Kentucky FARM AND HOME Science

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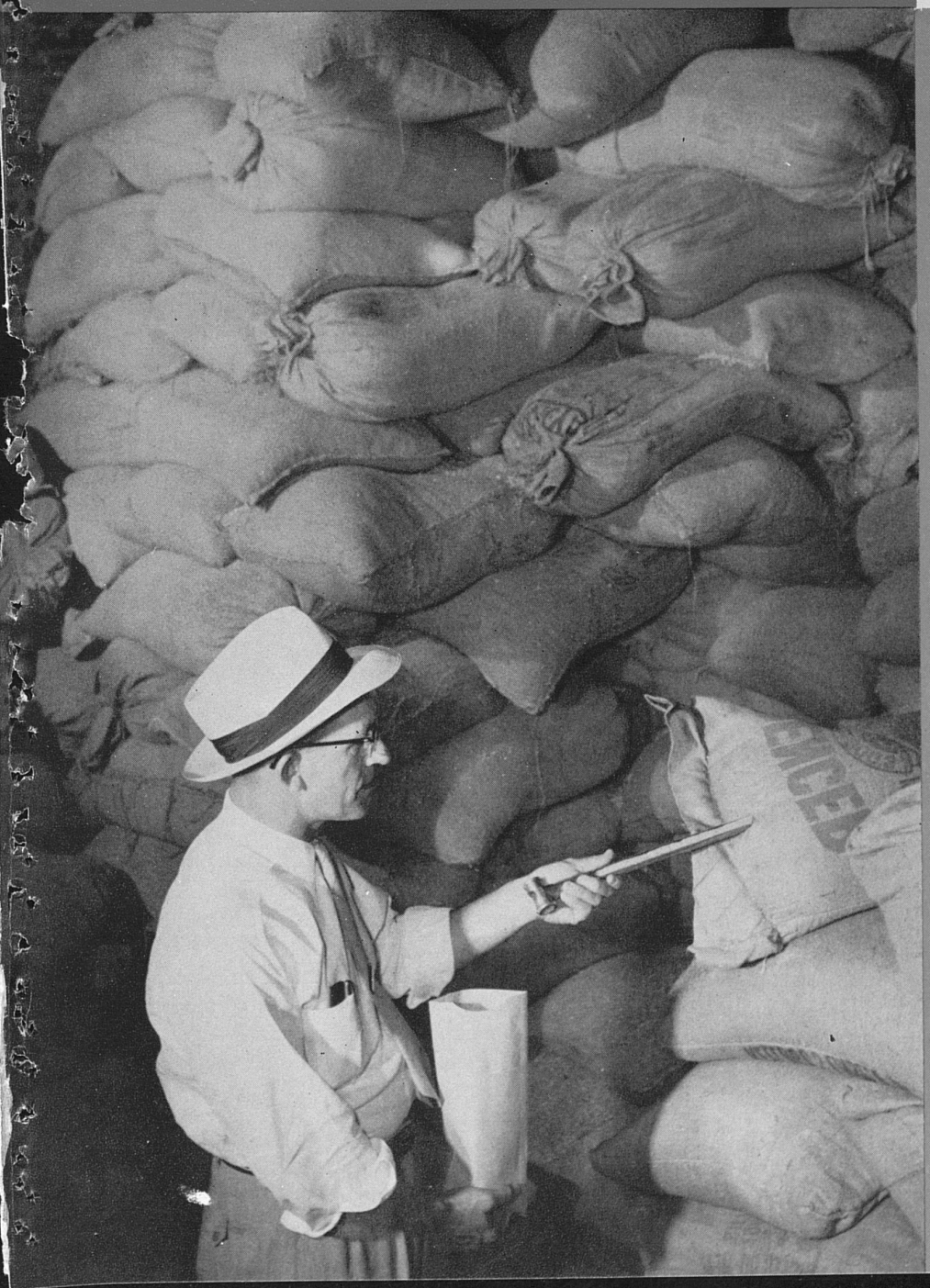

READ—

Steers on TV

Butter Quality

Office of Feed Control Celebrates 50 Years of Regulatory Work

PROTECTION FOR FEED USERS AND MANUFACTURERS
FEEDLAW
KY. AGR. EXPT. STATION
UNIVERSITY OF KENTUCKY
GOLDEN 1906-1956 ANNIVERSARY

