Tennessee, Bulletin No. 169, April 1939, pp. 43-60.

⁹Bureau of Agricultural Economics, Rations Fed to Milk Cows, 1949, U. S. Department of Agriculture, Washington, D. C., January 1950, p. 13.

feed, including cottonseed meal, is heaviest in its area of production. The study showed further that in feed deficit areas, such as the New England States, the use of commercial mixed dairy feeds tended to be more important. As in Shelby County, it is apparently more economical for farmers in feed deficit areas to use commercial mixed feeds than to grow or import grain and protein supplements and mix them at home.

Seasonal Factors

The percent of meal in the total concentrates fed averaged slightly more in summer than in winter (Figure 7). The fact that the dairy herds in Gibson and Shelby Counties were fed a higher proportion of meal in the summer accounted for the above situation, as the herds in the other three counties were fed proportionately less meal in the summer. Home-produced grains and commercial mixed dairy feeds were fed in about the same relative proportions in summer as in winter.

Fifty-eight herds were fed no meal during the summer season and 40 of these herds had dominantly leguminous pasture available (Table XXIV). Only one herd was fed meal in the summer but not in the winter season.

Feeding of Meal Related to Use of Pastures

Winter Pasture

Dairy farmers tended to feed meal at a higher rate to dairy herds without access to winter pasture. The proportion of meal in the concentrate ration was less for the cows with access to winter pasture. Also, all of the seven herds not fed meal during the winter months had access to winter pasture (Table XXII).

TABLE XXII

PERCENT MEAL WAS OF TOTAL CONCENTRATES FED RELATED TO USE OF WINTER PASTURES, 137 DAIRY HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Percent Cottonseed Meal was of Total Concentrates Fed	With Winter Pasture		Without Winter Pasture	
	Number and percent of farms			
	Number	Percent	Number	Percent
No meal fed	4	5.8	0	0.0
1 - 9	5	7.4	4	5.8
10 - 19	23	33.8	18	26.1
20 - 29	16	23.5	26	37.7
30 - 39	8	11.8	6	8.7
40 - 99	5	7.4	4	5.8
100	7	10.3	11	15.9
Total	68	100.0	69	100.0

The total amount of meal fed per cow during the winter feeding period was less for cows on winter pasture. This relationship was true in all of the counties. The protein content of the grasses and legumes used for winter pasture apparently replaced part of the cottonseed meal in the ration (Table XXIII).

Summer Pasture

The kind of pasture available to dairy cows during the summer feeding period affected both the amount of meal fed and whether any meal was fed (Table XXIV).

The proportion of meal in the concentrates fed tended to increase as the proportion of legumes in the pasture decreased. Since legumes are generally higher in protein than other pasture crops, the need for protein supplement would be less for cattle grazed on legume pastures. More herds were fed meal as the only concentrates on pastures that had either no legumes or only a small proportion of legumes.

Forty of the 58 herds that were fed no meal during the summer months had access to dominantly legume pasture. Also, nearly all of the other 17 herds that were not fed meal in the summer had access to pasture containing some legumes.

The total amount of meal fed per cow during the summer months was less where legume pastures were used. However, there were several exceptions within the five counties (Table XXIII).

Other Considerations

Careful examination was made of the possible effects of personal

TABLE XXIV

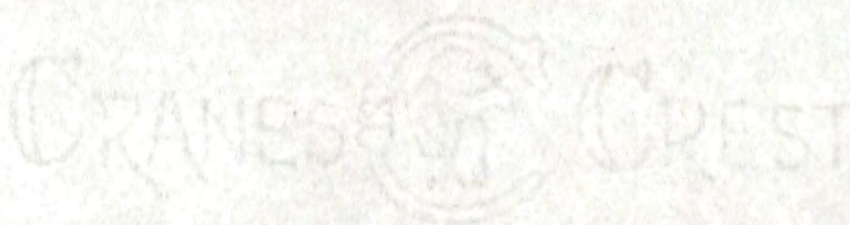
PERCENT THAT COTTONSEED MEAL WAS OF TOTAL CONCENTRATES FED RELATED TO KIND OF SUMMER PASTURE USED, 137 DAIRY HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Percent Cottonseed Meal was of Total Concentrates Fed	Legumes Dominant		Legumes and Grasses about Same Proportions		Grasses Dominant	
	Number and Percent of Farms		Number and Percent of Farms		Number and Percent of Farms	
	Number	Percent	Number	Percent	Number	Percent
Meal not fed	40	50.6	14	36.9	4	20.0
1 - 9	2	2.5	0	0.0	0	0.0
10 - 19	14	17.7	6	15.8	4	20.0
20 - 29	11	13.9	7	18.4	4	20.0
30 - 39	4	5.1	3	7.9	1	5.0
40 - 99	1	1.3	1	2.6	2	10.0
100	7	8.9	7	18.4	5	25.0
Total	79	100.0	38	100.0	20	100.0

characteristics of farm operators on their feeding practices. The results of these analyses indicate that age, tenure, education, and experience of the farmer in the use of hulls and meal had no significant effect on feeding practices.

These analyses support the hypothesis that economic factors, rather than the personal characteristics of the farm operator, determine the feeding practices that a particular farmer follows.

Sources of information used by farmers on the feeding of hulls and meal were also found to have no significant relationship to dairy farmer's feeding practices.



CHAPTER IV

MARKET POSSIBILITIES FOR COTTONSEED FEED PRODUCTS

IN THE BEEF CATTLE INDUSTRY

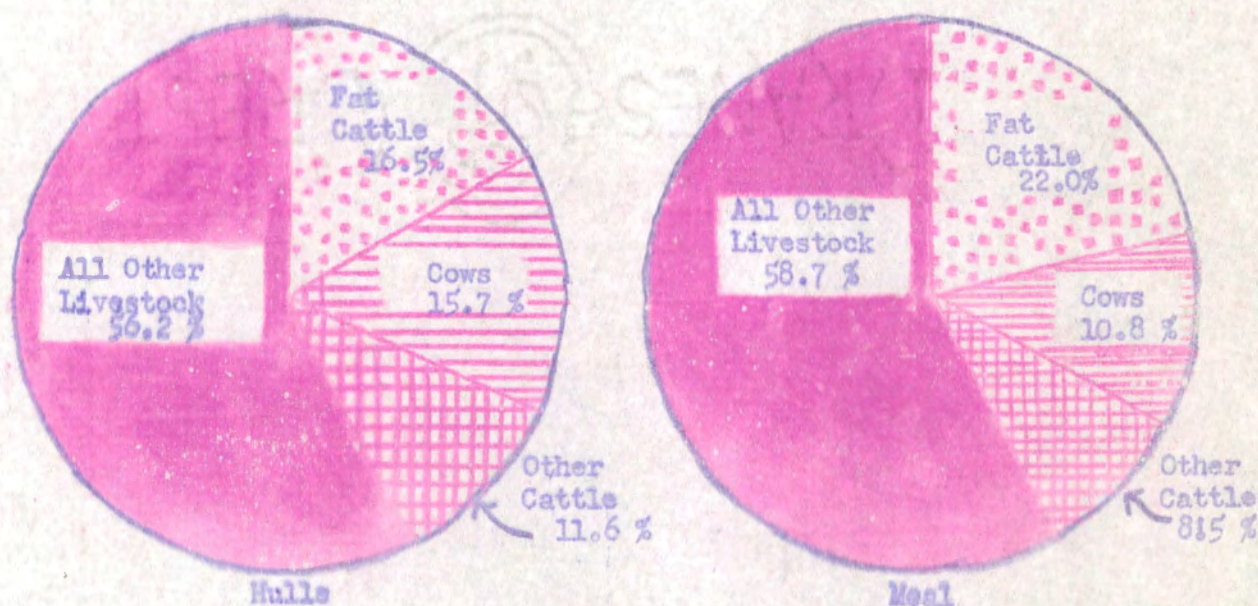
The feeding practices for four principal classes of beef cattle were analyzed to determine the market possibilities for hulls and meal. Supplementary or wintering rations were fed to 74 herds of beef cows and 47 herds of other cattle. The latter class included calves, yearlings, and heifers. The other two classes were beef cattle fattened on dry lot and cattle fattened on pasture.

Volume Consumed by Beef Cattle

Beef cattle of all classes ranked a close second to dairy cows as consumers of cottonseed feed products in this study. Further, beef cattle generally consumed more hulls and meal in those areas where dairy cattle consumed the least. Only in Madison County was the proportion of the total volume of hulls and meal purchased consumed by beef and dairy cattle about the same (Tables IX and X, Appendix B).

Fattened beef cattle consumed more of both hulls and meal than any other class of beef cattle (Figure 8). Slightly more meal was consumed by fattened beef cattle than by both of the other classes combined. The greatest proportion of hulls fed to fattened cattle was in Obion County and the smallest proportion was in Shelby County (Tables IX and X, Appendix B).

The cow-calf program of beef production seemed to be more favored in Gibson and Madison Counties, in contrast to the heavily favored steer



Source: Table IX and X, Appendix B.

Figure 8

Percent of hulls and meal purchased for beef cattle, 184 beef cattle herds, five West Tennessee Counties, 1948 - 49

feeding program in Obion and Dyer Counties. Beef production was of relatively minor importance in Shelby County. Most of the beef cattle farmers interviewed in Shelby County were purebred breeders.

Consumption of cottonseed feed products by the other classes of beef cattle ranked closely behind that of beef cows. Also, the relative proportion between the consumption of hulls and meal was about the same as that of beef cows, with a slightly higher proportion of hulls consumed in each case.

Proportion of Beef Cattle Fed Hulls and Meal

Only one-third of all beef cattle reported on the farms in this study were fed either hulls or meal. This fact indicates that an increase in the number of animals fed cottonseed feed products offers one of the more important possibilities of increased consumption of these products by beef cattle (Table XIII, Appendix B).

Analysis of the proportion of beef cattle fed hulls and (or) meal by each of the four classes studied revealed important differences in the feeding of cottonseed feed products (Figure 9). For example, more than twice the proportion of cattle fattened on dry lot were fed both hulls and meal, compared with those fattened on pasture. While 62 percent of those fattened on dry lot were fed neither hulls nor meal, which group offers the greatest relative potential market? The value of pastures in a beef fattening program is obviously a determining factor as to whether or not hulls and meal are fed, and the amounts required of each when they are used.

Beef cows ranked second to cattle fattened in the proportion of beef cattle fed hulls and meal (Figure 9). Over 50 percent of the cows were fed meal and about 35 percent were fed hulls. The beef cattle group which included calves, yearlings, and heifers apparently offers an even greater possibility for an expanded market for hulls and meal, as 75 percent of this group were not fed meal and over 80 percent were not fed hulls.

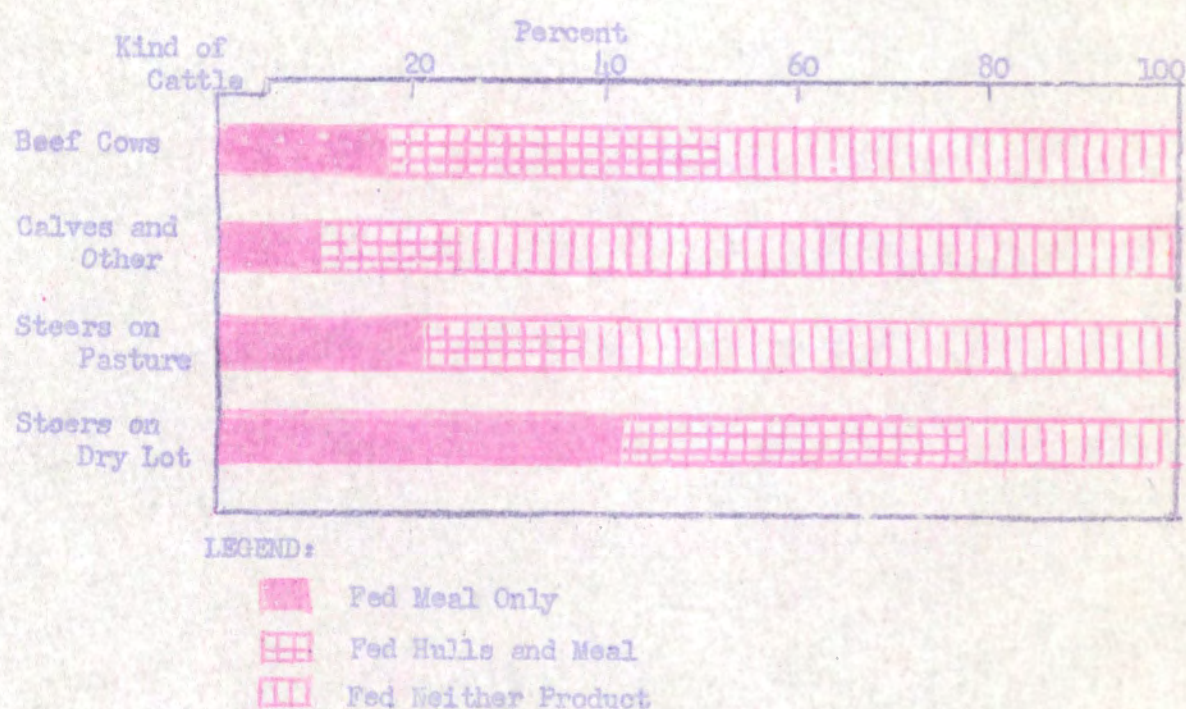
Proportion of Beef Cattle Producers Feeding Hulls and Meal

Another possibility for expanding the market for hulls and meal is to increase the proportion of beef cattle producers that feed hulls and meal. While part of all of the herds included in this survey were fed some hulls and meal, an undetermined number of beef cattle farmers used neither of the products. It is impossible to give an accurate estimate of this proportion, but it is probably large enough to provide a substantial increase in the potential market for hulls and meal.

Number of Beef Cattle on Farms

The potential market for hulls and meal, or for any other feed, depends upon the total number of livestock for which that feed is suitable.¹ The trends of livestock production is a factor to consider in estimating the amount of a feed that will be used by a particular class of livestock. The trend of beef cattle on farms in Tennessee is

¹Morrison, op. cit. p. 127.



Source: Table XIII, Appendix B.

