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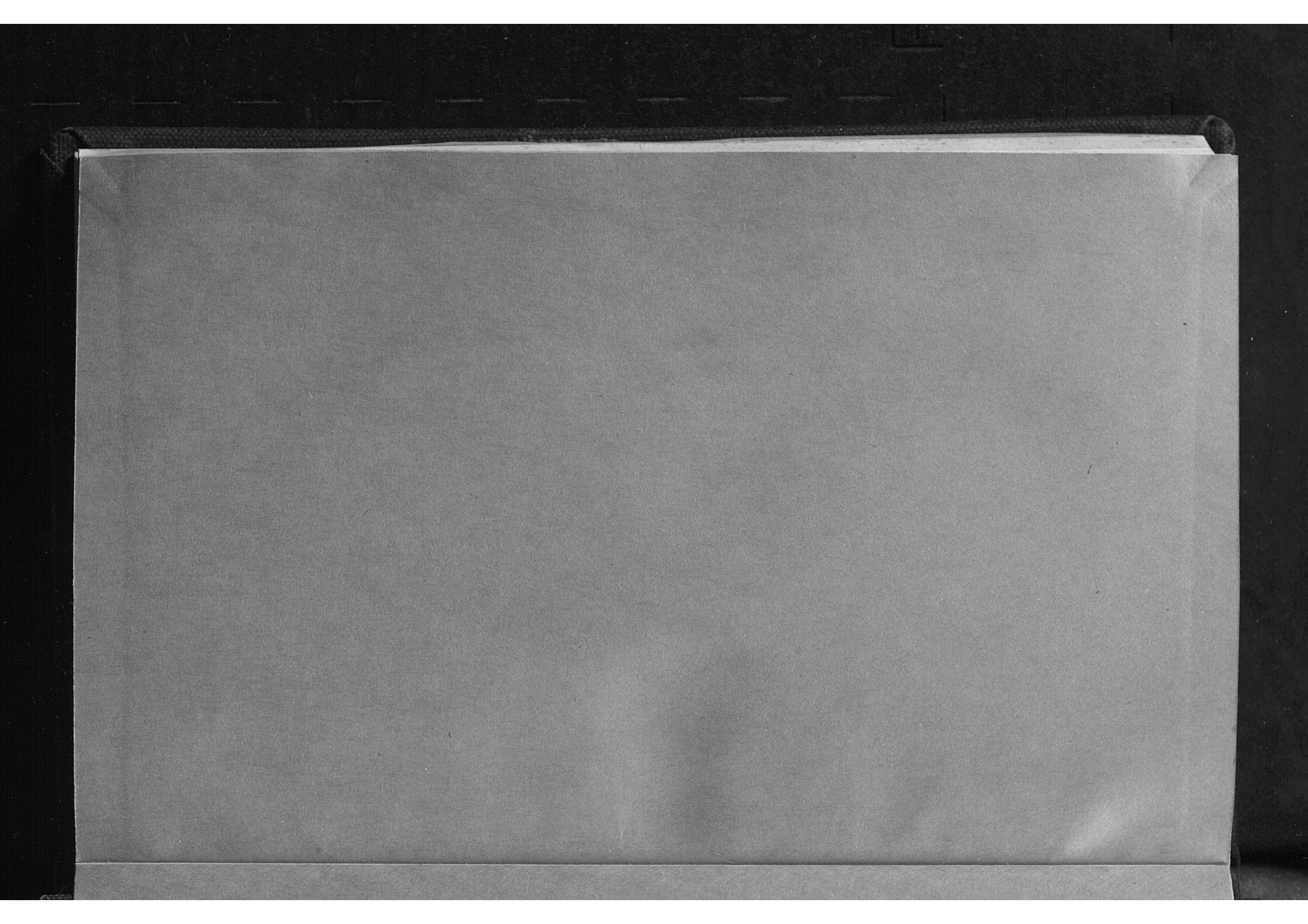

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THIRTY-EIGHTH ANNUAL REPORT

OF THE

Agricultural Experiment Station

OF THE

University of Kentucky

Lexington, Ky.

FOR THE YEAR 1925

Report of the Director

Meteorological Summaries

Part I.

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**Assigned by the U. S. Department of Agriculture.