Kentucky FARM AND HOME Science

Volume 2, Number 3 . . . . . Summer 1956

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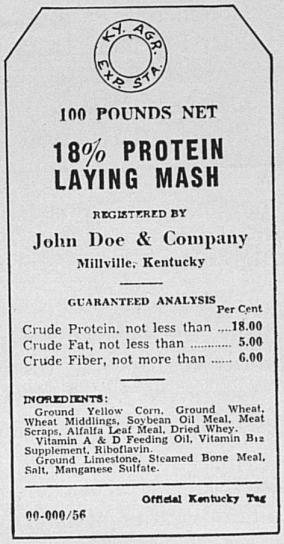
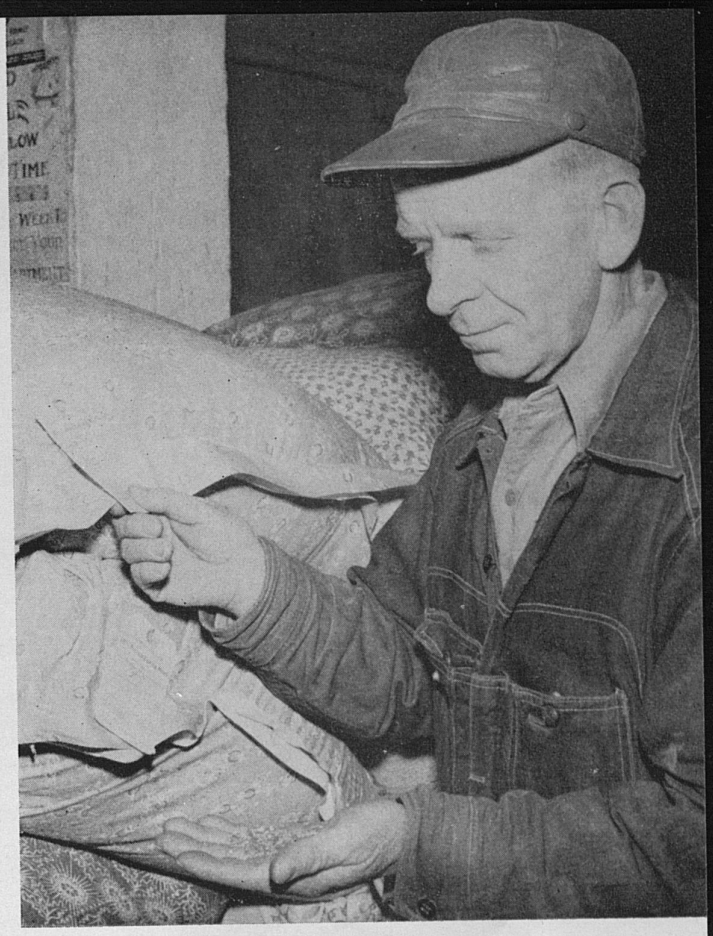
The Cover

Symbolic of the efficient work of the Office of Feed Control is the work of this inspector as he extracts a sample of feed for analysis. He is using a "core thief," designed for obtaining samples with a minimum of trouble and requiring only a few ounces of the product. His office is celebrating the Golden Anniversary of the beginning of feed regulatory work in Kentucky. For details, see pages 3-8.

Kentucky farmers last year bought approximately 542,000 tons of feed. The state feed law requires that each sack carry a tag on which is stated the guaranteed analysis of the feed. Farmers and other users should make it a habit to read the labels and thus study the relative merits of two similar items by comparing the data given. Little can be learned by "looking" at the feed itself.





Continuous and expanding aid to Kentucky feed users and manufacturers provided by the Office of Feed Control as it celebrates

50 Years of Feed Regulatory Service

By BRUCE POUNDSTONE

This summer marks the completion of 50 years of regulatory work by the Office of Feed Control of the Kentucky Agricultural Experiment Station. The state feed law became effective on June 11, 1906.

During its half-century of service to the feed industry and Kentucky farmers, the office has analyzed about 75,000 feed samples. Its laboratories have been improved until they now rank among the best of their type in this country. Inspectors from the office call regularly on the more than 1,500 retailers of animal feeds in Kentucky, to check on the 6,000 different kinds registered for sale in the state.

Why feed control is necessary and how the present work evolved from its beginning in 1906 are told in this article.

First, let us tell how the alertness of an inspector protected the pocketbooks of prospective buyers of a carload of "animal feed" and the health of their livestock.

A car was "spotted" on a siding beside a Kentucky feed manufacturing plant. The invoice showed the shipment to be "animal feed." A state inspector was on hand to sample this shipment and immediately issued a stop-sale notice because the bags bore no label as to the name of the product or ingredients. Samples from 50 bags were rushed to Lexington for analysis. The analysis revealed the product to contain 21 percent ash, made up largely of ground limestone

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Active in promoting passage of fertilizer and feed regulatory laws was Dr. Melville A. Scovell (1855-1912), Dean and Director of the Kentucky Agricultural Experiment Station.

OTHER REGULATORY LAWS

Acts in the 1880s to govern the sale of commercial fertilizers were the first of Kentucky's regulatory laws. Since then other laws of a similar nature have been passed, including:

Pure Food Law—1898
Pure Seed Law—1904
Commercial Feed Control Law—1906
Pure Food and Drug Act—1906
Nursery Inspection Law—1926
Creamery License Law—1918
Pesticide Law—1956

Feed Regulatory Service

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and sand. Microscopic examination showed the presence of cocoa shells, the meal of the cocoa bean and other items. The product was not only objectionable because of a lack of labeling but because it contained cocoa shells, considered poisonous to most classes of livestock. Further investigation revealed that the distributor of this product was assembling feed bag cleanings, discarded pie crust mix, low germinating seed, elevator cleanings, hard candy, ground kidney beans and other products that could not be used for the purpose originally intended, blending them and selling the resulting product as animal feed. No explanation was forthcoming as to why such a large amount of inert material was present or where the cocoa bean products came from. This shipment was later seized by federal authorities on the ground that it originated outside of the state, and it was disposed of under federal supervision.