Figure 9

Percentage of beef cattle fed cottonseed feed products, 184 beef cattle herds, five West Tennessee Counties, 1948 - 49

steadily upward.²

The Daily Ration

Beef Cows

The 74 herds of beef cows were fed a supplementary ration during the winter months. The need for a ration containing suitable roughages and concentrates in proper proportions is substantiated by recognized authority. Since most beef calves are born in the spring, cows need nutrients mainly for maintenance of their own bodies and for growth of the fetus during the winter months.³

While breeding cows should be fed to keep them in thrifty condition, their feed requirements are not so large as is commonly believed. Pregnant cows can be wintered on roughages alone, if some legume hay is available. If only non-legume roughage is fed, there should be added to the ration one pound per head daily of cottonseed meal or its equivalent in one of the other high protein supplements. Too liberal feeding of grains is not only extravagant but also may prove actually injurious.⁴

The one pound of cottonseed meal or its equivalent per head daily recommended by Morrison is well in line with recommendations of the University of Tennessee⁵ and the U. S. Department of Agriculture.⁶ In

²Tennessee Department of Agriculture, Agricultural Trends in Tennessee, Nashville, Tennessee, December 1948, p. 83.

³Morrison, op. cit., p. 701.

⁴Loc. cit.

⁵William P. Tyrrell, Keys to the Protein Feed Problem, Agricultural Extension Service, University of Tennessee, Knoxville, Tennessee, Publication 300, pp. 11-12.

⁶Feeding Cottonseed Products to Livestock, U. S. Department of Agriculture, Washington, D. C., Farmers Bulletin No. 1179, Sept. 1928, p. 7.

a review of recommendations by various agricultural experiment stations, not over two pounds per head daily was recommended in any case.⁷

Practically all of the commonly-grown roughages are satisfactory for wintering cows, provided proper protein supplements or pastures are used.⁸

A question pertinent to the problem of this study was to determine if the volume of hulls and meal consumed by beef cows could be increased by increasing the amount fed per head daily. In the case of meal, it was found that most of the farmers who fed meal probably fed more than was necessary. The average amount of meal fed per head daily for the 74 herds of beef cows was 2.1 pounds, which was about twice the amount generally recommended (Table XXV). This tended to border on extravagance, in view of the fact that legume hay and corn made up an important portion of the ration (Table XXV).

The amount of hulls that can be fed daily is not necessarily determined by the same factors that affect the amount of meal needed. Vitamin deficiencies in hulls require that well-cured hay, silage, or pasture be included in the ration if they are fed for long periods of time.⁹ Theoretically, hulls could constitute nearly all of the roughages fed to beef cattle, especially if pastures were used.

Legume hay and silage were the principal roughages fed, with hulls ranking third in importance. The relative abundance of each roughage

⁷Morrison, op. cit., pp. 701-703

⁸Loc. cit.

⁹Morrison, op. cit., p. 686.

seemed to determine the extent of its use. It was evident that the amount of hulls fed per head daily had a close relationship to the supply of hulls (Tables XIV and XXV).

From the above, the conclusion was drawn that the amount of hulls fed daily can be increased as the price of hulls decreases in relation to the prices of other roughages.

Other Beef Cattle

This group of cattle included calves, heifers, yearlings, and a few older stocker cattle. The stated purpose of feeding these cattle was to maintain them through the winter and to keep them gaining weight. The use of cottonseed meal as a protein supplement for this group of cattle is recommended if the roughage is other than legume hay.¹⁰ Morrison¹¹ and the University of Tennessee¹² recommend about one-half pound per head daily for older cattle. The National Cottonseed Products Association recommends up to 1½ pounds per head daily for calves and two pounds per head daily for older cattle.¹³

The recommended use of hulls for this group of beef cattle conforms closely to that for beef cows.

¹⁰Morrison, op. cit., p. 708.

¹¹Loc. cit.

¹²Tyrrell, op. cit., p. 12.

¹³National Cottonseed Products Association, 1949 Feeding Practices, Dallas, Texas, Bulletin No. 26, 1950, p. 19.

The 49 herds of other beef cattle were fed an average of 1.7 pounds of meal per head daily and an approximately equal amount of corn (Table XXVI). While this ration was somewhat liberal compared to Morrison's and the University of Tennessee's recommendations, it was well within the limits prescribed by the National Cottonseed Products Association. However, the possibility of increasing this amount seems to be extremely limited. The fact that legume hay was the most important roughage fed would tend to reduce the necessity of feeding meal at all, much less in more liberal quantities.

These cattle were fed practically the same amount of hulls per head daily as the beef cows (Table XXVI). The same conditions affecting the amount of hulls fed daily to beef cows apply equally well to this group of beef cattle. Thus, the supply and price of hulls in relation to the supply and price of other roughages are the principal factors affecting the use of hulls as a roughage.

Beef Cattle Fattened

Two principal methods of fattening beef cattle were practiced by the farmers in this survey; namely, by fattening on pasture and by dry lot feeding. Of the 69 beef herds fattened that were fed meal, 38 were fattened on pasture and 31 on dry lot. Most of the cattle fattened were two-year old steers, with a small proportion of yearling steers and calves.

Pasture feeding. The amount of concentrates to feed on pasture depends entirely on the quality of the pasture and on how rapidly it is desired to fatten the cattle. . . . The need for a protein supplement depends on the kind and quality of the pasture. If the cattle are on legume pasture, or if the pasture contains a

considerable proportion of legumes, there is no need for a protein supplement. However, in the South cottonseed meal is often the cheapest concentrate available and may be fed in amounts up to 4 pounds per head daily to cattle on pasture.¹⁴

Morrison states further that the benefits from protein supplements increase as the pasture matures and the protein content is lower than in the spring and early summer.¹⁵

The above quotations have established the fact that meal and other concentrates for fattening cattle may not be required on pasture or may be fed in considerable quantity, depending upon conditions.

The 38 beef cattle herds that were fed meal on pasture were fed an average of 2.7 pounds of meal and 8.5 pounds of corn per head daily (Table XXVII). Variations ranged from 1.5 pounds of meal per head daily in Shelby County to 3.5 pounds in Madison County, indicating changes in variable factors affecting the amount of concentrates required.

Since there is wide leeway in the recommendations for fattening cattle on pasture, it is difficult to determine if the amounts of meal and other concentrates fed were the proper amounts. However, if deductions are based upon the assumption that the feeders were rational, then it must be assumed that the rate of feeding could not be significantly changed. Under the conditions given, the ration does not appear to be either extravagant or insufficient.

The proportion of hulls in the 12 pounds of roughages fed was somewhat higher than for the other classes of beef cattle (Table XXVII). The use of hulls on pasture is generally approved to reduce bloating

¹⁴Morrison, op. cit., p. 714.

¹⁵Ibid., p. 715.

AVERAGE AMOUNTS OF ROUGHAGES AND CONCENTRATES FED DAILY TO BEEF CATTLE
FATTENED ON PASTURE, 38 HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

86

and scouring, and could constitute practically all of the roughages when pastures are used.

Considerable variation was found in both the amount of hulls in the ration and the total amount of roughages fed among the five counties. This is due to the fact that fattening cattle on winter pastures prevailed in some areas, while fattening cattle on summer pastures was more important in other areas. Since winter pastures are not as luxuriant and do not produce as much forage as summer pastures, heavier feeding of roughages would be required.

As stated previously, there is no technical reason why hulls could not be the whole ration of roughages for fattening cattle when pastures are available. The amount of roughage necessary would be determined by the method of feeding.

Dry Lot Feeding. Cattle fattened on the dry lot have the same nutrient requirements as cattle fattened on pasture, but the nutrients must come from the ration fed. Generally, the kind and amounts of roughages used are determining factors in the amount of protein supplements and concentrates required.¹⁶ Where part or all of the roughages are non-legumes Morrison recommends up to $3\frac{1}{2}$ or 4 pounds of high-protein supplement, plus 12 to 20 pounds of corn.¹⁷

The 31 herds of beef cattle fattened on dry lot in this study were

¹⁶Morrison, op. cit., p. 626.

¹⁷Loc. cit.

fed 2.4 pounds of meal and 8.6 pounds of corn per head daily (Table XXVIII).

This ration corresponds closely to the concentrate ration fed to the cattle fattened on pasture. However, dry lot cattle were fed over 20 pounds of roughages compared to 12 pounds for the cattle fattened on pasture. In addition, the proportion of hulls in the ration was lower and the proportion of both legume hay and silage was much higher (Tables XXVII and XXVIII).

Comparison of the rations of the cattle fattened by the two methods indicates a close parallel when all factors are considered. There was probably little variation in the total nutrients consumed by each group.

There was a close relationship between the amount of meal fed and the type of roughage fed. In those areas where legume hay was fed in considerable proportion, the amount of meal tended to be less than in areas where hulls or silage made up the larger proportion of roughages (Table XXVIII).

The possibility of increasing the amount of hulls and meal in the ration depends upon the kinds and amounts of other feeds in the ration, with the relative prices of each determining the extent of its use.

Length of Feeding Period

Beef Cows and Other Beef Cattle

The 74 herds of beef cows and the 49 herds of other classes of beef cattle were fed hulls and meal, for the most part, to carry them

through the winter months. In a few cases, they were fed for considerably longer periods. The average length of the period these cattle were fed hulls and meal ranged from about four to four and one-half months. Extreme variations in length of the feeding ranged from about 30 days to nearly one year in a few cases (Table XXIX).

The other herds of beef cattle were fed both hulls and meal for slightly longer periods than were the beef cows (Table XXIX). The fact that the aim of feeding calves and yearlings was not only to maintain them but to keep them growing explains in part the tendency to feed them for longer periods than the beef cows.

The need for protein supplement for maintaining beef cattle is largely determined by the amount of legume hay and the kind and quality of pasture available.¹⁸ Whether or not the feeding period for meal can be lengthened would be determined by the above factors.

Beef Cattle Fattened

The average feeding period for cattle fed on dry lot was about 3½ months. Those fattened on pasture were fed a little over four months. The highest proportion in each case was fed for 90 days or less (Table XXX).

Several factors other than nutrient requirements enter into the profitable production of beef cattle. The margin, which is the difference between the price paid for the cattle and the price received, and feed

¹⁸Morrison, op. cit., pp. 701-708.

TABLE XXIX

LENGTH OF FEEDING PERIOD FOR HULLS AND MEAL, 74 HERDS OF BEEF
COWS AND 49 HERDS OF OTHER BEEF CATTLE, FIVE WEST TENNESSEE
COUNTIES, 1948-49

Length of Feeding Period (Days)	Hulls				Meal			
	Number and percent of herds				Number and percent of herds			
	Beef Cows		Other Beef Cattle		Beef Cows		Other Beef Cattle	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
90 or less	18	24.3	5	10.2	20	27.0	8	16.4
91 - 120	15	20.3	14	28.6	25	33.8	20	40.8
121 - 150	10	13.5	9	18.4	20	27.0	11	22.4
151 - 180	5	6.8	5	10.2	6	8.1	9	18.4
Over 180	2	2.7	1	2.0	2	2.7	1	2.0
Hulls or meal not fed	24	32.4	15	30.6	1	1.4	0	0.0
Total	74	100.0	49	100.0	74	100.0	49	100.0
Average days fed ^a	122		134		122		131	

^aBased on herds fed hulls or meal.

TABLE XXX

LENGTH OF FEEDING PERIOD FOR FATTENED BEEF CATTLE, BY METHOD OF
FATTENING, 69 HERDS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Length of Feeding Period (Days)	Hulls				Meal			
	Number and percent of herds				Number and percent of herds			
	Dry Lot Feeding		Pasture Feeding		Dry Lot Feeding		Pasture Feeding	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
90 or less	7	22.6	8	21.0	14	45.2	14	37.0
91 - 120	5	16.0	3	7.9	10	32.2	11	29.0
121 - 150	2	6.5	2	5.3	2	6.5	6	15.7
151 - 180	2	6.5	0	0.0	4	12.9	1	2.6
Over 180	1	3.2	3	7.9	1	3.2	6	15.7
Hulls or meal not fed	14	45.2	22	57.9	0	0.0	0	0.0
Total	31	100.0	38	100.0	31	100.0	38	100.0
Average days fed ^a	112		108		106		129	

^aBased on herds fed hulls or meal.

costs are two important economic factors affecting the situation.¹⁹ Therefore, the price paid for feeder cattle, feeding costs, and the prospective prices of fat cattle as the feeding period lengthens plus the rate of gain would largely determine the length of the feeding period.

Amount of Hulls Fed Per Head Related to Use of Pastures

Beef Cows

The use of pastures by beef cows had a definite effect upon the extent to which hulls were used. There was more of a tendency to feed hulls to cattle on pasture than to cattle without pasture. The highest percent of herds fed hulls were herds with pasture (Table XXXI). Legume hay and silage were the most important roughages fed to herds without pasture.

The average number of days that hulls were fed was longer for herds on pasture. Also, the amount of hulls fed per animal was larger for herds fed on pasture (Table XXXI). The longer feeding period rather than the difference in the amount fed per head daily would account for most of this.

The kinds of pastures used consisted mostly of winter cover crops, such as small grains, crimson clover, and rye grass. Bluegrass and fescue were also included in most of the pasture programs.

Other Beef Cattle

Practically the same kinds of pastures were used for the mixed

¹⁹Morrison, op. cit., p. 635.

class of beef cattle that were used for the beef cows.

The proportion of herds fed hulls was higher for herds fed on pasture. There was little difference in the total amount consumed per head with and without pasture. However, the shorter period that hulls were fed indicated that hulls were fed at a higher daily rate to cattle without pasture (Table XXXI).

There was a definite tendency for more beef cattle farmers to feed hulls to cattle on pasture than to cattle without pasture. Also, hulls were fed for longer periods to cattle on pasture.

The extended use of hulls would be possible if winter pastures were more widely used by farmers feeding maintenance rations to beef cows, calves, yearlings, and other beef cattle. There is considerable opportunity for the use of winter pastures to be expanded. Only 35 percent of the beef cow herds and 41 percent of the other herds of cattle had access to winter pasture.