LETTER OF TRANSMITTAL

To His Excellency, Hon. William J. Fields, Governor of Kentucky:

Sir:—In accordance with an act of Congress, approved March 2, 1887, entitled, "An Act to establish Agricultural Experiment Stations in connection with the Agricultural Colleges established in the several states under the provisions of an act approved July 2, 1862, and under the acts supplementary thereto," and of the act of the Legislature of the State of Kentucky, approved February 20, 1888, entitled, "An act to accept the provisions of an act passed by the Congress of the United States, approved March 2, 1887, for the establishment and maintenance of Agricultural Experiment Stations in connection with Agricultural Colleges established by the several states and territories under an act of Congress approved July 2, 1862," I herewith submit the Thirty-eighth Annual Report of the Kentucky Agricultural Experiment Station.

Very respectfully,

THOMAS COOPER, *Director.*

January 1, 1926.

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Lexington, Ky.

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ANNUAL REPORT

of the

DIRECTOR OF THE

KENTUCKY AGRICULTURAL EXPERIMENT STATION

For the Year 1925.

The Agricultural Experiment Station has shown progress in its work during the year. Research has continued on a sound and productive basis, while the various service activities rendered to the citizens of the state have been upon an increasing scale. Each year, there is indication of increased use of the work of the Experiment Station on the part of the citizens of the state. Contacts with farmers have been multiplied by the establishment of the substations.

During the past few years, the proportion of funds and the time devoted to the economic phases of agriculture have greatly increased. Farm management and cost of production investigations, studies in marketing, in cooperation and in the economics of production, are in progress. These and other studies furnish the source of an enlarging fund of information to those interested in the agricultural problem of the state. The results of economic research are immediately applicable to farm problems. An illustration of this may be seen in connection with the work on the standardization of lambs and of poultry and poultry products. The products named have taken an improved position due to the utilization of principles of grading and standardization that meet the market demands.

Funds for the work of the Experiment Station have been augumented thru an act of Congress known as the Purnell Act. This act follows the previous federal endowments created under the Hatch and Adams Acts. The funds appropriated may, according to the wording of the act, "be applied only to paying the necessary expenses of conducting investigations or making experiments bearing directly on the production, manu-

facture, preparation, use, distribution and marketing of agricultural products, and including such scientific researches as have for their purpose the establishment and maintenance of a permanent and efficient agricultural industry, and such economic and sociological investigations as have for their purpose the development and improvement of the rural home and rural life, and for printing and disseminating the results of said researches.'' The funds available this year were used in providing for new studies in tobacco diseases, research in home economics and in an extension of the investigations in marketing and cooperation.

A department of home economics was established in the Experiment Station September 1, 1925. Two research projects, one a study of the vitamins of kale, and the other an investigation of the metabolism of obesity, have been undertaken. It will be the purpose of this department to develop investigation relative to foods and to other problems of the home.

The current year marked the formal dedication of the new substations in Western and Eastern Kentucky. These branches of the Experiment Station are well located to serve the agricultural interests of the state and to supplement the work of the Experiment Station. Necessarily, the progress of the substations in research will be slow. The first essential has been the erection of buildings, the cleaning and clearing of lands and the upbuilding of the soil, so that work could be begun. Much of the preliminary work has been completed. During the coming year, increasing attention will be given to the agricultural problems of the regions served.

Costs, Returns and Profits for Tobacco. Studies of costs, returns and profits for tobacco covering a six-year period in the Burley Region and a five-year period in the Dark Tobacco Region have been completed. Some of the results are given in Table 1.

Table 1. Factors in the Cost of Production of an Acre of Burley and of Dark Fired Tobacco.
From a study of 287 farms in Central Kentucky, and 264 farms in Western Kentucky.

	BURLEY	DARK
Total acres of tobacco	2,214.2	2,469.4
Total pounds of tobacco	2,355,930.	1,961,508.
Acres tobacco per farm	7.7	9.4
Pounds per acre	1,064.	794.
Hours man labor per acre	330.4	252.0
Hours horse labor per acre	97.6	84.3

Cost items	Per cent of Total Cost	Per cent of Total Cost
Man labor	38.27	49.21
Horse work	7.14	13.02
Barn and sticks	11.87	8.49
Machinery	1.06	1.97
Manure and fertilizer	.50	3.79
Insurance	2.76	3.65
Other costs	1.74	3.99
Total "operating cost" (excluding rent)	63.34	84.12
Use of land	36.66	15.88
Total cost per acre	100.00	100.00

The largest factor affecting unit costs was yield. The lowest yields per acre were associated with highest costs per pound and the highest yields per acre with the lowest costs per pound.

The tobacco crop, except in years when too large an acreage resulted in overproduction, was shown to be the most profitable money crop for farms having conditions favorable for its production and marketing. However, a diversity of enterprises in connection with the tobacco crop is necessary for the full utilization of the grower's land, labor and capital for the best profits.