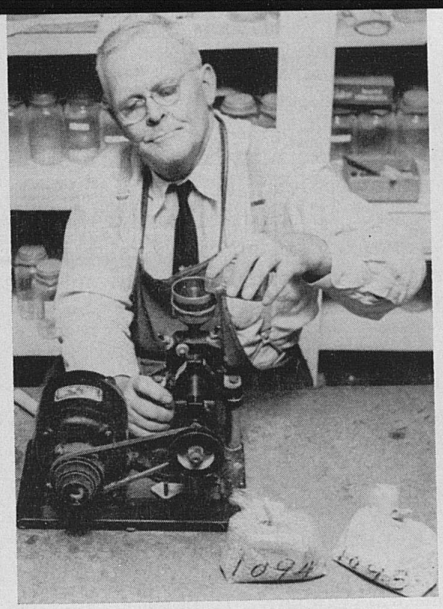
This happened less than 5 years ago and illustrates several aspects of the animal feed business. Basically, animal feeds are made in large part of by-products. The fact these by-products are not easily identified when ground and mixed means there may be attempts to substitute inferior products for good ones and in varying proportions. It illustrates also the need for control on the part of governmental authorities and finally, the interdependence of state and federal authority in handling these matters.

The mixed feed business of 50 years ago bore little resemblance to the complicated multi-million dollar industry we know today. Trade in feeding stuffs consisted largely of such items as bran, shorts, shipstuff, inferior grades of flour, corn meal, cottonseed meal, oil meal, gluten feed, dried distillery slops and various mixtures of ground grain. Formula feeds were unknown. Such mixtures as were sold were called "mixed feed" with occasionally "dairy," "poultry and chick," "horse" or "cow" feed appearing in the name of these products.

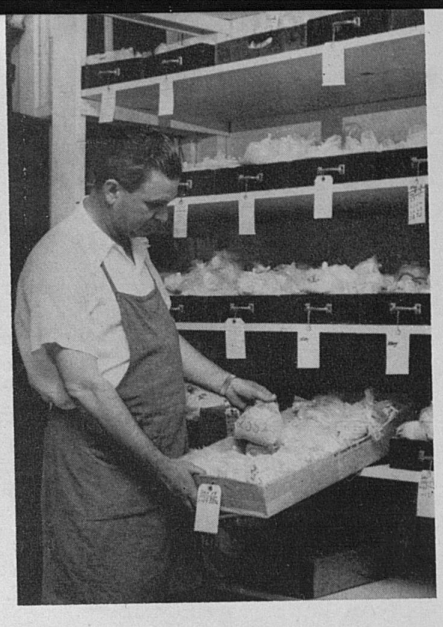
"Let the Buyer Beware"

There were no standards of identity, no uniform basis of labeling existed and little a purchaser could depend on in buying feed other than "let the buyer be aware." Kentucky Agricultural Experiment Station

Job D. Turner was in charge of feed regulatory work in Kentucky from the passage of the act in 1906 until his death in 1946.



(left) A feed sample consisting of "cores" taken from several sacks is thoroughly mixed in a machine, then a portion of the sample is ground in this mill for use in the laboratory.



(right) Reserve portions of feed samples are stored in plastic bags for additional rechecking if requested. Samples are normally kept on file for 3 months.

Bulletin 131, published in 1907, describes the situation: "Feeds are adulterated with corn cob meal, rice hulls, corn bran, peanut hulls and even sawdust; cottonseed meal is being adulterated with cottonseed hulls, and many mixed feeds are almost entirely composed of oat hulls and the by-products of factories making oat meal and offered as superior feed for cattle, horses, etc." Often feeds were found bearing the same name yet varying widely as to feeding value. Prices were no indication of the real value of feeds.

Other States Protected

The situation in 1906 was aggravated further by the fact that states bordering on Kentucky had control laws, and feedstuffs containing inferior products that could not be marketed elsewhere were sold in Kentucky. To prevent this practice and require manufacturers to guarantee and keep their products up to standard, the Southeastern Millers Association and the State Millers Association secured passage of the act known as the "Kentucky Concentrated Commercial Feeding Stuffs Law" by the Legislature.

Administrative responsibility for the law was placed in the hands of Director M. A. Scovell of the Kentucky Agricultural Experiment Station. Mr. Job D. Turner, of the Experiment Station, was charged with setting up the program, under whose guidance the law was put into operation June 11, 1906. He continued to head this work until his death in 1946.

The objectives of the feed law as described in one of the early bulletins remain unchanged:

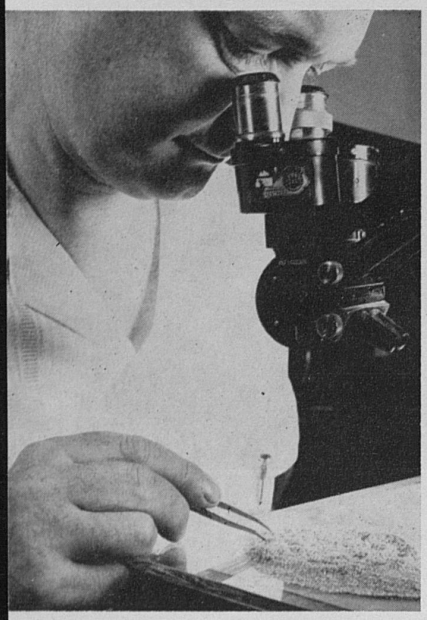
1. To require all feeding stuffs to be tagged, giving the name of the feed, the name and address of the manufacturer or dealer, and the manufacturer's or dealer's guarantee stating the percentage of protein, fat and fiber and the names of the ingredients from which the feed is made.
2. To protect the consumer against inferior and adulterated feeds.
3. To protect the manufacturer and dealer against dishonest competition.
4. To promote a more rational use of feeding stuffs.