Beef Cattle Fattened

About 17 percent of the beef herds fattened were fed on winter pasture. Thirty-eight percent were fattened on other pasture, and the remainder on dry lot (Table XXXII). The winter pasture consisted of the usual grasses, legumes, and small grains used for winter cover crops. The other pasture included the permanent pasture mixtures of grasses and legumes, and most of the pasture crops used in the area. Legumes were in greater proportion in all of these pastures, except in a few where small grains were the only winter pasture.

The amount of hulls consumed per head tended to decrease as the

TABLE XXXI

AMOUNT OF HULLS FED PER ANIMAL RELATED TO USE OF PASTURES, 74 HERDS OF BEEF COWS AND 49 HERDS OF OTHER BEEF CATTLE, FIVE WEST TENNESSEE COUNTIES, 1948-49

Amount of Hulls Per Animal (Pounds)	Beef Cows				Other Beef Cattle			
	Number and percent of herds				Number and percent of herds			
	With Pasture		Without Pasture		With Pasture		Without Pasture	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1 - 499	6	23.1	5	10.4	3	15.0	1	3.4
500 - 999	4	15.4	15	31.2	7	35.0	9	31.2
1000 - 1999	3	11.5	8	16.7	2	10.0	6	20.6
1500 and over	6	23.1	3	6.3	3	15.0	3	10.3
Total fed hulls	19	73.1	31	64.6	15	75.0	19	65.5
Hulls not fed	7	26.9	17	35.4	5	25.0	10	34.5
Total	26	100.0	48	100.0	20	100.0	29	100.0
Average pounds fed per animal	1188		912		966		1078	
Average days hulls were fed	153		104		151		120	

quality of the pasture increased. The largest amount per head was fed to cattle on the dry lot. The next largest amount was fed to cattle fattened on winter pastures. However, the rate of feeding was higher on winter pastures, as indicated by a relatively short feeding period (Table XXXII). Cattle fattened on summer pastures were fed the smallest amount of hulls per head and at a lower daily rate, as indicated by a comparatively long feeding period (Table XXXII).

There was a strong tendency not to feed hulls to beef cattle fattened. Nearly two-thirds of the cattle fattened on summer pasture were not fed hulls, and almost half of those fattened on both winter pasture and dry lot were not fed hulls (Table XXXII). The use of hulls by farmers fattening beef cattle was of considerably more importance in dry lot feeding. The daily rate of feeding, the amount consumed per animal, and the proportion of herds fed hulls are higher than for cattle fattened by other methods.

Amount of Meal Fed Per Head Related to Use of Pastures

Beef Cows

Thirty-five percent of the beef cow herds were fed meal on winter pasture. The remainder were fed meal without pasture of any kind.

Beef cows on pasture consumed more meal per head than cows without pasture. The cows on pasture were fed meal over 30 days longer than the cows without pasture. The rate of feeding was approximately the same for both groups (Table XXXIII).

The possibility of increasing the total amount of meal fed to beef

TABLE XXXII

AMOUNT OF HULLS FED PER ANIMAL RELATED TO USE OF PASTURES,
69 BEEF HERDS FATTENED, FIVE WEST TENNESSEE COUNTIES, 1948-49

Amount Fed Per Animal (Pounds)	<u>Legume Pasture</u>		<u>Winter Pasture</u>		<u>No Pasture</u>	
	Number and percent of herds					
	No.	Pct.	No.	Pct.	No.	Pct.
1 - 499	2	7.7	2	16.7	3	9.7
500 - 999	4	15.4	2	16.7	4	12.9
1000 - 1499	2	7.7	1	8.3	0	0.0
1500 and over	1	3.8	2	16.7	10	32.3
Total fed hulls	9	34.6	7	58.4	17	54.8
Hulls not fed	17	65.4	5	41.6	14	45.2
Total	26	100.0	12	100.0	31	100.0

Average pounds per animal	850		950		1260	

Average days hulls fed	140		87		112	

TABLE XXXIII

AMOUNT OF MEAL FED PER ANIMAL RELATED TO USE OF PASTURES,
74 HERDS OF BEEF COWS AND 49 HERDS OF OTHER BEEF CATTLE,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Amount of Meal Per Animal (Pounds)	Beef Cows				Other Beef Cattle			
	Number and Percent of Herds				Number and Percent of Herds			
	With Pasture		Without Pasture		With Pasture		Without Pasture	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
0 - 99	4	15.4	9	18.8	1	5.0	6	20.6
100 - 199	8	30.8	22	45.8	7	35.0	9	31.2
200 - 299	3	11.5	8	16.7	5	25.0	4	13.8
300 - 399	8	30.8	7	14.6	6	30.0	7	24.1
400 and over	3	11.5	2	4.1	1	5.0	3	10.3
Total	26	100.0	48	100.0	20	100.0	29	100.0
Average pounds per animal	256		190		230		219	
Average days meal fed	143		111		149		118	

cows is supported by the fact that nearly two-thirds of the cows had no winter pasture, and that cows fed meal on winter pasture were fed for longer periods.

Other Beef Cattle

Twenty of the 49 herds of other beef cattle were fed meal on pasture. The herds fed on pasture consumed slightly more meal per head than the herds without pasture (Table XXXIII). The feeding period was over 30 days longer for the herds fed on pasture. However, the daily rate of feeding meal was somewhat higher for the herds without pasture.

Increased use of winter pastures offers considerable opportunity for expanding the use of meal by miscellaneous beef cattle. An important factor supporting this statement is the longer feeding period for cattle fed on pasture.

Beef Cattle Fattened

Forty-five percent of the beef herds fattened that were fed meal were fed on dry lot. The remainder were fattened on pasture. About two-thirds of the pasture-fed cattle were fattened on summer pasture, consisting mostly of legumes. The remainder were fattened while on winter pasture (Table XXXIV).

The largest amount fed per animal for the length of the feeding period was fed to the cattle fattened on winter pasture. The average daily rate of feeding was approximately the same as that of the cattle fed on dry lot, but the feeding period was over 30 days longer.

The cattle fed on summer pasture were fed the lowest amount per

TABLE XXXIV

AMOUNT OF MEAL FED PER ANIMAL RELATED TO USE OF PASTURES,
69 BEEF HERDS FATTENED, FIVE WEST TENNESSEE COUNTIES, 1948-49

Amount Fed Per Animal (Pounds)	<u>Summer Pasture</u>		<u>Winter Pasture</u>		<u>No Pasture</u>	
	Number and percent of herds					
	No.	Pct.	No.	Pct.	No.	Pct.
1 - 199	11	42.3	4	33.3	9	29.0
200 - 399	9	34.6	1	8.3	13	41.9
400 - 599	4	15.4	5	41.7	8	25.8
600 and over	2	7.7	2	16.7	1	3.3
Total	26	100.0	12	100.0	31	100.0

Average pounds fed per animal	298		395		304	

Average days meal fed	131		138		106	

animal. The rate of feeding was less, but the length of the feeding period made the total amount consumed per head for the feeding period comparable to that of cattle fattened on dry lot.

The relative returns from each method of feeding would determine which offers the greatest possibility for the increased use of cottonseed meal.

An increase in total herds fed by any method would be desirable. An increase in the use of winter pastures would be even more desirable, as herds fed by this method were fed the highest average amount per head. Also, the relatively low proportion of herds fed meal on winter pastures indicates the possibility of a substantial increase in the use of this method.

CHAPTER V

POSSIBILITIES OF INCREASING THE CONSUMPTION OF COTTONSEED FEED PRODUCTS BY HOGS AND OTHER CLASSES OF LIVESTOCK

Volume Consumed by Hogs

Slightly over 11 percent of the meal purchased by the 290 farmers was fed to hogs (Table X, Appendix B). Practically all of the meal fed to hogs was fed to those being fattened. The amount of meal fed to brood sows and other breeding stock was negligible.

The use of meal as a feed for hogs was more important in Obion, Dyer, and Gibson Counties. Less than four percent of the total volume purchased was fed to hogs in Shelby County (Table X, Appendix B).

Farmers Producing Hogs

Approximately two-thirds (195) of the 290 farmers had brood sows. A slightly higher proportion (199) produced market hogs (Tables I and III, Appendix B). The farms reporting brood sows averaged over five sows per farm. Farmers who produced fat hogs for market fed an average of 91 hogs each.

Proportion of Farmers Feeding Meal to Hogs

Sixty-five of the farmers who produced market hogs fed meal. The 134 hog producers who did not feed meal represent a potential market that would approximately double the consumption of meal by hogs. Slightly

over half of the market hogs produced were not fed meal.

Proportion of Hogs Fed Meal

Forty-eight percent of the market hogs produced were fed meal (Figure 10). Only three percent of the brood sows were fed meal (Table XIII, Appendix B).

There was little variation among the areas studied in the proportion of market hogs fed meal. Gibson County was the only area in which over 50 percent of the hogs fattened were fed this product (Table XIII, Appendix B).

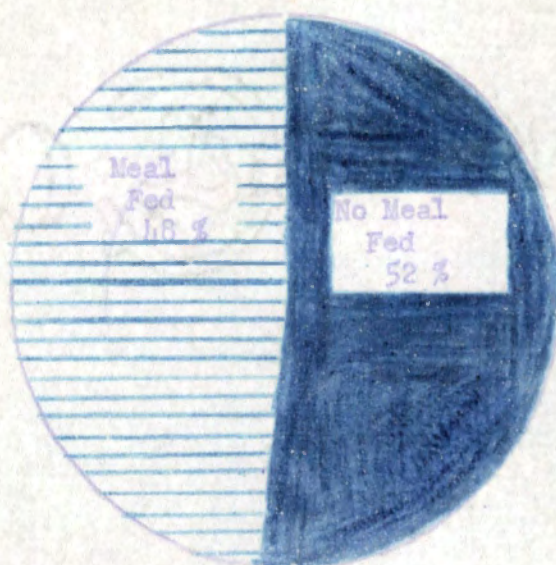
Number of Hogs on Farms

The potential market for any hog feed is determined primarily by the hog population. The area studied is the most important in Tennessee for hog production. The general pattern of hog production in Tennessee shows an upward trend with a five-year cycle. Hog production at the present time is approaching the upward peak of the cyclical pattern.¹

The Daily Ration for Fattened Hogs

The 65 herds of hogs fattened were fed an average of one-half pound of cottonseed meal per head daily. Tankage, 40 to 45 percent protein commercial feeds, soybean oil meal, and other protein supplements

¹Tennessee Department of Agriculture, op. cit., p. 90.



Source: Table XIII, Appendix D.

Figure 10

Percent of all hogs fattened that were fed cottonseed meal, 199 farms producing market hogs, five West Tennessee Counties, 1948 - 49

amounted to 1.1 pounds per head daily. Corn, small grains, and other feeds accounted for the remainder of the ration. The total daily ration averaged 7.9 pounds² per head daily (Table XXXV).

There was considerable variation among the counties in the daily amount of meal and other feeds fed to the fattened hogs. The daily ration of meal ranged from .3 pounds per head in Obion County to 1.0 pounds per head in Shelby County (Table XXXV). The increase in available supply of meal southward from Obion County (Table XIV) is directly related to the daily rate of feeding meal for hogs.

Hogs will eat only limited amounts of supplement, grain, and pasture, even when they have access to these feeds at all times. The amount of cottonseed meal a hog will eat daily depends upon the kinds and amounts of other feeds in the ration.³ The proportion of meal in the protein supplement mixture would largely determine the amount of meal consumed per head daily.

Ratio of Meal to Other Protein Supplements

Protein supplement rations for hogs are formulated on the basis of

²The total daily ration may appear to exceed the average amount that a hog can consume daily. This apparent discrepancy is explained by the fact that most of the farmers fed ear corn, which was unhusked in many cases. The shelled corn equivalent would be up to 30 percent less than the amount of corn reported to be fed.

³Morrison, op. cit., pp. 864-886.

TABLE XXV

AVERAGE DAILY RATION PER HOG, 65 HERDS OF FATTENED HOGS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Kind of Feed	County					
	Obion	Dyer	Gibson	Madison	Shelby	Total
	Average pounds and percent of total ration					
	Lbs. Pct.	Lbs. Pct.	Lbs. Pct.	Lbs. Pct.	Lbs. Pct.	Lbs. Pct.
Cottonseed meal	.3 5.3	.4 5.3	.5 6.5	.8 11.4	1.0 10.6	.5 6.2
Tankage	.4 7.4	.6 6.6	.6 7.2	.6 7.5	.4 4.2	.5 6.8
40-45% hog supplement	.6 10.6	(c)	.1 5.5	.4 5.5	.1 1.1	.4 5.0
Other protein supplements ^a	.1 1.6	(c)	.4 3.4	.4 5.8	.1 1.1	.2 1.9
Corn	4.2 73.4	7.5 87.6	6.2 76.1	4.8 64.0	4.0 42.5	5.9 74.4
Small grain	.1 1.6	-	(c)	.4 5.8	-	.1 1.1
Other feeds ^b	.1 .1	-	-	-	3.8 40.5	.4 4.6
Total	5.8 100.0	8.5 100.0	8.1 100.0	7.4 100.0	9.4 100.0	7.9 100.0

^aIncludes soybean meal, alfalfa meal, wheat bran and shorts.

^bIncludes skim milk and garbage.

^cLess than .1 pound.

animal proteins⁴ and vegetable proteins.⁵ Morrison,⁶ the Tennessee Agricultural Experiment Station,⁷ and other recognized authorities recommend that some supplement of each origin be included in the ration for hogs. The exact proportions depend on the stage of growth of the hogs, comparative prices and availability of the supplements, and certain technical factors.⁸ Cottonseed meal alone is not recommended as the only protein supplement.

A protein supplement consisting of one part cottonseed meal and one part tankage or other animal protein is considered to be one of the best by the University of Tennessee. When corn and pasture are used, the ratio of meal to other proteins may be up to 4:1, if the price of meal is relatively lower than other proteins.⁹ Morrison says not to use more than two-thirds of cottonseed meal in the supplement mixture.¹⁰

Nearly one-third of the 65 herds of hogs fattened were fed meal and other protein supplements in a 1:1 ratio. This is the ration highly

⁴Proteins of animal origin include tankage, meat scraps, and fish meal.

⁵Proteins of vegetable origin include cottonseed meal and the other meals made from oil-bearing seeds.