Labor Requirements of the Tobacco Crop. The various operations used in the production and marketing of tobacco are shown in Table 2. The average time required for burley tobacco was 33 ten-hour days per acre. Stripping requires the largest amount of labor (more than a third of the total); cutting and housing came second, with nearly 18 per cent;

worming, topping, suckering and spraying required nearly 13 per cent and transplanting a little over 9 per cent.

The production of an acre of dark fire-cured tobacco required an average of 25 1/5 days of man labor. As in the case of burley tobacco, the operation of stripping required the largest amount of labor. Topping, worming, suckering and spraying came second, with about 21½ per cent of the total, followed by cutting and housing, with 11.1 per cent.

Table 2. Labor Operations and their Relation to the Total Labor Required for Producing an Acre of Burley and Dark Tobacco.

OPERATIONS	BURLEY		DARK	
	Average Number of Hours Used per Acre	Per Cent Total Hours Used on each Operation	Average Number of Hours Used per Acre	Per Cent Total Hours Used on each Operation
Plant Bed Work	17.38	5.26	9.22	3.66
Field Preparation	19.32	5.85	18.93	7.51
Transplanting	30.84	9.34	15.77	6.26
Cultivating with Plow	12.97	3.93	19.60	7.78
Cultivating with Hoe	23.69	7.17	19.04	7.55
Worming, Topping, Suckering and Spraying	42.35	12.82	54.15	21.48
Cutting and Housing	58.45	17.69	27.98	11.10
Curing	0.77	.23	24.36	9.66
Stripping	117.10	35.45	56.64	22.48
Marketing	7.48	2.26	6.34	2.52
Total	330.35	100.00	252.03	100.00

Effect of Yield on Cost of Producing Wheat. Interesting data were obtained in connection with cost studies in the Purchase Region of western Kentucky as to the effect of wheat yields and the average cost per bushel. Yields and costs were obtained upon nineteen farms, and these divided into the five having the highest yields and the five having the lowest yields. It is of importance in plans of farm management, to note the very great variance of cost between average yields of 8, 15 and 23 bushels.

Effect of Yield on Cost of Producing Wheat

(Acre Basis)

	Average Nineteen Farms		Five Farms Having Highest Yields		Five Farms Having Lowest Yields	
	Quantity	Total Value	Quantity	Total Value	Quantity	Total Value
Items of cost:						
Man labor	14.9 hrs.	$2.61	17.4 hrs.	$3.04	11.8 hrs.	$2.06
Horse work	21.3 hrs.	2.13	23.0 hrs.	2.30	20.4 hrs.	2.04
Machinery		1.50		1.50		1.50
Seed	1.4 bu.	2.21	1.4 bu.	2.25	1.1 bu.	1.73
Fertilizer	143 lbs.	1.59	198 lbs.	2.19	158 lbs.	1.73
Twine	1.6 lbs.	.29	2.5 lbs.	.45	.75 lbs.	.14
Contract threshing		1.77		2.78		.96
Interest, and taxes on land		4.50		5.00		4.00
Miscellaneous costs		1.50		1.75		1.25
Total		18.10		21.26		15.41
Yield of grain, bushels	14.8		23.2		8.0	
Cost per bushel		$1.22		$ .92		$ 1.93

Complete Farm Cost Studies in Christian County. The results of a three-years' study of farm operation and farm costs on Christian County farms have been tabulated and studied and a bulletin prepared on "Man Labor, Horse Work and Materials Used in Producing Crops in Christian County." Tabulations of these data showed wide variations in the amount of the expenditures for various costs by different farmers in producing an acre or a given quantity of product. Thus some farmers used but 200 hours of man labor and 100 hours of horse labor in the production of 1,000 pounds of tobacco while others used more than 400 hours of man labor and 150 hours of horse labor. The time at which, and the efficiency with which, the different operations were performed were found to be responsible for a large part of the differences in the amount of labor used. For example, land which was thoroly disked, harrowed and dragged at the proper time required but little labor in preparation for transplanting, while on the other hand when these operations were neglected or poorly done, a relatively large amount of labor was required to lay off and hill the land. An interesting point brought out was that the men in the study who used labor most efficiently and who got the largest amount of tobacco for a given amount of effort also received higher prices for their crop than the men who performed their work less timely and less efficiently. The seven farmers who produced 1,000 pounds of tobacco with the most efficient use of labor received 17 cents a pound for their product while the seven farmers least efficient in the use of labor received 13½ cents a pound.