A new program such as this involved many details. A system of tagging had to be worked out. Standards of identity and names for products were developed. A field inspection system had to be established as well as a legal procedure for prosecution when necessary.

To help the consumer readily ascertain the kind and character of feed, the Station issued tags of three types. (This continued until 1954.) The first of these tags was a manila tag printed in black ink to be attached to a feeding stuff made up of straight feed material, such as that derived from one grain, i.e., wheat bran, cottonseed meal, etc. The second type of tag was a manila tag printed in red ink indicating that a

(Continued on page 6)

Careful weighing on a delicate balance is a part of the procedure of feed analysis. As shown, portions of samples in jars on the right are being weighed directly into the flasks on the left.



Microscopic analysis by a skilled technician sometimes reveals adulterations and injurious materials in feed samples. Kentucky's feed laboratory has made such analyses continuously since the beginning of the control work in 1906.

Feed Regulatory Service

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feed was made of a mixture of two or more grains, as corn and wheat or corn, wheat and oats or products such as cottonseed meal, bran, oats, etc. The third type was a yellow tag attached to a feeding stuff containing substances of little feeding value, such as cottonseed hulls, oat hulls, corn cob meal, grit, oyster and clam shells, etc. Yellow tags were primarily used to show that a product was "not pure." For example, a cottonseed meal containing less than 41-percent protein required a yellow tag because the product was made up of a mixture of cottonseed meal and cottonseed hulls. Likewise, bran, shipstuff, etc., containing corn cob meal, hulls, screenings refuse could not be sold as bran or shipstuff but as a mixture and must have a yellow tag attached. It is clear how the "yellow" tag idea arose in Kentucky, especially in view of widespread dilution of products at the time of passage of the law.

Laboratory Findings Important

The back bone, then as now, for the enforcement of the law rested in the findings of the laboratory. Through the years it is the work of the laboratory that has lifted and held these standards of operation to today's high level of quality in representing feed products to the purchasing public.

It is worthy of note that even before the law was passed (in April 1906) Dr. Scovell, anticipating the problems involved and realizing the condition of the feed industry with respect to adulteration of products, recognized a need for microscopical analysis in this work. The test tube of the laboratory might show chemically what a product contained but it would not show from what substances these chemicals were derived.

Microscopic Analysis Essential

The first report of the Kentucky Experiment Station covering analysis of feed samples contains microscopic reports as well as reports of chemical analysis. This method of examination has consistently proven to be the primary basis for detecting adulterations and must in large part be credited with meeting the problem of adulteration that was primarily responsible for the passage of the law.

Drying weighed samples in a vacuum oven is a part of the procedure used in determining the moisture content of the feed.

Chemical analysis likewise was appreciated as the basis for detecting deficiencies in protein and other chemical values. Over the years the matter of chemical analysis has been amplified to include many features that are more than just a matter of determining deficiencies. Drugs, vitamins and minerals are now vital in formula feeds. Fifty years ago the laboratory was concerned only with protein, fat and fiber and to some extent moisture and ash. Today over a score of drugs and an equal number of vitamins and minerals require attention. Certain toxic items must also be checked for, such as fluorine which may appear in

phosphorus-bearing materials. Synthetic ingredients such as urea require special analysis.

Not only has the task of chemist in the laboratory been complicated by the variety and complexity of the items included, but the fact that the volume of business in the feed industry has increased to the point where Kentucky farmers now purchase more than 500,000 tons per year has meant a corresponding increase in the number of samples handled. A look at the number of samples analyzed in 1955 compared with 10 years earlier, in 1946, shows over three times as many samples analyzed in 1955. In 1946 each sample represented approximately 750 tons of feed. In 1955 each sample represented approximately 190 tons of feed. Even the number of samples does not tell the whole story as the number of analyses made for drugs, vitamins and minerals has meant that the number of analyses made per sample has more than doubled during the same period. Handling this larger number of samples and the intensification in the analysis work accompanying it have been possible by streamlining, putting in "production line" methods and greatly increasing the size of the units of chemical apparatus and equipment and by some increases in laboratory personnel.

A significant feature of this program is the speed with which a large number of analyses are made and reported. Samples are brought into the laboratory the week they are taken. It is customary to analyze them and by the end of the second week send a report to

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(above) Does a feed contain the guaranteed amount of protein? Juices secreted by an animal's glands flow into its stomach and are largely responsible for the natural digestive process. A similar process is followed in the laboratory to determine the amount of protein in a feed sample. A portion of the sample is treated with an acid to form a substance which, when measured, enables the technician to determine the amount of protein.

(left) To determine the fiber content of a feed, the "double digestion" process is used. The residue remaining is the non-digestible portion of the feed. It must not exceed the amount stated on the tag.