⁶Morrison, op. cit., p. 813.

⁷Tyrrell, op. cit., p. 13.

⁸Morrison, op. cit., pp. 885-886.

⁹John S. Robinson, Pigs for Profit, Agricultural Extension Service, University of Tennessee, Knoxville, Tennessee, Publication 237, February 1950, p. 12.

¹⁰Morrison, loc. cit.

TABLE XXVI

RATIO OF COTTONSEED MEAL TO OTHER PROTEIN SUPPLEMENTS FED TO 65 HERDS
OF FATTENED HOGS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Ratio of Meal to Other Protein Supplements	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
1:0	2	16.7	1	6.3	1	5.0	1	8.3	2	40.0
2:1	1	8.3	3	18.7	1	5.0	1	8.3	-	-
1:1	1	8.3	5	31.3	7	35.0	6	50.0	2	40.0
1:2	2	16.7	7	43.7	5	25.0	2	16.7	-	-
1:3	2	16.7	-	-	2	10.0	2	16.7	1	20.0
1:4 and greater	4	33.3	-	-	4	20.0	-	-	-	-
Total	12	100.0	16	100.0	20	100.0	12	100.0	5	100.0
Average ratio	1:3.7		1:1.5		1:2.8		1:1.8		1:0.6	

1:2.2

recommended by the University of Tennessee. Approximately 48 percent of the herds were fed meal in smaller proportions than the 1:1 ratio. Nine percent were fed meal in a 2:1 ratio, and 11 percent were fed meal as the only protein supplement. The average for all herds was one part of meal to 2.2 parts of other supplement (Table XXXVI).

The above analysis indicates that the proportion of meal in the protein supplement fed to almost half of the 65 herds of hogs fattened could be doubled and still meet the recommendations of a wide range of recognized authorities. When meal is available in large quantity and the price is relatively low, the proportion fed to hogs could be increased to 2:1 and still be within the limits recognized for the safe feeding of meal to hogs. Only seven farmers who fed meal as the only protein supplement were not within the feeding recommendations of recognized authority.¹¹

Length of Feeding Period

The 65 herds of hogs fattened were fed meal for an average of 123 days. The average ranged from 99 days in Obion County to 139 days in Gibson County. About 14 percent of the herds were fed meal for 150 to 180 days. On the other hand, fifteen percent were fed meal for 90 days or less. The remaining 71 percent were fed meal 91 to 150 days (Table XXXVII).

¹¹ Morrison, *op. cit.*, pp. 362-363. Cottonseed meal contains a substance called gossypol that is poisonous to some species of animals if consumed in too large amounts. Swine may be seriously injured if fed too much cottonseed meal.

NUMBER OF DAYS PATTERNED HOGS WERE FED MEAL, 65 HERDS OF HOGS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

110

Most of the market hogs were sold when 180 to 210 days of age. A few were fed for longer periods. Since pigs start eating when two or three weeks old, the total length of the feeding period ranges from about $5\frac{1}{2}$ to $6\frac{1}{2}$ months. The age at which market hogs are sold depends on their weights and on market conditions. The feeding of protein supplements to pigs is generally recommended from the time they start eating until market weights are reached.¹² Also, pigs require more protein than older hogs.¹³ The facts indicate that the number of days the 65 herds of hogs were fed meal could be increased by from 45 to 75 days.

Over half of the 65 herds of hogs fattened were fed no meal until they were over two months old. The remainder were started on meal when they were from six to eight weeks old (Table XXXVIII). This indicates that meal could have been fed to all hogs that were on a meal ration for an additional 30 days.

Methods of Feeding

Forty-nine herds of the hogs fattened were fed by the free-choice method in self-feeders. Some of the self-fed hogs were hand-fed for the first few weeks after feeding. The other 16 herds were hand-fed throughout the feeding period.

All but five of the herds of hogs fed were fed meal while the hogs were on pasture. White clover was the most important pasture crop.

¹²Robinson, op. cit., pp. 9-10

¹³Morrison, op. cit., p. 814.

Ladino clover, alfalfa, and permanent pasture mixtures containing a large proportion of legumes accounted for nearly all of the remainder. One herd of the hogs was fed on Sudan grass.

Nineteen farmers hogged down crops of corn, soybeans, or mixtures of the two. Pastures were used by all of the above prior to the time the crops were hogged down.

None of the above practices had any significant effect on the amount of cottonseed meal used in the ration.

Meal Fed to Brood Sows

Only four of the 195 farmers who owned brood sows fed them meal as a protein supplement. A total of 961 sows, or 97 percent of the total number reported, were not fed meal. More extensive feeding of meal to brood sows would provide a substantial increase in the consumption of meal by hogs.

While sows require relatively less protein than pigs or fattening hogs, protein supplements are recommended by Morrison,¹⁴ the University of Tennessee,¹⁵ and other authorities.

The few sows that were fed meal were given the same ration as the hogs being fattened. The only divergence from the general feeding practices for fattening hogs was in the length of the feeding period. Nearly all of the sows fed meal were fed the year round.

¹⁴Morrison, op. cit., pp. 884-886.

¹⁵Tyrrell, op. cit., p. 13.

Other Classes of Livestock as Market Possibilities
for Cottonseed Feed Products

Morrison states that only limited amounts of meal are profitable when fed to sheep, and that only when poor roughages are used.¹⁶ Also, meal fed to lambs will usually not produce enough gain to pay the additional costs involved.¹⁷

Of 26 flocks of sheep included in the study only six were fed some meal. Two flocks of fat lambs were fed meal for a short period of time. Four flocks of ewes were fed some hulls and meal for about three weeks before lambing. One ewe flock was fed some meal for about 10 days prior to the breeding season.

In view of the above data and the downward trend of sheep production in Tennessee,¹⁸ little increase in the consumption of hulls and meal by sheep may be expected.

Workstock also offers somewhat limited possibilities for the increased use of cottonseed feed products. While meal is a generally satisfactory feed for horses and mules, farmers apparently found it more economical to use other feeds. Most of the farmers studied kept workstock, but only one fed meal or hulls at any time. One Tennessee Walking Horse breeder fed a small amount of meal during the late winter and spring to facilitate shedding and to add gloss to the horses' coats.

¹⁶Morrison, op. cit., p. 757.

¹⁷Ibid., p. 739.

¹⁸Tennessee Department of Agriculture, op. cit., pp. 94-96.

Only one flock of poultry was fed meal, although poultry flocks were reported on nearly all of the farms. However, it was not determined to what extent poultry flocks were fed commercial feeds that contained cottonseed meal.

CHAPTER VI

ATTITUDES AND OPINIONS OF FARMERS TOWARD COTTONSEED FEED PRODUCTS

Cottonseed Hulls

Why Farmers Fed Hulls

The farmers who fed hulls to livestock were asked the question, "Why do you feed hulls?" Use as a filler¹ was the most frequent reply. Since some kind of roughage must be included in the ration, some of the other replies are probably more indicative of the real reasons that hulls were fed (Table XXXIX).

Approximately half of the farmers who fed hulls indicated that price and economic reasons were the most important factors causing them to use hulls. Many replies were made in colloquial terms, such as "most feed for the money," and "cheaper than other feeds when you have to buy roughages." Replies concerning economic reasons for using hulls were interpreted to mean that hulls were included in the least-cost combination of feeds for the particular class of livestock fed.

The use of hulls as a carrier or mixer for concentrate rations was given by about 40 percent of the farmers as the reason for their use. It was a common practice to feed both dairy and beef cattle a mixture of hulls and meal. The wastage of meal was reportedly reduced to a minimum when mixed with hulls.

¹Filler is a colloquial term meaning a feed used to "fill" livestock or to add bulk to the ration, with most of the nutrient requirements being supplied by higher quality feeds.

TABLE XXXIX

REPLIES TO THE QUESTION: "WHY DO YOU FEED COTTONSEED HULLS?",
171 FARMERS WHO FED HULLS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Item	Number and percent of reasons reported	
	Number	Percent
Used as a filler	145	29.1
Price and economic reasons	85	17.0
As a carrier or mixer for concentrates	67	13.4
To help prevent scours	54	10.8
To help prevent bloat	37	7.4
Generally satisfactory results	35	7.1
Convenient to use	24	4.8
Readily available to buy	17	3.4
To help cotton growers	14	2.8
Saves hay and pasture	7	1.4
All other reasons	14	2.8
Total	499	100.0

The feeding of hulls to help control bloat and scours in cattle on lush pastures was given as a reason for their use by nearly one-third of the farmers. The general practice was to feed the cattle a partial ration of hulls before allowing them on pasture. A small amount of meal was usually added to the hulls to make them more palatable.

Convenience in feeding, availability to purchase, and to help cotton growers were mentioned frequently as reasons for using hulls. Many of the farmers who fed hulls were also cotton growers, which explains the latter reason given.

Why More Hulls Were Not Fed

The role of hulls as a roughage for livestock is further clarified by examination of the reasons farmers gave for not using more hulls. Forty-three farmers indicated that they fed livestock all the hulls they would eat. An equal number produced enough other roughages that additional hulls were not needed. The reply "animals don't need more" was interpreted to mean that hulls should be fed only as part of the roughage fed. Thirty-seven farmers said they did not feed more hulls because the food value of hulls was too low. There is probably some relationship between the latter two reasons. Price and economic factors amounted to 10 percent of the reasons given for not feeding more hulls, and indicate that more feeding of hulls would probably be unprofitable (Table XL).

Why Less Hulls Were Not Fed

Ninety-six of the 171 farmers gave "needed as a filler" as the reason why fewer hulls were not fed. Nearly all of the other reasons

TABLE XL

REPLIES TO THE QUESTION: "WHY DO YOU NOT FEED MORE (OR LESS)
COTTONSEED HULLS?", 171 FARMERS WHO FED HULLS, FIVE WEST
TENNESSEE COUNTIES, 1948-49

Item	Number and percent of reasons	
	Number	Percent
Why more hulls were not fed		
Animals won't eat more	43	22.5
Grows other roughages	43	22.5
Animals don't need more	39	20.4
Food value of hulls too low	37	19.4
Price and economic reasons	19	9.9
Would unbalance ration	5	2.6
Other roughages more profitable	3	1.6
May cause harmful effects	2	1.1
Total	191	100.0
Why less hulls were not fed		
Needed as a filler	96	51.6
Not enough other roughages	42	22.6
Needed as a carrier or mixer for concentrates	30	16.1
Price and economic reasons	9	4.8
Would unbalance ration	5	2.7
All other	4	2.2
Total	186	100.0

given indicated that hulls were needed in the ration in order to meet feeding requirements. A few farmers gave price and economic factors as reasons for not feeding less hulls. The latter reason was interpreted to mean that hulls were being used to better economic advantage than other roughages (Table XI).

The above statements indicate that hulls fulfill a definite need in livestock feeding programs in the area.

How Farmers Evaluate Hulls

The 290 farmers were asked the question, "To what other feeds are hulls equivalent?" This check was made in order to obtain some idea of the farmers' knowledge of the actual worth of hulls as a roughage. The protein-content of the various feeds was used as a criteria for estimating the results. The majority of answers included feeds that are roughly equal to hulls in food value. However, there was more of a tendency to over-evaluate the feeding value of hulls than to under-evaluate them (Table XII).

Nearly one-fourth of the farmers had no knowledge of the relative feeding value of hulls. Most of the farmers who knew nothing of the value of hulls had no experience in feeding them.

How Farmers Compared Hulls to Oat Straw

The farmers were asked to compare hulls with oat straw as a roughage.² Thirty-eight percent of the farmers said that hulls and oat straw were about the same. However, 30 percent said hulls were

²Hulls and oat straw are practically identical in food values (see Morrison, op. cit., p. 960.)

TABLE XLI

REPLIES TO THE QUESTION: "TO WHAT OTHER FEEDS ARE HULLS EQUIVALENT?",
290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kind of Feed	Average Protein Content* (Percent)	Number and Percent of Farmers	
		Number	Percent
Corn stover	5.6	73	25.2
Grass hay	7.0	51	17.6
Lespedeza hay	12.8	36	12.4
Oat or wheat straw	3.0	21	7.2
Corn cob meal	0.4	17	5.9
Silage (corn)	2.1	8	2.8
Average quality hay	3.0-10.0	5	1.7
Crushed corn (with cob and shuck)	8.7	5	1.7
Ground cotton bolls	8.7	2	.7
Sawdust	-	2	.7
Peanut hulls	6.7	1	.3
Don't know	-	69	23.8
Total	-	290	100.0

*Morrison, op. cit., pp. 954-976.

TABLE XLII

REPLIES TO THE QUESTION: "HOW DO YOU THINK HULLS COMPARE
AS A ROUGHAGE TO OAT STRAW?", 290 FARMERS, FIVE WEST
TENNESSEE COUNTIES, 1948-49

Cottonseed Hulls Compared to Oat Straw	Number and Percent of Farmers	
	Number	Percent
Hulls better	86	29.6
Oat straw better	19	6.6
About the same	109	37.6
Don't know	76	26.2
Total	290	100.0

better, compared with only seven percent who said oat straw was better. Over one-fourth had no experience in feeding either hulls or oat straw (Table XLII).

The above answers indicated a fair knowledge of the relative value of hulls as a roughage, but with a strong tendency to prefer hulls over comparable roughages.

Opinions of Farmers on Ill-effects to Livestock Caused by Feeding Hulls

About seven percent of the farmers expressed the belief that certain ill-effects may result from the continued feeding of hulls to beef and dairy cattle. Constipation was the ill-effect most frequently mentioned for each class of cattle. Nearly all of the ill-effects reported had to do with stomach and digestive disorders. More dairymen reported ill-effects from feeding hulls than did beef cattle producers (Table XLIII).

It should be kept in mind that the above ill-effects were not conclusively attributed to the feeding of hulls, but were believed to be a contributing factor. Possible ill-effects to livestock from the feeding of hulls are probably not important enough to greatly deter their continued and increased use as a roughage.