Business Analysis of Farms in Union and Henderson Counties. A study, including an analysis of the capital, crop acreage and yields, livestock by classes, farm receipts, expenses and net incomes, was made of 270 farms in these two counties. The chief factors influencing farm profits were found to be: (1) efficient labor utilization as measured by total labor accomplished per man; (2) control of expenses and low cost of production as measured by the ratio of expenses per $100.00 receipts; (3) volume of sales per 100 acres; (4) good crop

yields; (5) good returns from live stock as measured by returns from live stock per $100.00 worth of feed fed. The details of this study and its results have been prepared in bulletin form.

Poultry and Egg Marketing. The purpose of this study is to obtain information concerning the present methods of handling poultry and eggs, the principal outlets, the problems encountered and possible improvements. Statistical material available with regard to the poultry industry, such as production, prices, market receipts, storage holdings and movements, has been studied and analyzed. Some of the conclusions which may be drawn from this study are that (1) the outstanding problem in both poultry and egg marketing is that of quality improvement, which involves production and handling methods on the farm as well as during the marketing operation; (2) satisfactory results from endeavors to improve quality will not be obtained until some satisfactory system of paying the producer for eggs and poultry on a definite grade basis comes into general use. The adoption of such a system is dependent upon the common understanding and united effort of all agencies engaged in buying eggs and poultry direct from the farmer, and the system of grades, necessarily the simplest possible, will have to be employed intelligently and uniformly; (3) the problem of distribution is one of getting the products into the larger centers of consumption; (4) price comparisons indicate that Kentucky eggs average higher in price than Tennessee and Missouri eggs, but lower than those of Indiana and Ohio.

Tobacco Marketing. Studies of the trends in production, consumption, exports and accumulation of tobacco stocks have been continued. In the absence of statistics of tobacco consumption according to types an indicator of consumption has been evolved by using the available data on production and stocks. The figure thus obtained indicates that the consumption of burley tobacco in recent years has been slightly below 250 million pounds annually while production

during each of the years, 1922, 1923, and 1924 has run considerably above this figure. For the dark tobacco of Western Kentucky, the production and consumption have been more nearly equal.

Statistical Studies. Among the general conclusions which may be drawn from this study thus far are that: (1) the long time trend of land in farms in Kentucky has been upward. The 1925 census, however, shows a falling off in land in farms; (2) Kentucky, like other southern states, has a considerably larger proportion of rural population than the country as a whole; (3) the trend has been and still is towards smaller farms; (4) tobacco has been growing in importance. In recent years there has been a decrease in feed production and a consequent increase in the outlay for purchased feeds.

Tobacco Brown Root-Rot. The results from tests made during the year suggest that corn root-rot and tobacco brown root-rot may be caused by identical organisms. Sections of rotting tobacco roots from sand cultures revealed the presence of numerous oogonia and oospores of a pythium-like fungus similar to those found in the roots of corn.

Bacterial Leaf-Spots of Tobacco. Studies on the longevity of the causal organisms in cured tobacco indicated that they die in the course of twelve months. Tests with seed 18 months old (two-year old seed) have given results far more promising than seed treatment, as several beds on farms remained free and others were infected at the spot where most frequent inspections were made, suggesting accidental infection from other beds or from infected tobacco used personally.

Tobacco Mosaic. The eradication of perennial weeds capable of carrying mosaic disease from the permanent tobacco bed has not resulted in a reduction of initial mosaic infection in the field. Tests to determine whether or not chewing tobacco, which is used extensively by most tobacco men, is a source of mosaic infection at planting time, suggests strongly that it is the important source of infection. The mechanism of infection does not appear to be spitting, as suggested for the

leaf-spot diseases, but rather contaminating the hands with saliva in wiping the mouth. Evidence has been obtained that certain brands of commercial tobacco may carry mosaic and that tobacco as old as five years may still retain the virus in a virulent state.

Effect of Fertilizer Treatments on Chlorine Content and Quality of Tobacco. The results thus far indicate that while average field applications of fertilizer salts carrying chlorine increase the chlorine content of burley tobacco, yet this will not be a factor of importance in affecting the quality of the tobacco.

Effect of Limestone and Phosphate on Wheat and Clover. The past season having been unfavorable for wheat and clover, the effect of limestone and phosphate on these crops on the outlying experiment fields is of interest. The average yield of wheat on these fields was 20 bushels where limestone and phosphate were used, and 7 bushels on the untreated soil. The average yield of clover was 2,350 pounds where limestone and phosphate were used, and 300 pounds on the untreated soil. The yield of clover is much below the usual average because of the unfavorable season.

Clover. The selections for resistance to mildew show a high degree of resistance and apparently in a few years a good mildew-resistant strain of clover seed will be obtained. For the first time in a ten-year period, the clover sown with a drill after the ground became settled gave a much better stand than sowing on frozen ground or in any other way.