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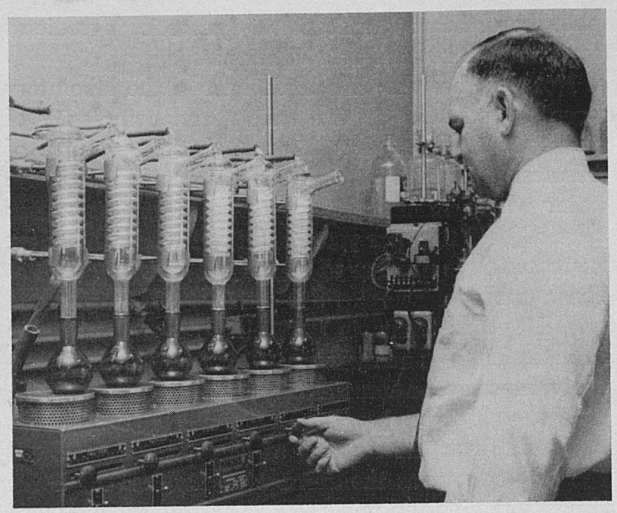
the manufacturer and dealer so that all concerned may know promptly the results of the analysis.

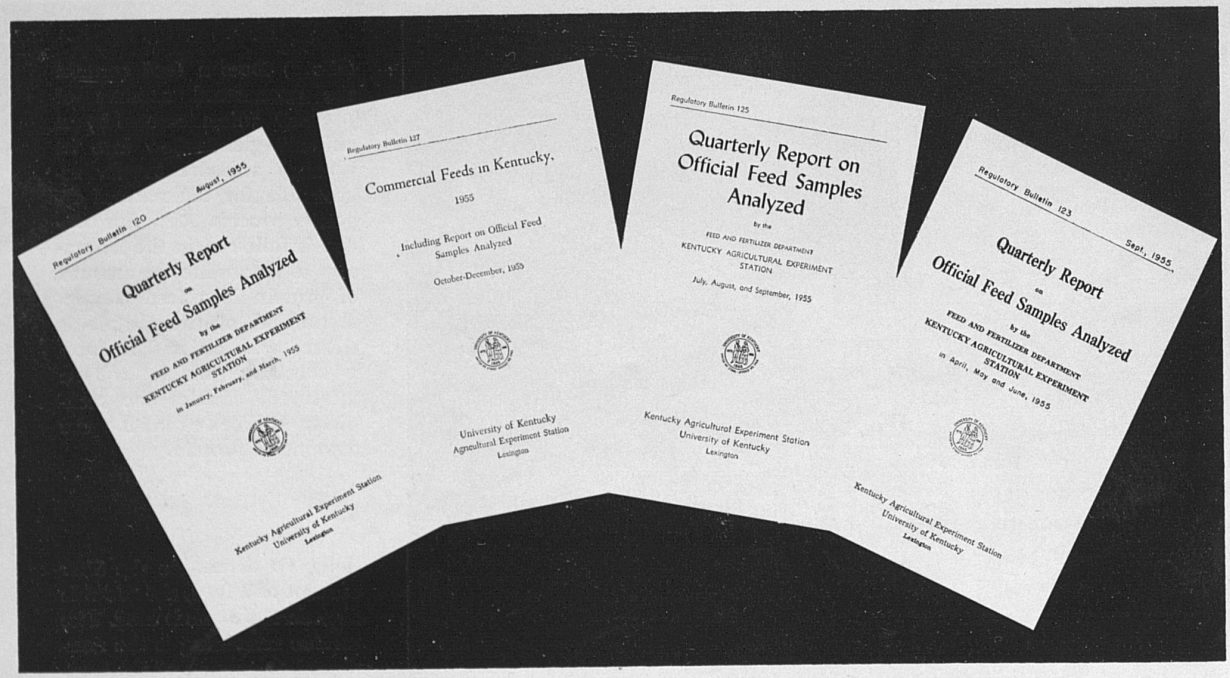
Special reports are prepared periodically and if desired anyone may learn what these analyses are. Every 3 months the Experiment Station publishes a bulletin showing all of the analyses made in the previous 3-month period. These are usually available within one or two months after the close of the period covered so that the general public may have constant knowledge of the work.

More than 80 percent of the samples analyzed fulfill the guarantee. The few that do not are usually so close in this respect as not to be considered greatly deficient. It is exceptional for a sample to be seriously out of line. When such is reported, the manufacturer takes immediate steps to correct the matter.