Sources of Information Used by Farmers Relative to the Feeding of Hulls

The 229 farmers with experience in feeding hulls were asked where they obtained information on the use of hulls as a roughage. Forty-eight percent indicated that their knowledge of the use of hulls came

largely from their own experience.³

The College of Agriculture at the University of Tennessee and the National Cottonseed Products Association were equally important, with 13 percent of the farmers obtaining information from each. Farm magazines, county agents and extension workers, and other farmers were each utilized as a source of information by 12 percent of the farmers. Seven percent of the farmers obtained information on feeding hulls directly from the West Tennessee Experiment Station, at Jackson. Other sources of information used were: Morrison's Feeds and Feeding, vocational agriculture and veteran's teachers, and field representatives of milk and feed companies. The most significant regional variation occurred in Madison County. Madison County farmers made much more extensive use of the West Tennessee Experiment Station and their county agent than did the other farmers (Table XLIV). This might be expected because the Experiment Station is located at Jackson, in the central part of the county.

Many of the farmers used more than one source of information, and generally those who used the more valid sources tended to make extensive use of all sources available to them.

³The probability of some error in the high percentage of farmers reportedly depending upon their own experience should be fully considered, in light of the fact that the average education of the farmers is high. Cottonseed products have been used in the area studied for several generations and most of the farmers interviewed have been familiar with these products since childhood. It seems improbable that such a high percentage of relatively well-educated livestock feeders should reach a mature age without having discussed feeding problems with their neighbors, or having read a magazine article on feeding practices, or having utilized at least a few of the many types of such services available.

TABLE XLIII

HARMFUL EFFECTS BELIEVED TO BE CAUSED BY FEEDING COTTONSEED HULLS TO
CATTLE, 20 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kind of Effect and Kind of Cattle	Number of Farmers
Dairy cows	
Constipation	8
Stomach impaction	3
Bloat	2
Irritated digestive system	2
Lessened appetite	1
Causes hardened quarters	1
May be toxic under certain conditions	1
Malnutrition	1
Total	19
Beef cattle	
Constipation	2
Stomach impaction	2
Lessened appetite	1
Bloat	1
Total	6

TABLE XLIV

SOURCES OF INFORMATION USED BY FARMERS WHO FED COTTONSEED HULLS, 229 FARMERS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Sources of Information	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Little or no information	15	34.7	32	62.7	21	48.8	17	34.7	25	56.8	110	48.0
U. T. and U. T. bulletins	5	11.9	10	20.0	6	14.0	0	0.0	9	20.5	30	13.1
Local oil mills and NCPA ^a	6	14.3	8	15.7	7	16.3	4	8.2	5	11.4	30	13.1
Farm magazines	3	7.1	15	29.4	2	4.7	4	8.2	3	6.8	27	11.8
County agents & extension workers	5	11.9	2	3.9	3	7.0	13	26.5	4	9.1	27	11.8
Other farmers	4	9.6	5	9.8	1	2.3	11	22.4	6	13.6	27	11.8
West Tennessee Experiment Station	2	4.8	1	2.0	2	4.7	11	22.4	1	2.3	17	7.4
"Feeds and Feeding" ^b	2	4.8	2	3.9	2	4.7	0	0.0	2	4.5	8	3.5
Vo. agriculture and vet. teachers	0	0.0	1	2.0	1	4.3	0	0.0	5	11.4	7	3.1
Other	4	9.6	2	3.9	0	0.0	1	2.0	3	6.8	10	4.4
Total farmers ^c	42	-	51	-	43	-	49	-	44	-	229	-

^aNational Cottonseed Products Association

^bMorrison, op. cit.

^cTotal of number and percent is greater than 229 and 100.0 because some farmers used more than one source of information.

Information Desired by Farmers on the Feeding of Hulls

Nearly two-thirds of the farmers expressed the desire for further information on the use of hulls as a roughage (Table XLV). However, few farmers were specific in the particular type of information desired. General information on the use of hulls as a feed for livestock was desired by 70 percent of the farmers who wanted more information. Information on the value of hulls as a feed and the economy of their use was the most frequently mentioned specific kind of information desired. Several farmers requested information on the proper amount of hulls to include in the rations of beef and dairy cattle (Table XLV).

Attitudes Toward Encouraging More Feeding of Hulls to Livestock

The opinions of the farmers were sought toward encouraging more feeding of hulls to livestock. About 54 percent of the farmers favored more feeding of hulls, 28 percent were opposed, and about 18 percent expressed no opinion. The proportion of farmers favoring more use of hulls by livestock feeders was slightly less than the proportion who fed hulls (Table XLVI).

Price and economic reasons were 40 percent of the total reasons given in favor of more use of hulls by farmers. These reasons were interpreted to mean that farmers can obtain higher net returns from dairy and beef cattle enterprises by utilizing hulls as part of the roughages under the conditions within the area. Suitability as a filler was also an important reason for advocating more use of hulls. To help cotton growers, ease of feeding, and generally favorable results were

TABLE XLV

INFORMATION DESIRED BY 184 FARMERS ON THE USE OF COTTONSEED HULLS AS A
FEED FOR LIVESTOCK, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kind of Information Desired	Number of Farmers
Information applicable to both beef and dairy cattle:	
Recommended feeding practices	130
Value as a feed and economy of use	16
Amount to use with other feeds	9
Possibility of crushing own cottonseed	1
Effects of oil left in hulls	1
Use in controlling bloat and scours	1
Effects of storage on quality; shrinkage	1
Length of time advisable to feed hulls	1
Maximum amount of hulls to feed	1
Why food value has been taken out	1
The results of this study	1
Information on feeding beef cattle:	
Proper feeding practices	6
Amount to use with meal for wintering	4
Amount to feed growing calves	2
Results of latest feeding experiments	2
How to bring steers on feed	1
Use in fitting purebred cattle	1
Information on feeding dairy cattle:	
Proper feeding practices	8
Effect on milk test	1
Effect on freshening cows	1

TABLE XLVI

REPLIES TO THE QUESTION: "DO YOU THINK MORE FEEDING OF HULLS AND MEAL TO LIVESTOCK SHOULD BE ENCOURAGED?", 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Item	Number and percent of farmers	
	Number	Percent
Hulls		
Yes	158	54.5
No	81	27.9
No opinion	51	17.6
Total	290	100.0

Meal		
Yes	277	95.5
No	6	2.1
No opinion	7	2.4
Total	290	100.0

frequently mentioned reasons given for encouraging more use of hulls by farmers (Table XLVII).

Most of the reasons given against the encouraging of more feeding of hulls related to the relatively low food value of hulls and to economic factors. Over 40 percent of the reasons given against the proposal were that the food value of hulls is too low to advocate them as a feed for livestock. Thirty-six percent of the reasons in opposition to the proposal were that farmers should produce all roughages required on their farms. Other replies were that roughages better than hulls were available to farmers in the area, and that hulls were not an economical feed (Table XLVIII).

The reasons given for and against encouraging more feeding of hulls to livestock indicate that hulls have a place in livestock feeding programs in the area. However, their principal value seems to be in supplementing other roughages of better quality.

Cottonseed Meal

Why Farmers Fed Meal

Over 200 of the farmers who fed meal stated that the principal reason for its use was as a source of protein. While the need for a protein supplement in the area seems to be well established, other reasons given for the use of meal are more indicative of why it was used in preference to other protein supplements.

TABLE XLVII

REASONS WHY THE USE OF COTTONSEED HULLS BY LIVESTOCK FEEDERS SHOULD BE ENCOURAGED, 158 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Why the Feeding of Hulls Should be Encouraged	Number and percent of reasons	
	Number	Percent
Price and economic reasons	85	39.5
A good filler	55	25.6
Help cotton growers	23	10.7
Convenient to feed	14	6.5
Gives good results	12	5.6
A good emergency feed	9	4.2
Available when needed	9	4.2
Little waste in feeding	6	2.8
No harmful effects	2	.9
Total	215	100.0

TABLE XLVIII

REASONS WHY THE USE OF COTTONSEED HULLS BY LIVESTOCK FEEDERS SHOULD NOT BE ENCOURAGED, 81 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Why the Feeding of Hulls Should Not Be Encouraged	Number and percent of reasons	
	Number	Percent
Food value of hulls too poor	36	40.4
Farmers should produce all roughages required	32	36.0
Too many roughages better than hulls	11	12.5
Not an economical feed	5	5.6
Would increase demand and raise price	2	2.2
Every feeder should decide for himself	2	2.2
Cows don't like them	1	1.1
Total	89	100.0

Generally satisfactory results⁴ was the reason given by 198 farmers for the use of cottonseed meal. Typical statements of the reasons meal was fed were "cattle do better on meal", "get faster gains", or "best feed on the market." Price and economic factors were given by 131 farmers as the reason for feeding meal. The implication was that meal was relatively lower in price than other protein supplements or gave higher returns per feed dollar. The availability of meal when needed ranked as an important reason for its use. Other reasons given for feeding meal were to balance the ration, to help cotton growers, and ease and convenience of feeding (Table XLIX).

The need for a protein supplement in the area and the suitability of meal to supply this need tend to give it a firm place in the farm economy of the area.

Why More Meal Was Not Fed

Possible injury to the livestock fed was given by 113 of the 287 farmers who fed meal as the reason why more meal was not fed. The proportion of farmers who believed that injury may result to livestock if fed more meal is large enough to be a deterring factor should an increased rate of feeding be proposed. General satisfaction with the results from the amounts fed was the reason given by 83 farmers for not changing the ration of meal. Forty-three farmers said the ration would become unbalanced if more meal were fed. Price and economic factors were

⁴Many of the reasons in this classification had price and economic implications, but were not so classified because of their indefiniteness.

TABLE XLIX

REPLIES TO THE QUESTION "WHY DO YOU FEED COTTONSEED MEAL?", 287 FARMERS
FIVE WEST TENNESSEE COUNTIES, 1948-49

Item	Number and percent of reasons	
	Number	Percent
As a source of protein	202	29.6
Generally satisfactory results	198	29.0
Price and economic reasons	131	19.2
Readily available	55	8.1
To balance ration	47	6.9
To help cotton growers	22	3.2
Convenient to use	20	2.9
All other	7	1.1
Total	682	100.0

the reasons 42 farmers did not feed more meal. Price as a factor in discouraging the use of more meal was construed to mean that returns from feeding more meal would not justify the additional costs involved. Availability of other concentrates on the farm was another reason for not feeding more meal (Table L).

Why Less Meal Was Not Fed

The reason given by 223 farmers for not reducing the amount of meal fed to livestock was that the amounts they fed were necessary for desirable results. Forty-nine farmers said the ration would become unbalanced if less meal was fed. Price and economic reasons were given by 21 farmers as reasons for not feeding less meal. The latter reason implies that prices of similar feeds were relatively higher or that returns would be less if less meal were fed (Table L).

The reasons why more and why less meal was not fed tend to further establish the necessity for some protein supplement in the area, and the suitability of meal to supply this need.

Cottonseed Meal Compared to Soybean Meal

Although cottonseed meal and soybean are closely comparable to each other with respect to feeding value and feeding characteristics, the farmers studied had a strong tendency to prefer cottonseed meal for most of the classes of livestock fed. Hog producers were an exception. However, many of the farmers had no experience with soybean meal as a feed for livestock.

The proportion of dairymen and beef cattle producers who preferred

TABLE L

REPLIES TO THE QUESTION, "WHY DO YOU NOT FEED MORE (OR LESS) COTTONSEED MEAL?", 287 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Item	Number and percent of reasons	
	Number	Percent
Why more meal was not fed		
May cause harmful effects	113	36.8
Amount fed was satisfactory	83	27.0
Would unbalance ration	43	14.0
Price and economic reasons	42	13.7
Has other concentrates	19	6.2
Animals won't eat more	4	1.3
Advised not to	2	.7
Meal not available	1	.3
Total	307	100.0

Why less meal was not fed		
Present amount fed is necessary for desired results	223	71.9
Would unbalance ration	49	15.8
Price and economic reasons	21	6.8
Present amount is satisfactory	16	5.2
Advised not to	1	.3
Total	310	100.0

cottonseed meal was significantly higher than those who preferred soybean meal or who had no preference. The fact that most of the farmers were also cotton growers undoubtedly influenced their preference for cottonseed meal (Table LI).

Hog producers tended to prefer soybean meal as a protein supplement for hogs. However, almost one-fourth of the hog producers had no preference between cottonseed and soybean meal. The fact that hogs are susceptible to gossypol poisoning from cottonseed meal, which is not true of soybean meal, was probably the principal reason for the preference for soybean meal⁵ (Table LI).

The conclusion is that cottonseed meal tends to be preferred in its area of production, with other factors remaining the same.

Ill-effects to Livestock Believed to Result from Feeding Meal

It was shown that the principal reason that farmers did not feed more meal was that ill-effects to the livestock might occur. "If fed too much" was a qualifying phrase in practically all of the cases of livestock injury reported. The exact amount of how much meal was "too much" was not usually specified.

Sixty-three dairymen believed that feeding too much meal to dairy cows would result in ill-effects. Udder trouble, in the form of caked udders and hardened quarters, was the kind of ill-effect most reported. Digestive troubles, resulting in lessened appetite and a drop in milk production, were the second most important kinds of injuries resulting

⁵Marrison, op. cit., p. 884.

TABLE LI

REPLIES TO THE QUESTION: "HOW DOES COTTONSEED MEAL COMPARE TO SOYBEAN MEAL AS A FEED FOR EACH KIND OF LIVESTOCK YOU RAISED?", 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Item	126 Beef Cattle Producers		141 Dairymen		92 Hog Producers	
	Number and percent of farmers					
	No.	Pct.	No.	Pct.	No.	Pct.
Cottonseed meal better	4	34.9	43	30.5	13	14.1
Soybean meal better	5	4.0	13	9.2	34	37.0
About the same	30	23.8	35	24.8	21	22.8
Don't know	47	37.3	50	35.5	24	26.1
Total	126	100.0	141	100.0	92	100.0

TABLE LII

NUMBER OF FARMERS REPORTING HARMFUL EFFECTS THAT MAY RESULT TO LIVESTOCK FROM FEEDING COTTONSEED MEAL, BY CLASS OF LIVESTOCK AFFECTED, FIVE WEST TENNESSEE COUNTIES, 1948-49

63		46		25	
Kind of	Dairymen	Beef Cattle	Kind of	Hog	Producers
Harmful Effect	Number of Farmers	Kind of Harmful Effect	Number of Farmers	Kind of Harmful Effect	Number of Farmers
Udder trouble	24	Scours	27	Toxic effect	7
Gets cows "off-feed"	13	Blindness on long feed	13	Kills pigs	6
Scours	10	Overheating in summer	4	Scours	6
"Burns-out" cows	8	Sore feet on long feed	3	Blindness	4
Blindness	7	Gets cattle "off-feed"	2	Digestive troubles	3
Milk production drops	6	Causes hair to come off	2	"Thumps"	2
Overheating in summer	3	Makes yellow fat	1	Overheating in summer	1
Affects flavor of milk	2	Causes poor breeding	1	Sore feet if fed for long period	1
Causes poor breeding	2				
May cause death	1				
Causes hair to come off	1				
Constipation	1				
Total*	78	Total*	53	Total*	30

*Totals are greater than number of farmers reporting possible ill-effects because several reported more than one ill-effect.

from feeding too much meal. Other ill-effects to dairy cows were scours, "burned-out" cows, and blindness (Table LII).