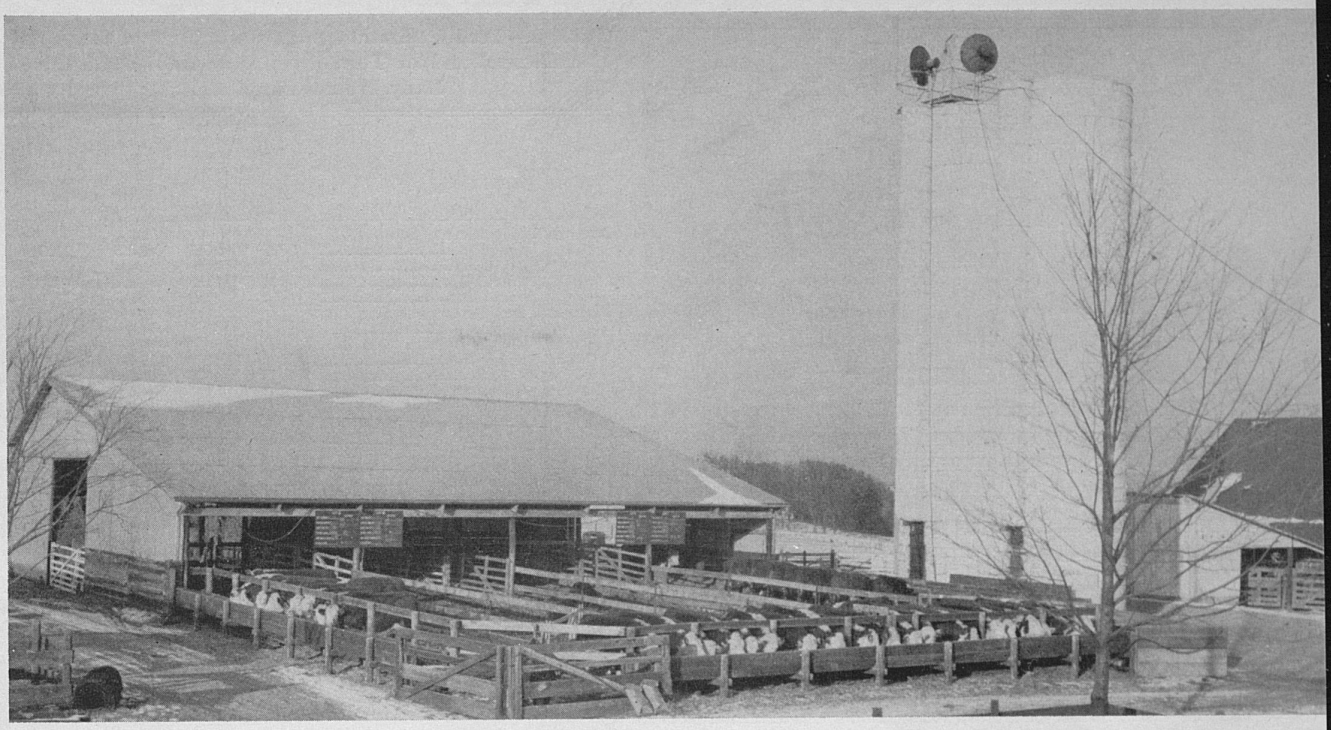
The feed control program is operated with a minimum of court action because of the splendid cooperation between the manufacturers and the control office. The producers of feeds sold in Kentucky are anxious that their products have a good record with the laboratory, and the reports concerning feeds are a credit to this important segment of our industry.



Vitamins are important in animal feeds. This apparatus is used to determine the amount of carotene in alfalfa meal. Likewise, pure vitamin A is extracted with this instrument. The laboratory also has equipment to determine the presence and amount of each of the several drugs used in feeds.



The feed control law requires the publication at least once a year of the results of analyses of official samples. Since 1946 the office has published the reports quarterly. Copies may be obtained from the Bulletin Office, Experiment Station Building, University of Kentucky, or from your county extension office.



This is a general view of the WAVE-TV Farm feedlot and the steers used in Kentucky's first televised beef cattle feeding experiment. Note the microwave transmitting units on top of the silos. The purpose of televising the work was to reduce the lag between the time research is done and when the public is informed and the results can be applied.

RURAL AND URBAN VIEWERS WATCH EXPERIMENT AS

Feedlot Steers Perform on Television

By A. R. PARSONS, J. D. KEMP and W. P. GARRIGUS

During the past 5 years television has become one of the most important methods of getting current information to farm operators. Kentucky has a television station that is pioneering in this field by maintaining a demonstration farm from which a live television program originates once every week. In the summer of 1955, WAVE-TV Farm Director Shirley Anderson made the facilities of this farm available to the Animal Husbandry Section for a full-scale research project on beef cattle feeding to be conducted before a television audience.

This experiment was designed to test the effects of diethylstilbestrol and terramycin, alone and in combination, on the feedlot performance and carcass quality of steers full-fed under dry-lot conditions. These two additives were tested because, under certain conditions, they had been shown to greatly increase gains and feed efficiency of fattening cattle. Their effects on carcass quality, shrinks, and profits had not been clearly defined. Beef cattle feeders needed this information as soon as possible, and the necessary livestock, labor, feed, and feedlots were not available elsewhere. The television camera gave the University the additional opportunity to acquaint both rural and urban viewers not only of the merits of the two feed additives but also of the methods used in livestock research and the fact that modern agriculture is closely geared to science. The effectiveness of this program was shown when the results of this experiment were published in Kentucky Agricultural Experiment Station Miscellaneous Publication 47. The first printing of this report was exhausted in less than 2 weeks.

On August 1, 1955, 40 yearling Hereford steers

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At the end of the experiment each steer was graded by a group of beef cattle buyers from Louisville meat processing plants. The TV camera recorded this scene.

Feedlot Steers on Television

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weighing 735 pounds each were divided into 4 uniform groups and continued on test for 142 days. They were weighed every 2 weeks, at which time the cattle and the progress report were shown to the TV audience. At the conclusion of the feeding test, the animals were graded by beef cattle buyers representing most of the meat processing plants in the Louisville area. This grading was also done on TV, after which the animals were trucked to a local packing plant and processed. A movie film was made of the processing and grading of the carcasses. This was also shown to the TV viewers, thereby concluding the program.

Description of Experiment

The actual experiment was as follows: Lot I received a control ration of alfalfa silage, shelled corn full-fed, soybean meal and wheat straw daily; Lot II, the same as lot I plus 10 milligrams of diethylstilbestrol per animal daily; Lot III, the same as lot I plus 80 milligrams of terramycin per animal daily; and Lot IV, the same as lot I plus 10 milligrams of diethylstilbestrol and 80 milligrams of terramycin daily. Table 1 shows the feed utilization and growth data of the steers.

At the completion of the fattening program, the animals were followed through the marketing and the processing phase for obtaining shrinks and carcass data which are shown in Table 2. The 9th, 10th, and 11th rib cut of each carcass was taken to the laboratory for physical separation and the 12th rib was taken in for chemical analysis.

According to the results of this experiment, the feeding of 10 milligrams of diethylstillbestrol resulted in a 10.4-percent increase in gains, the addition of 80 milli-

Table 1.— Feed Utilization and Growth Data of Steers and Stilbestrol and/or Terramycin as an Additive in the Daily Protein Supplement

	I Control	II 10 mg Stilbestrol	III 80 mg Terramycin	IV 10 mg Stilbestrol + 80 mg Terramycin
Average Daily Ration, Lb:				
Alfalfa silage	20.6	20.5	20.5	21.0
Shelled corn	15.1	14.9	14.8	15.1
Soybean meal	1.0	1.0	1.0	1.0
Straw	1.0	1.0	1.0	1.0
Performance:				
Days on test	142	142	142	142
Initial weight, lb	736	734	738	737
Final weight, lb	1090	1127	1115	1145
Gain, lb	354	393	377	408
Average daily gain, lb	2.50	2.76	2.66	2.87
Increase in gain over Lot I, %	....	10.4	6.4	14.8
[a]Cost per hundred pounds gain	19.44	17.47[c]	18.20[d]	17.26[e]
[b]Sale value per hundred	18.43	18.30	18.03	19.34

[a] Values used in determining cost of gain:

Alfalfa silage	$10.00 per ton
Shelled corn	1.26 per bushel
Soybean meal	68.50 per ton
Straw	20.00 per ton

[b] The steers were slaughtered at the Fischer Packing Company, Louisville. Their value was determined by yield and grade of each individual carcass.

[c] $5 per ton was added to the cost of protein supplement used by the lots fed stilbestrol.

[d] $10 per ton was added to the cost of protein supplement used by the lots fed terramycin.

[e] $15 per ton was added to the cost of protein supplement used by the lots fed a combination of the additives, stilbestrol, and terramycin.

(Additional data are given in Ky. Agr. Expt. Sta. Misc. Pub. 47.)

Table 2.— Carcass Data of Steers Fed Stilbestrol and/or Antibiotic as an Additive in the Daily Protein Supplement

	I Control	II 10 mg Stilbestrol	III 80 mg Terramycin	IV 10 mg Stilbestrol + 80 mg Terramycin
[a]Carcass Quality:				
Feeder grade, Aug. 1, 1955	2	2	2	2
Live slaughter grade, Dec. 17, 1955	5	6	6	6
Carcass grade, Dec. 22, 1955	4	4	4	5
[b]Slaughter Data:				
Farm to market shrinkage, %	1.83	2.32	2.30	2.55
Farm to processor shrinkage, %	3.48	3.91	3.64	3.86
Hot to cold carcass shrinkage, %	1.81	1.83	1.84	1.73
Dressing percentage, %	58.89	59.36	59.65	59.88
Percent Live Animal Represented by:				
Hide	7.92	8.36	8.09	7.94
Liver	1.13	1.13	1.12	1.18
Viscera	16.83	16.60	16.42	16.70
Carcass Measurements:				
Area rib eye, sq. in.	10.43	10.90	11.19	10.83
Area rib eye per 100 lb carcass	1.65	1.67	1.72	1.62
[c]Fat layer over rib eye, mm.	15.9	14.2	11.8	14.8
Angle of lumbo-sacral arch, degrees	150.6	151.4	148.6	152.4

[a] The steers were graded as feeders at beginning of test, Aug. 1, 1955, by a panel of 3 persons. The steers were graded for slaughter by a panel of five at the conclusion of the test. The steers were graded according to carcass grades by a panel of three 48 hours after slaughter. Following is a key to the grades represented by numbers. Average choice, 7; Low choice, 6; High good, 5; Average good, 4; Low good, 3; High commercial or High medium feeder, 2; Average commercial or Average medium, 1.

[b] The steers in this test were last fed on the evening of Dec. 18, 1955, were weighed on the farm at 6:00 a.m. Dec. 19, and were hauled 25 miles before being delivered to the Bourbon Stockyards where they were weighed at 11:00 a.m. and were then sent to the Fischer Packing Company where they were weighed again at 3:00 p.m. Dec. 19. The steers were slaughtered beginning at 7:00 a.m. Dec. 20, and hot carcass weights were made; also, the hides, liver, and viscera from each steer were weighed. Cold carcass weights were made at 48 hours, and the carcasses were graded at that time. The rib eye and the lumbo-sacral arch from each steer were traced prior to the grading of the carcasses.

[c] The measurement of the fat layer over the rib eye was made three times, and an average of the three is reported here.

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Dairy Scientists Study Ways to Aid Butter Quality

Conditions influencing production of water-insoluble free fatty acids in farm-produced cream being investigated

By T. R. FREEMAN

Kentucky creameries manufacture about 17 million pounds of butter each year, thus providing a market for some 40-45 million pounds of cream. To insure the continuation of a profitable market for the cream producer, the creamery operator must, in turn, be able to dispose of the finished product at a price which will repay him for processing and marketing the butter. The quality of the butter which the creamery offers for sale is the most important single factor determining the price which that butter will bring. In fact, the quality of the butter may at times determine whether there will be *any* market for this product.