Numerous experiments have been conducted by various agricultural experiment stations on the extent of cottonseed meal injury to milk cows. The concensus of the findings were that large quantities of meal can be fed without injury to dairy cows provided plenty of Vitamin A is included in the ration.⁶

Scours was the most frequently mentioned ill-effect believed to result from feeding meal to beef cattle. Twenty-seven beef cattle producers reported the above effect from feeding too much meal. Blindness resulting from feeding a heavy ration of meal over long periods of time was reported by 13 beef cattlemen. Overheating in the summer and lameness were other ill-effects believed to be caused by feeding too much meal (Table LII).

The same conditions affecting the possibility of cottonseed meal injury to dairy cattle apply to beef cattle. Most of the alleged injuries resulting from feeding meal to beef cattle are actually caused by deficiencies in the ration and not by the toxic effect of meal.⁷

Seven farmers said that too much meal was toxic to hogs, and six farmers said meal would be fatal if fed to pigs. Scours, blindness, and digestive troubles were also reported to result from feeding meal to hogs (Table LII).

⁶Morrison, op. cit., p. 531.

⁷Morrison, op. cit., p. 669.

Actually, injury from feeding meal is more likely to occur to pigs and hogs than any other class of livestock.⁸

Sources of Information Used by Farmers on Feeding Meal

About 40 percent of the farmers stated that they used little or no information on the feeding of meal to livestock other than their own experience.⁹

The most important source of information was the University of Tennessee and the farmers' bulletins published by agencies of the University. Over 18 percent of the farmers used the above services. Farm magazines were the next most important source of information, being used by nearly 18 percent of the farmers. The National Cottonseed Products Association publishes an annual feeding practices bulletin that was used by 17 percent of the farmers.¹⁰ Sixteen percent of the farmers obtained feeding information from other farmers. County agents, extension workers, and the West Tennessee Experiment Station were also frequently used sources of information. As in the case for hulls, the proportion of farmers utilizing the services of their county agent and the West Tennessee Experiment Station was significantly higher in Madison County. Morrison's Feeds and Feeding and agricultural teachers were other sources of information used (Table LIII).

While information sources were not significantly related to

⁸Morrison, op. cit., p. 884.

⁹See footnote, p. 124.

¹⁰Based on the results of agricultural experiment stations.

TABLE LIII

SOURCES OF INFORMATION USED ON THE FEEDING OF COTTONSEED MEAL, 287 FARMERS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Sources of Information	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Little or no information	18	30.0	28	46.7	24	40.0	19	31.7	25	52.1
U. T. and W. T. bulletins	15	25.0	16	26.7	12	20.0	1	1.7	9	18.8
Farm magazines	9	15.0	22	36.7	10	16.7	7	11.7	3	6.2
Local oil mills and MCPA ^a	9	15.0	14	23.3	16	26.7	6	10.0	5	10.4
Other farmers	15	25.0	6	10.0	7	11.7	12	20.0	7	14.6
County agents & extension workers	10	16.7	3	5.0	4	6.7	21	35.0	5	10.4
West Tennessee Experiment Station	5	8.3	1	1.7	4	6.7	17	28.3	2	4.2
Feeds & Feeding ^{a,b}	6	10.0	7	11.7	9	15.0	1	1.7	1	2.1
Vo. agriculture and vet. teachers	5	8.3	2	3.3	2	3.3	3	5.0	4	8.3
Other	7	11.7	7	11.7	5	8.3	6	10.0	6	12.5
Total farmers ^c	60	-	60	-	60	-	59	-	48	-

^aNational Cottonseed Products Association.

^bMorrison, op. cit.

^cTotal of number and percent is greater than 287 and 100.0 because many farmers used more than one source of information.

specific feeding practices, the various media used would be important in disseminating further information on feeding practices. Over half of the farmers obtained information on feeding meal from various sources. The total effect of any particular media would be difficult or impossible to measure, but is nonetheless valuable from the standpoint of the dissemination of information.

Kinds of Information Desired by Farmers on the Feeding of Meal

Nearly all of the farmers said they were interested in obtaining further information on the feeding of meal. However, few farmers were specific in the kind of information desired. Information on recommended feeding practices for all classes of livestock was desired by 186 of the farmers who fed meal. The value of meal as a feed and the economy of its use was the most frequently mentioned specific kind of information desired. The maximum amount of meal that can be fed safely to all classes of livestock was information desired by 11 farmers (Table LIV).

Seven of the 184 beef cattle farmers requested information on the amount of meal necessary to winter beef cattle. Also, four farmers wanted the results of recent experiments on feeding meal to beef cattle at agricultural experiment stations.

Dairy farmers were even less specific than beef cattlemen on the kinds of additional information desired. Eight of the 142 dairymen wished information on feeding meal to dairy cows. Three others wanted to know the value of meal as a milk and butterfat producer.

Eight hog producers were interested in more information on general feeding practices, and three wanted the results of feeding

TABLE LIV

INFORMATION DESIRED BY 271 FARMERS ON COTTONSEED MEAL AS A FEED
FOR LIVESTOCK, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kind of Information	Number of Farmers
Information applicable to all classes of livestock:	
Recommended feeding practices	186
Value as a feed; economy of use	13
Maximum amount that can be fed safely	11
Possibility of crushing own seed	1
The results of this study	1
Why food value of meal has decreased	1
How to feed on pastures	1
Information on feeding beef cattle:	
Amount to feed for wintering cattle	7
General recommended practices	6
Results of feeding experiments	4
Amount to feed calves at various ages	2
How to feed on pasture, with corn	1
Use in fitting purebreds	1
Use in dry lot feeding	1
Information on feeding dairy cattle:	
General recommended practices	7
Value in producing milk and butterfat	3
Effect on freshening cows	1
How to feed dairy calves	1
How to feed dry cows and heifers	1
Information on feeding hogs:	
General recommended practices	8
Results of feeding experiments	3
Amount to feed with home-grown feeds	1
How to bring hogs on feed	1
How to prevent scours and thumps	1

trials at agricultural experiment stations.

While farmers were not clear on the specific kinds of information desired on the feeding of meal, their attitude toward additional information was favorable. This attitude would be worth considering in a program to expand the use of cottonseed products.

Attitudes Toward Encouraging More Feeding of Meal to Livestock

Over 95 percent of the farmers said that more feeding of meal to livestock should be encouraged. Seven farmers had no opinion, and only six were opposed (Table XLV).

Price and economic factors was given by over half of the farmers as the reason for encouraging more feeding of meal. Interpretation of the colloquial terms used by the farmers indicated that meal was the "best feed for the money." Closely related to price were quality factors, given by 128 farmers as reasons for more use of meal. Quality was distinguished from price in that meal was the "best feed" rather than the "best feed for the money." The general ability of meal to produce milk and meat accounted for 18 percent of the reasons given for encouraging its use. The availability of meal when needed amounted to nine percent of the reasons. To help cotton growers, convenience in feeding, and to balance the ration were frequently mentioned reasons for more feeding of meal (Table LV).

The opinions of farmers who fed meal toward encouraging more feeding of meal to livestock indicated that price and economic factors were the principal reasons why meal was used.

Reasons for opposing more feeding of meal by farmers were that

TABLE LV

REASONS WHY THE USE OF COTTONSEED MEAL BY LIVESTOCK FEEDERS
SHOULD BE ENCOURAGED, 277 FARMERS, FIVE WEST TENNESSEE COUNTIES,
1948-49

Why the Feeding of Meal Should Be Encouraged	Number and percent of reasons	
	Number	Percent
Price and economic factors	150	32.6
Quality factors	128	27.8
General results; production ability	84	18.4
Available when needed	41	8.9
Help cotton growers	25	5.4
Convenient to feed	18	3.9
Needed to balance ration	12	2.6
Farmers are familiar with its use	2	.4
Total	460	100.0

farmers should decide individually what feeds to use without encouragement, and that price was prohibitive of more feeding of meal.



CHAPTER VII

SUMMARY

Purchasing Practices

Cotton oil mills were the most important sources of supply for cottonseed feed products. Ninety-five percent of the hulls and 91 percent of the meal purchased by the 290 farmers were bought directly from the oil mills. The remainder was purchased from retail supply sources. The price of both hulls and meal was significantly lower at the oil mills.

Hulls were readily available to purchase when desired by 82 percent of the farmers. Eighty-five percent of the farmers could buy meal when needed.

Fifty-nine percent of the 290 farmers used hulls at some time during the year. All but three of the farmers fed cottonseed meal.

The average size of purchase was one ton for meal and over six tons for hulls. Price tended to be lower for both products when purchased in large quantities. Also, the number of purchases necessary to meet feeding requirements was less as the size of purchases increased. Savings in both price and transportation costs could be made by farmers purchasing hulls and meal in large quantities. Quantity purchases would also enable farmers to take advantage of seasonal price movements.

The potential supply of hulls, as determined by the number of oil mills in each area, was directly related to the proportion of farmers who fed hulls and to the amount of hulls purchased by each

farmer. The total amount of meal purchased per farmer was also directly related to the number of oil mills in each area.

Hulls are more likely to be used in areas that do not produce enough roughages to meet livestock feeding requirements. In such areas, most of the land on livestock farms will be needed for pasture.

Distance was apparently a factor in the use of hulls. Few farmers hauled hulls for over 25 miles.

A pricing policy by oil millers offering discounts on quantity purchases was indicated to be a feasible method of increasing the sales of hulls and meal.

Dairying

Commercial dairy cattle consumed 55 percent of the hulls and 46 percent of the meal purchased by the 290 farmers. Milk cows fed cottonseed feed products consumed slightly over one ton of hulls and 588 pounds of meal per head for the one-year period. Amounts fed ranged from 65 pounds to over 3000 pounds per cow for hulls and from 40 to over 1000 pounds per cow for meal.

Few dairymen approached the maximum amount of meal that can safely be fed daily to milk cows. About six pounds daily was the largest amount fed to any of the dairy herds. Milk cows were fed an average of two pounds of meal per head daily during the winter season and 1.7 pounds during the summer months. It is technically possible to approximately quadruple the above amounts. However, the relative

prices of meal and other dairy feeds will determine the proportions fed of each. The proportion of meal in the ration was directly associated with the supply.

The kinds of pastures available affected the extent to which meal was used. Dairy herds were fed at a lesser rate when winter pastures were available and a few herds were fed no meal when they had access to winter pastures. The proportion of legumes in summer pastures had a significant effect on the use of meal. Forty of the 58 herds not fed meal in the summer months had access to dominantly leguminous pastures. Further, the total requirements of meal were less on winter pastures and on leguminous summer pastures.

The daily ration of hulls could be increased provided well-cured hay or pastures are used. The relative prices of other roughages would determine the extent to which hulls are used.

Hulls were used in greater quantity in areas where insufficient roughages are produced to meet feeding requirements. The Memphis area, where most of the land is needed for pasture, is illustrative of the above case.

Commercial dairy feeds tend to reduce the requirements of meal in the Memphis area because less grain is produced on the farms than in other areas. Since nearly all of the concentrate must be purchased, it is probably more economical to buy mixed feeds.

Eleven percent of the commercial dairy cows were not fed meal and 61 percent were not fed hulls. Also, 76 percent of the dairy calves and heifers were fed neither hulls nor meal. It is thus indicated that more use of cottonseed feed products could be made on farms where they were

already in use. However, the kinds and amounts of other feeds available would determine the extent to which hulls and meal were used.

Hulls were fed 75 percent of the total days possible, while meal was fed only one-third of the total days possible for the one-year period.

Sixty percent of the dairy herds were fed meal the year round; only 19 percent were fed hulls the year round. More extensive use of hulls and meal during the summer months would be largely determined by the kinds and amounts of pastures available.

Beef Cattle

Beef cattle were second in importance as consumers of hulls and meal. More cottonseed feed products were fed to fattened beef cattle than to other classes of beef cattle.

The greatest possibilities for increasing the consumption of hulls and meal in the beef cattle industry are to increase the number of animals fed. Only one-third of all beef cattle on the 290 farms were fed cottonseed feed products. Nearly half of the beef cows and three-fourths of other cattle fed maintenance rations were potential markets for hulls and meal. Half of the beef cattle fattened were fed neither hulls nor meal. Nearly two-thirds of the cattle fattened on pasture were not fed hulls or meal, compared with less than one-fourth not fed either product on the dry lot.

The possibility of increasing the rate of feeding meal to beef cattle is somewhat limited. Meal was fed to beef cows at a rate border-

ing on extravagance, considering the other feeds in the ration. Calves and yearlings were also fed amounts of meal that approached the maximum amounts recommended by recognized authorities. While fattened beef cattle were not fed maximum amounts of meal, higher rates of feeding would be adopted only when meal was relatively cheaper than other feeds. Pastures and legume hay in the ration tended to reduce the rate at which meal was fed to all classes of beef cattle.

The rate at which hulls are fed to beef cattle could be increased when well-cured hay or pastures are included in the ration. Most of the cows, calves, and yearlings that were fed hulls had access to winter pasture. Hulls were fed for longer periods, and more per animal was fed to cattle pastured. More extensive use of winter pastures would probably lead to more use of hulls for the supplementary feeding of beef cattle.