Federal Standards

But there is also another reason why the Kentucky butter industry must be constantly alert to new methods of maintaining and improving the quality of its product. Butter entering interstate commerce must meet certain standards of the Federal Food and Drug Administration.

A few years ago chemists in the Food and Drug Administration devised a new test to assist them in judging the quality of butter. This test measures the amount of water-insoluble free fatty acids in butter (or cream), and is popularly referred to as the "WIA Test." Because the water-insoluble acid (WIA) concentration of butter appears to be a measure of chemical break-down of the fat molecule, the Food and Drug Administration feels that the WIA test on butter gives an indication of the extent to which the cream had deteriorated at the time it was churned. Therefore, butter with a WIA content above a certain maximum value will not pass inspection by the Food and Drug officials.

Problem Studied Since 1951

Since 1951, the Kentucky Agricultural Experiment Station has been studying the WIA problem in this state, in an attempt to discover the conditions which either promote or prevent the occurrence of excessive amounts of WIA in farm-separated cream.

It has been found that many conditions under which cream is produced and handled on the farm do influence the WIA content of the cream at the time it reaches the cream station. For instance, cream obtained by means of a mechanical separator will have a much lower WIA concentration than that obtained by hand-skimming methods or by the use of a water-dilution "separator." In fact, cream obtained by the latter two methods generally is not acceptable on the basis of its WIA content.

The method of cooling and storing the cream on the farm also has a bearing on the production of WIA in such cream. Cream that is cooled quickly to 50° F or below, and held at such temperature until delivered to the cream station, will have a much lower WIA concentration than cream not cooled properly. Some sort of artificial refrigeration (ice or an electric refrigerator) is virtually a necessity.

Frequent Delivery Essential

One of the most important factors related to WIA concentration in cream is the age of that cream. It has been consistently demonstrated in many trials and experiments that the older the cream the higher the WIA content. Our studies have shown that most of the cream over 4 days old will not make butter that will pass inspection by Food and Drug officials. Frequent delivery of the cream thus becomes a very important part of the "quality butter" program.

It appears that the amount of WIA in farm-separated cream is related to the season of the year. Strangely enough, it has been discovered that the WIA concentration is higher, on the average, in the winter than in the summer. The reason for this is not yet fully understood, but at least two factors may be given on the basis of information thus far obtained: (1) Certain minor chemical constituents of milk, capable of promoting the production of WIA in raw cream are present in slightly greater quantity during the winter than during the summer; and (2) many farmers do

(Continued on page 12)

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Study Ways to Aid Butter Quality

(Continued from page 11)

not deliver their cream as frequently in winter as in summer.

Some conditions which might affect the WIA content of the butter itself are beyond the control of the cream producer. It has been shown experimentally that cream must either be churned very soon after it has been delivered to the cream station or held at a very low temperature if churning is delayed as much as 24 hours. This phase of the cream quality problem can be solved only through the cooperative efforts of the cream station operator and the creamery.

Investigations most recently completed at the Kentucky Station show that there is a relatively small but fairly constant amount of WIA in freshly drawn milk. This does not seem to vary a great deal with the breed of cow, season of year, or stage of lactation. If there were no subsequent increase in WIA, this "original" quantity in the milk would be of no practical significance.

Breed Differences

It was observed that cream from Holsteins increased in WIA content much more than cream from Jerseys, when both lots of cream were held at 50° F for 24 or 48 hours. Although these experiments were limited to the cows in the Experiment Station herd (about 25 of each breed), this breed difference was a very noticeable and consistent one. It is believed that this trend would be observed in other herds.

Based upon nearly 5 years of research at this Station, recommendations for the production of high quality cream can be summarized as follows: (1) Use only mechanical separators, (2) cool the cream rapidly to below 50° F and keep it cold until delivered, (3) deliver cream at least once every 4 days, winter as well as summer, and (4) keep cream cold at the buying station and until received at the creamery.

Feedlot Steers on Television

(Continued from page 10)

grams of antibiotics resulted in a 6.4-percent increase in gain, while the combination of the two increased gains by 14.8 percent. The feeding of these two compounds alone had no apparent effect on carcass grade; however, when fed in combination, carcass quality was raised one-third of a grade. This was revealed in the value per animal at the time of slaughter. There was no significant difference in the shrink-in-transit between the four groups of cattle and the dressing percentage; however, there was a slight advantage of the latter in favor of the additives. When these results are expressed in dollars gross profit increase per animal, lot 2 returned $4 per head more than lot 1, and lot 4 returned $17.14 more per head than lot 1. These values were determined after paying for all feed including the additives. There were no differences among the lots with respect to weights of hides, livers, and viscera. Carcass measurements also failed to show any differences among the groups of steers. Also, the physical separation and the chemical analyses of the 9th, 10th, 11th, and 12th rib sections from each steer failed to show any differences that could be attributed to the additives.

The facilities of this farm and its educational TV programs made it possible to conduct this experiment and to present the experimental data to interested people sooner than would have been otherwise possible. Also, not only were farm people benefitted with information that would help reduce production costs but interested urbanites learned the steps of beef manufacturing and are now more able to understand farmers' problems.