Hulls were used more extensively to fatten cattle on the dry lot than on pasture. More herds were fed hulls on the dry lot, and the amount fed per head was greater than for other methods of fattening.

Cows, calves, and yearlings were fed more meal per head and for 30 days longer when on winter pastures. Since only one-third of the cattle wintered had access to winter pasture, the increased use of winter pasture would help to increase the consumption of meal by beef cattle.

Fattened beef cattle were fed more meal per animal on winter pasture. The heavier rate of feeding on winter pasture was the principal reason for the above fact. The rate of feeding meal to fattened cattle on summer pastures was lighter than for other methods, but the feeding period was long enough to result in fairly high amounts per animal.

There seems to be little possibility for a substantial lengthening of the feeding period for all classes of beef cattle. Cattle fed maintenance rations do not usually need supplements after spring pastures become available. Also, the many factors affecting the length of time fattened beef cattle are kept on feed tend to limit the length of the feeding period. While cattle fattened on summer pastures were fed for longer periods than by other methods, the total amount of hulls and meal consumed per head would not be increased due to lesser feeding rates.

Hogs

Hogs offer several possibilities for the expanded use of meal. Nearly half of the hogs fattened were fed meal; the remainder were a market not reached by the cottonseed products industry. Only three percent of the brood sows were fed meal.

Fattened hogs were fed one-half pound of meal per head daily. The daily ration of meal for hogs was directly associated with the supply. The amount of meal consumed by hogs depends on the ratio of meal to other protein supplements in the ration. The average ratio of meal to other protein supplements was 1:2.2. This ratio could be increased in the favor of meal by from two to three times without exceeding the safe limits for hogs as recommended by authorities. The price of meal in relation to the price of other proteins is the principal factor determining the proportion of meal used in the ration.

The length of the feeding period for hogs fed meal could have been increased by from 30 to 75 days by starting pigs on meal at an

earlier date.

Attitudes and Opinions of Farmers

Cottonseed Hulls

The reasons farmers gave for using hulls indicate that they have a definite but limited position in the farm economy of the area. The technical and economic characteristics of hulls indicate that their principal value is to supplement other roughages and pastures.

Attitudes expressed by the farmers indicated that the rate hulls are fed will not be substantially changed.

The farmers indicated that they have a fair knowledge of the food value of hulls, and tend to prefer them over roughages of comparable quality.

Possible ill-effects believed to result from feeding hulls are not important enough to greatly deter their continued use.

The most important sources of information used by farmers on the feeding of hulls were the University of Tennessee and its agencies, the National Cottonseed Products Association, farm magazines, and other farmers. However, 48 percent of the farmers said they obtained little or no information on recommended practices in feeding hulls. Sixty-three percent of the farmers desired more information on the feeding of hulls and of these 29 percent asked for specific kinds of information.

The proportion of farmers favoring increased use of hulls by livestock feeders was slightly less than the proportion who fed hulls. The principal reason for favoring greater use of hulls was that they

could be used to economic advantage by most of the farmers in the area. Most of the reasons against more use of hulls related to their poor food value.

Cottonseed Meal

Reasons stated or implied for the use of meal were that meal gave higher returns per feed dollar than comparable feeds. Availability of meal was also an important factor. The ability of meal to supply the protein requirements of livestock tend to give it a firm place in the economy of the area.

The belief that heavier feeding of meal may injure livestock was important enough to be a deterring factor should increased feeding rates be advocated. However, the amounts fed will probably not be decreased unless the price of meal becomes relatively higher.

Nearly half of the dairymen and about one-third of beef cattle producers believed that injury to livestock may result if fed too much meal. Udder trouble and digestive disorders were the most important ill-effects reported. Scours and blindness were also attributed to meal. The need for accurate information on the proper use of meal is indicated.

Few hog producers reported cottonseed meal injury, despite the fact that hogs are more susceptible to meal injury than other classes of livestock.

Sources of information used by farmers on the feeding of meal were the same as used for hulls. However, more use was made of each

of the information services. Forty percent of the farmers obtained little or no information on the feeding of meal.

Nearly all of the farmers desired further information on feeding meal and few were specific in the kinds of information desired. A publication on recommended practices for meal would probably be utilized by many farmers.

Over 95 percent of the farmers favored more feeding of meal to livestock. Principal reasons were favorable prices, economic factors, and quality factors. Interpretation of colloquial terms indicated that meal was the "best feed for the money."

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APPENDIX A

Enumerator _____

Schedule No. _____

Date _____

PRACTICES OF FARMERS USING COTTONSEED HULLS AND MEAL

I. Characteristics of Livestock Feeders

Name _____ County _____ C.D. _____

Tenure now _____ Years as landlord _____ Tenant _____ Owner-Operator _____

Age _____ Highest grade completed in school _____

Acres in farm _____ Cropland _____ Pasture _____ Woodland _____

No. beef cattle: Cows _____ Calves _____ Yearlings _____ Above yearlings _____

No. beef cattle fattened on pasture _____ Dry lot _____

No. hogs: sows _____ Pigs raised for market _____

No. sheep: ewes _____ fat lambs marketed _____

No. workstock _____ No. chickens _____

No. dairy cows _____ Cows for family use _____

Sales of milk 1948 (lbs.) _____ Cream 1948 (lbs.) _____

Chief source of farm income 1948 _____

II. Origin, Cost, and Method of Purchase

1. From what oil mill or agency do you buy cottonseed: _____

a. Hulls _____ b. Meal _____

2. a. How much hulls do you buy at one time _____ b. Meal _____

c. About how many tons of hulls did you use in 1948 _____ d. Meal _____

3. a. Do you buy mixed feed containing cottonseed meal _____

b. Protein content _____

4. a. Were you able to buy hulls wholesale _____ b. Meal _____

5. a. What did the hulls cost per ton in 1948 _____ b. Range in price _____

6. a. What did the meal cost per ton in 1948 _____ b. Range in price _____
7. a. Do you ever use any cottonseed cake _____ b. If so, in what form _____
 _____ c. How much in 1948 _____
8. a. Can you always buy as much hulls as you wish at one time _____
 b. Meal _____
9. Comments -

III. Feeding Schedule for Each Class of Livestock

(Milk cows, dairy heifers, dairy calves, beef cows, beef calves, yearling steers, 2-year steers, brood sows, fattening hogs, breeding ewes, fattening lambs, workstock, laying hens, friers.)

1. Pounds fed per day: a. Hulls _____ b. Meal _____
2. Percent of total ration: a. Hulls _____ b. Meal _____
3. Other feeds Roughages: a. Kind (1) _____ b. Pounds _____
 in ration Kind (2) _____ Pounds _____
 Kind (3) _____ Pounds _____
- Other Concentrates: c. Kind (1) _____ d. Pounds _____
 Kind (2) _____ Pounds _____
 Kind (3) _____ Pounds _____
- Minerals:* e. Kind (1) _____ f. Pounds _____
 Kind (2) _____ Pounds _____
4. Times fed per day: a. Hulls _____ b. Meal _____
5. Length of feeding period Days: a. Hulls _____ b. Meal _____
 Dates: a. Hulls _____ b. Meal _____

6. a. Do you mix cottonseed with hulls _____ b. If so, why _____

7. Pasture a. Do you feed hulls while livestock is on pasture _____

b. Meal _____ Is your pasture: c. Good _____

d. Fair _____ e. Poor _____

f. Kind of pasture** _____

* Salt, bone meal, etc.

** Include number of legumes and proportion of each grass or legume.

8. Describe method of feeding:

IV. Attitudes Toward Cottonseed Hulls and Meal

1. a. Why do you use hulls _____

b. Meal _____

2. a. Why don't you use more hulls _____

b. Less hulls _____

c. More meal _____

d. Less meal _____

3. a. Where do you get your information on how to feed hulls _____

b. Meal _____

c. Would you like to obtain more information about hulls _____

d. About meal _____ e. If so, what kind of information _____

4. a. To what other feed is hulls equivalent to _____

b. How do you think hulls as a roughage compares with oat straw _____

5. In your opinion how does cottonseed meal compare with other concentrates, such as soybean meal, as a feed for each kind of livestock you raised:

Beef Cattle _____ Dairy Cattle _____ Hogs _____

Sheep _____ Workstock _____ Poultry _____

6. What percent of your feeding of cottonseed meal has been replaced by soybean meal in the past 4 years in feeding: _____

a. Dairy cows _____ b. Beef cattle _____ c. Hogs _____

7. a. Do you believe cottonseed meal has any harmful effects on livestock or livestock products _____ b. If so, what _____

c. Do hulls have any harmful effects on livestock or livestock products _____ d. If so, what _____

8. a. Do you feed hulls to prevent bloat or scours _____

b. If so, when and how fed _____

9. a. Do you feed meal to prevent bloat or scours _____

b. If so, when and how fed _____

10. a. For how many years have you fed cottonseed hulls _____ b. Meal _____

11. a. Do you believe we should encourage more livestock feeding of cottonseed hulls _____ b. Why _____

c. Meal _____ d. Why _____

12. Comments - _____



APPENDIX B

TABLE I

AGE DISTRIBUTION OF 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Age (Years)	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
Number and percent of farmers												
Under 25	2	3.3	0	0.0	0	0.0	0	0.0	2	4.0	4	1.4
25 - 34	8	13.3	7	11.6	11	18.4	8	13.3	11	22.0	45	15.5
35 - 44	18	30.0	18	30.0	15	25.1	13	21.7	6	12.0	70	24.1
45 - 54	13	21.7	15	25.1	16	26.7	13	21.7	15	30.0	72	24.8
55 - 64	11	18.4	13	21.7	12	19.8	17	28.3	9	18.0	62	21.4
65 and over	8	13.3	7	11.6	6	10.0	9	15.0	7	13.0	37	12.8
Total	60	100.0	60	100.0	60	100.0	60	100.0	50	100.0	290	100.0
Average age		47.7		48.5		47.5		49.6		47.4		48.2
Median age		45.0		46.0		47.0		50.5		48.0		47.0
County avg. (all farmers)*		49.4		44.0		47.3		46.9		48.9		47.3

*From 1945 census data.

TABLE II

DISTRIBUTION BY YEARS OF SCHOOL COMPLETED, 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

School Years Completed	County											
	Obion			Dyer			Gibson			Madison		
	No.	Pct.	No.	No.	Pct.	No.	No.	Pct.	No.	No.	Pct.	No.
	Number and percent of farmers											
0-4	7	11.7	2	3.3	3	5.0	1	1.7	3	6.0	16	5.5
5-7	6	10.0	4	6.7	5	8.3	6	10.0	4	8.0	25	8.6
8	9	15.0	10	16.7	18	30.0	12	20.0	13	26.0	62	21.4
9-11 (Some H. S.)	16	26.7	18	30.0	13	20.7	14	23.3	10	20.0	71	24.5
12 (H. S. Grad.)	14	23.3	19	31.7	12	20.0	15	25.0	13	26.0	73	25.2
13-15 (Some Coll.)	5	8.3	2	3.3	6	10.0	7	11.7	2	4.0	22	7.6
16 or more	3	5.0	5	8.3	3	5.0	5	8.3	5	10.0	21	7.2
Total	60	100.0	60	100.0	60	100.0	60	100.0	50	100.0	290	100.0
Average years	9.4			10.4			9.7			10.8		
Median years	10.0			10.0			9.0			11.0		

TABLE III

DISTRIBUTION BY TENURE, 290 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Tenure	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.
	Number and percent of farmers									
Landlord	7	11.6	2	3.3	0	0.0	0	0.0	1	2.0
Owner-operator	31	51.7	50	83.4	55	91.6	47	78.3	29	58.0
Tenant	21	35.0	5	8.3	4	6.7	10	16.7	14	28.0
Manager	1	1.7	3	5.0	1	1.7	3	5.0	6	12.0
Total	60	100.0	60	100.0	60	100.0	60	100.0	50	100.0

TABLE IV

SIZE DISTRIBUTION OF FARMS, BY ACRES, 290 FARMS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Size of Farm (Acres)	County					Total	
	Obion	Dyer	Gibson	Madison	Shelby	No.	Percent of Farms
	Number of farms						
30-49	2	1	3	1	4	11	3.8
50-69	6	2	3	4	1	16	5.5
70-99	11	4	10	3	5	33	11.4
100-139	7	10	11	3	7	38	13.1
140-179	8	8	8	6	5	35	12.1
180-219	11	5	6	5	6	33	11.4
220-259	3	7	4	6	4	24	8.3
260-379	4	12	8	16	10	50	17.2
380-499	5	2	4	2	1	14	4.8
500-699	3	4	3	6	2	18	6.2
700-999	0	2	0	6	0	8	2.8
1000 & over	0	3	0	2	5	10	3.4
Total	60	60	60	60	50	290	100.0
Average acres	193	472	193	345	377	314	
Median acres	155	248	167	335	216	205	

TABLE VI

LIVESTOCK ON FARMS WHERE COTTONSEED FEED PRODUCTS WERE USED, 290 FARMS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Class of Livestock	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Avg.	No.	Avg.	No.	Avg.	No.	Avg.	No.	Avg.
	Number of livestock and average per farm									
Beef Cattle										
Cows	897	31.0	1387	53.3	395	13.3	904	28.2	474	26.3
Calves	512	20.5	596	22.9	289	10.0	458	17.6	261	16.3
Yearlings	141	14.1	1300	35.1	170	15.5	164	12.6	120	10.9
Above yearlings	1106	32.5	511	17.6	101	5.3	443	14.8	173	19.2
Total	2566	62.6	3794	71.6	945	27.8	1969	26.9	1028	51.4
Dairy Cattle										
Cows	565	18.2	235	21.4	639	17.7	543	19.4	1484	45.0
Calves & yrlds.	53	13.2	76	9.5	245	15.3	64	32.0	188	20.9
Family cows	57	1.8	140	3.0	67	2.2	99	1.9	48	2.0
Total	675	12.1	451	7.8	1001	17.9	706	12.4	1720	36.6
Brood sows	301	6.7	212	6.1	239	5.4	171	4.1	70	2.4
Ewes	599	59.9	268	44.7	198	66.0	202	33.7	21	21.0
Workstock	127	2.5	255	4.9	161	3.4	382	7.1	267	6.4
Chickens	6635	114.4	8561	142.7	6965	122.2	5318	91.7	3352	72.9

TABLE VIII

LIVESTOCK MARKETING FROM FARMS WHERE COTTONSEED FEED PRODUCTS WERE USED,
290 FARMS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kinds of Livestock Marketed	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.	No.	Ave.
Beef Cattle										
From pasture	743	29.7	2034	40.7	352	23.5	664	30.2	348	24.9
From dry lot	547	68.4	610	50.8	376	41.8	400	80.0	50	50.0
Total	1290	41.7	2644	47.9	728	33.1	1064	40.9	398	26.5
Hogs	6844	134.2	4900	104.3	3372	84.3	1777	43.3	1260	63.0
Lambs	488	54.2	212	35.3	185	61.7	167	30.8	0	0.0
									1072	44.7

TABLE IX

DISPOSITION OF COTTONSEED HULLS PURCHASED BY 171 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

Disposition of Hulls	County											
	Obion		Dyer		Gibson		Madison		Shelby		Total	
	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.
Amount and percent of total												
Beef Cattle												
Heifers, calves, etc.	94.0	19.7	187.1	29.8	9.5	1.8	122.2	12.0	72.0	4.6	484.8	11.6
Cows	65.1	13.6	125.6	20.0	67.6	13.0	274.7	27.1	24.4	8.0	657.4	15.7
Fattened cattle	237.8	49.9	220.7	36.5	31.2	6.0	161.0	15.9	33.4	2.2	693.1	16.5
Total	396.9	83.2	542.4	86.3	108.3	20.8	557.9	55.0	229.8	14.8	1835.3	43.8
Dairy Cattle												
Cows, winter feeding	57.2	12.0	41.4	6.6	143.3	27.5	289.9	28.6	114.0	71.9	1645.8	39.3
Cows, summer feeding	13.4	2.8	30.1	4.8	207.0	39.8	165.0	16.3	120.7	7.8	537.1	12.8
Dairy heifers	8.2	1.7	0.0	0.0	15.9	3.1	0.0	0.0	81.8	5.3	105.9	2.5
Total	78.8	16.5	71.5	11.4	366.2	70.4	455.8	45.0	1316.5	85.0	1288.8	54.6
Sheep	0.4	0.1	5.4	0.8	1.0	.2	0.0	0.0	0.0	0.0	6.8	0.2
Total fed to livestock	476.1	99.8	619.3	98.5	475.5	91.4	1013.7	99.9	1546.3	99.8	4130.9	98.6
Inventroy or use not reported	0.9	0.2	9.4	1.5	45.1	8.6	1.5	0.1	3.1	0.2	60.0	1.4
Total	477.0	100.0	628.7	100.0	520.6	100.0	1015.2	100.0	1549.4	100.0	4190.9	100.0

DISPOSITION OF COTTONSEED MEAL PURCHASED BY 287 FARMERS, FIVE WEST TENNESSEE COUNTIES, 1948-49

175

TABLE XI

KINDS AND AMOUNTS OF ROUGHAGES AND CONCENTRATES FED TO 137 DAIRY HERDS,
WINTER FEEDING PERIOD, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kinds of Roughages and Concentrates	County									
	Obion		Dyer		Gibson		Madison		Shelby	
	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.
	Amount and percent of total									
Roughages										
Cottonseed hulls	57.2	5.8	41.4	11.4	143.3	9.3	289.9	20.7	1114.0	34.8
Legume hay	469.9	47.4	164.3	45.3	687.3	44.7	529.4	37.8	914.5	28.5
Silage	405.7	40.9	156.7	43.3	551.2	35.8	518.4	37.0	987.1	30.8
Grass hay, shucks, etc.	58.3	5.9	---	---	152.6	10.2	62.0	4.5	189.7	5.9
Total	991.1	100.0	362.4	100.0	1534.4	100.0	1399.7	100.0	3205.3	100.0
Concentrates										
Cottonseed meal	61.9	17.0	33.1	20.7	105.5	22.8	128.1	34.1	260.5	19.1
Corn	190.3	52.6	77.1	48.1	242.6	52.6	160.1	42.6	24.3	1.8
Commercial mixed feed	73.7	20.4	17.2	10.7	55.4	12.0	64.8	17.2	936.0	68.6
Small grains	23.8	6.6	23.2	14.5	28.1	6.1	8.1	2.2	33.4	2.4
Other	12.3	3.4	9.5	6.0	30.1	6.5	14.7	3.9	110.5	8.1
Total	362.0	100.0	160.1	100.0	461.7	100.0	375.8	100.0	1364.7	100.0

TABLE XII

KINDS AND AMOUNTS OF ROUGHAGES AND CONCENTRATES FED TO 137 DAIRY HERDS,
SUMMER FEEDING PERIOD, FIVE WEST TENNESSEE COUNTIES, 1948-49

Kinds of Roughages and Concentrates	County										
	Obion		Dyer		Gibson		Madison		Shelby		Total
	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	Tons	Pct.	
Amount and percent of total											
Roughages											
Cottonseed hulls	13.4	15.4	30.1	42.0	207.0	32.4	165.9	45.7	120.7	36.9	537.1 36.1
Legume hay	73.7	84.6	41.5	58.0	314.8	49.2	94.2	25.9	179.7	54.7	703.3 47.2
Silage	—	—	—	—	85.1	13.3	—	—	—	—	85.1 5.7
Grass hay	—	—	—	—	—	—	—	—	—	—	—
shucks, etc.	—	—	—	—	32.9	5.1	103.0	28.4	27.3	8.4	163.2 11.0
Total	87.1	100.0	71.6	100.0	634.8	100.0	363.1	100.0	327.1	100.0	1488.7 100.0
Concentrates											
Cottonseed meal	15.8	14.8	21.4	16.1	93.0	32.0	92.8	31.4	107.9	20.0	330.9 24.3
Corn	69.8	65.6	59.7	44.9	142.8	49.2	138.5	46.9	15.5	2.9	426.3 31.2
Commercial											
mixed feed	4.7	4.4	12.9	9.7	17.5	6.0	43.7	14.8	247.4	45.9	326.2 24.0
Small grains	9.6	9.1	26.8	20.1	7.7	2.6	8.3	2.8	42.2	7.8	94.6 6.9
Other	6.4	6.1	12.3	9.2	29.6	10.2	12.2	4.1	125.6	23.4	186.1 13.6
Total	206.3	100.0	133.1	100.0	290.6	100.0	295.5	100.0	538.6	100.0	1364.1 100.0

TABLE XIII

DISTRIBUTION OF LIVESTOCK FED COTTONSEED FEED PRODUCTS, BY COUNTIES, 290 FARMS,
FIVE WEST TENNESSEE COUNTIES, 1948-49 (CONTINUED)

Class of Livestock	Obion County					Dyer County										
	Number & percent of Livestock on farms					Number & percent of Livestock on farms										
	Fed Meal Only No.Pct.	Hulls No.Pct.	Neither Meal No.Pct.	Fed Meal No.Pct.	Total No.Pct.	Fed Meal Only No.Pct.	Hulls No.Pct.	Neither Meal No.Pct.	Fed Meal No.Pct.	Total No.Pct.						
Beef Cattle																
Cows	314	39	139	17	354	44	807	100	144	10	325	23	918	67	1387	100
Calves, yrlgs., etc.	115	6	216	12	1428	82	1759	100	525	22	401	17	1481	61	2407	100
Total	429	17	455	18	1682	65	2566	100	669	18	726	19	2499	63	3784	100
Beef Fattened																
On pasture	256	35	142	19	345	46	743	100	459	22	219	11	1356	67	2034	100
Dry lot	160	29	217	40	170	31	547	100	256	42	304	50	50	8	610	100
Total	416	32	359	28	515	40	1290	100	715	27	523	20	1406	53	2644	100
Hogs																
Brood sows	0	0	-	-	301	100	301	100	0	0	-	-	212	100	212	100
Fat hogs	3160	46	-	-	3684	54	6844	100	2345	48	-	-	2555	52	4900	100
Total	3160	44	-	-	3985	56	7145	100	2345	46	-	-	2767	54	5112	100
Sheep																
Ewes	54	9	24	4	521	87	599	100	0	0	0	0	268	100	268	100
Lambs	0	0	0	0	488	100	488	100	0	0	60	28	152	72	212	100
Total	54	5	24	2	1009	93	1087	100	0	0	60	12	420	88	480	100
Dairy Cattle																
Cows	334	59	114	20	117	21	565	100	115	49	65	28	55	23	235	100
Calves & yrlgs.	9	17	0	0	44	83	53	100	0	0	11	14	65	86	76	100
Family cows	0	0	0	0	57	100	57	100	0	0	0	0	140	100	140	100
Total	343	51	114	17	218	32	675	100	115	25	76	17	260	58	451	100

TABLE XIII

DISTRIBUTION OF LIVESTOCK FED COTTONSEED FEED PRODUCTS, BY COUNTIES, 290 FARMS,
FIVE WEST TENNESSEE COUNTIES, 1948-49 (CONTINUED)

Class of Livestock	Gibson County					Madison County										
	Number & percent of livestock on farms					Number & percent of livestock on farms										
	Fed Meal Only No.Pct.	Fed Hulls & Meal No.Pct.	Fed Neither No.Pct.	Fed Total No.Pct.	Total No.Pct.	Fed Meal Only No.Pct.	Fed Hulls & Meal No.Pct.	Fed Neither No.Pct.	Fed Total No.Pct.	Total No.Pct.						
Beef Cattle																
Cows	76	20	206	54	103	26	385	100	129	14	458	51	317	35	904	100
Calves, yrlgs, etc.	11	2	20	4	529	94	560	100	30	3	165	15	870	82	1065	100
Total	87	9	226	24	632	67	945	100	159	8	623	32	1187	60	1969	100
Beef Fattened																
On pasture	63	18	116	33	173	49	352	100	0	0	182	27	482	73	664	100
Dry lot	204	57	56	16	96	27	356	100	170	43	117	29	113	28	400	100
Total	267	38	172	24	269	38	708	100	170	16	299	28	595	56	1064	100
Hogs																
Brood sows	27	11	-	-	212	89	239	100	5	3	-	-	166	97	171	100
Fat hogs	1970	58	-	-	1402	42	3372	100	802	45	-	-	975	55	1777	100
Total	1997	55	-	-	1614	45	3611	100	807	41	-	-	1141	59	1948	100
Sheep																
Ewes	171	86	27	14	0	0	198	100	0	0	0	0	202	100	202	100
Lambs	130	70	0	0	55	30	185	100	0	0	0	0	187	100	187	100
Total	301	79	27	7	55	14	383	100	0	0	0	0	389	100	389	100
Dairy Cattle																
Cows	260	38	304	45	115	17	689	100	141	26	388	71	14	3	543	100
Calves & yrlgs.	15	6	14	6	216	88	245	100	0	0	0	0	64	100	64	100
Family cows	0	0	0	0	67	100	67	100	0	0	26	26	73	74	99	100
Total	275	27	328	33	398	40	1001	100	141	20	414	39	151	21	706	100

TABLE XIII

DISTRIBUTION OF LIVESTOCK FED COTTONSEED FEED PRODUCTS, BY COUNTIES, 290 FARMS,
FIVE WEST TENNESSEE COUNTIES, 1948-49

Class of Livestock	Shelby County						Total					
	Number & percent of livestock on farms						Number & percent of livestock on farms					
	Fed Meal Only No.Pct.	Fed Hulls & Meal No.Pct.	Fed Neither Meal No.Pct.	Fed Total No.Pct.	Fed Hulls & Meal No.Pct.	Fed Neither Meal No.Pct.	Fed Meal Only No.Pct.	Fed Hulls & Meal No.Pct.	Fed Neither Meal No.Pct.	Fed Total No.Pct.	Fed Hulls & Meal No.Pct.	Fed Neither Meal No.Pct.
Beef Cattle												
Cows	63	13	219	46	192	41	474	100				
Calves, yrlds, etc.	18	3	91	16	445	81	554	100				
Total	81	8	310	30	637	62	1028	100				
Beef Fattened												
On pasture	85	24	28	8	235	68	348	100				
Dry lot	30	60	20	40	0	0	50	100				
Total	115	29	48	12	235	59	398	100				
Hogs												
Brood sows	0	0	-	-	70	100	70	100				
Fat hogs	523	42	-	-	737	58	1260	100				
Total	523	39	-	-	807	61	1330	100				
Sheep												
Ewes	21	100	0	0	0	0	21	100				
Lambs	-	-	-	-	-	-	-	-				
Total	21	100	0	0	0	0	21	100				
Dairy Cattle												
Cows	167	11	1232	83	85	6	1484	100				
Calves & heifers	0	0	101	54	87	46	188	100				
Family cows	0	0	4	8	44	92	48	100				
Total	167	10	1337	78	216	12	1720	100				

TABLE XIV

DISTRIBUTION OF 137 DAIRY FARMERS FEEDING ROUGHAGES ON SUMMER PASTURE,
BY TYPE OF PASTURE, FIVE WEST TENNESSEE COUNTIES, 1948-49

County	Legumes Dominant						Legumes and Grasses About the Same Proportion						Grasses Dominant											
	Other			No			Other			No			Other			No								
	Rough- ages Fed			Rough- ages Fed			Rough- ages Fed			Rough- ages Fed			Rough- ages Fed			Rough- ages Fed								
	Number & percent of farmers						Number & percent of farmers						Number & percent of farmers											
	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.	No.	Pct.						
Obion	1	5	5	23	16	72	22	100	0	0	8	50	2	50	4	100	0	0	1	33	2	67	3	100
Dyer	2	40	1	20	2	40	5	100	0	0	0	0	5	100	5	100	0	0	0	0	0	0	0	0
Gibson	7	39	4	22	7	39	18	100	5	33	4	27	6	40	15	100	2	40	2	40	1	20	5	100
Madison	5	33	1	7	9	60	15	100	3	75	0	0	1	25	4	100	5	56	1	11	3	33	9	100
Shelby	3	16	3	16	13	68	19	100	3	30	2	20	5	50	10	100	1	33	0	0	2	67	3	100
Total	18	23	14	18	47	59	79	100	11	39	8	21	19	50	38	100	8	40	4	20	8	30	20	100