Sweet Clover. Confirming results of previous years' work, close cutting of the second year's growth during the past summer, after the stand had attained sufficient growth for hay, resulted in the death of practically all plants. Cutting the plants high (5 to 10 inches) allowed more or less branch development. It has been found that this branch development varies inversely with the rate of seeding and with the stage of maturity and directly with the height of the stubble left. It appears that the crop, if correctly handled, may be made to

yield both pasture and hay, or pasture and seed, or pasture, hay and seed the second year, tho no one product to nearly the same extent as would be secured if grown for the single purpose alone.

Sweet Clover Pasturage for Dairy Cattle. A plot of five acres was planted to sweet clover in the spring of 1925 and five cows were grazed on it from July 1 to October 1. A second group of five cows was continued on bluegrass pasture during the summer, each cow in this group having three acres of pasture. The sweet clover became somewhat woody and tough in September and did not maintain the milk flow quite as well during that month, but the results of this trial lead to the tentative conclusion that each acre of sweet clover (allowed a good start before being pastured) nearly equalled three acres of bluegrass pasture during the past dry summer.

Soybean Hay. Study and observation made in regard to handling the hay crop indicate very clearly that heavy seeding for hay is advisable. The stems are finer, the hay cures more readily and it is more palatable. The forage cures much more readily if cut shortly after the pods have formed. When the pods are well filled they require a long time to dry. The most practical way of curing the hay for home use is to let it lie in the swath as it cures more rapidly and the quality is not seriously injured. It is dangerous to store or stack soybean hay until well cured. Under average conditions, curing will require at least a week.

Methods of Inoculating Soybeans. The use of one of the agar jelly commercial cultures and of various methods of applying infected soil were compared. It was found that soil known to be well supplied with the bacteria is equal, if not superior, to the commercial cultures.

Corn Root-Rot. Tests to determine the cause of corn root-rot have resulted in distinguishing two distinct types of injury —seedling blights, due to seed-borne organisms, and true corn root-rot, which may be produced experimentally by using old corn soil or by adding rotted roots from a continuous corn plot

to sand cultures of fungus-free plants. The results indicate that *Gibberella saubinetii, Fusarium* spp. and probably *Diplodia zeae* are not concerned in the true corn root-rot, and suggest strongly that the cause of this disease is a phycomycete of the pythium type. An organism of this type has been found consistently at the rotting border of the corn rootlets, and in the rotted tissue, oogonia and oospores of a pythium type have been found abundantly and consistently.

A method has been developed for producing corn seedlings, for pot culture work, entirely free of seed-borne fungi.

Insecticide Tests. Of various insecticides tested for the purpose of learning their value against the Mexican bean beetle, the best results were obtained from calcium arsenate, 1 part, and hydrated lime 9 parts, only 2.85 per cent of the plants being injured when finally examined.

Similar tests were made with a view to controlling the injury of the cucumber beetle, arsenate of lead and arsenate of lime being used in mixtures with hydrated lime. Nicotine dust was employed at the same time for comparison and gave the best results in the final yield, but further tests are needed to settle this point definitely.

Blight Infestation of Apple Trees. From careful observations to determine the relative susceptibility of varieties to blight, it was found that, irrespective of varieties, the degree of infection is clearly correlated with severity of pruning. The filler rows, which have been much more severely pruned for several years, show a clearly marked increase of the diseased parts as compared with the corresponding lightly pruned rows of permanent trees. The most severely infected varieties in 1925 were Domine, Lowell, Maiden Blush, Milam, Pewaukee, Rhode Island Greening and Tolman.

Effect of Pruning Upon Fruit Production. Again, in 1925, as for several years past, the experiment being conducted upon the effect of degree of pruning upon fruit production in the apple variety orchard on the Station farm, has shown marked results. The odd numbered rows, those lightly pruned,

produced a yield 45 per cent in excess of that upon the corresponding trees in the even numbered or filler rows, which have been much more rigorously pruned year after year.

Sterility in Mares. The work that has been done in this project demonstrates very clearly that it is possible to effect a cure tho not in a high percentage of cases. Observations, extending over a number of years, of groups of animals maintained for breeding, show very conclusively that with proper hygiene it is possible to reduce the number of new cases of infection which may occur from year to year, and thus materially increase the breeding efficiency of the group of animals. The work done on the diseases of the reproductive organs of mares shows that by not breeding mares with genital infections; by the proper handling of mares with functional disturbances, and by the correct application of even the simplest forms of cleanliness during the breeding season, the percentage of foals in a number of studs has been raised from 50 and 60 per cent to 75 and 80 per cent. In other instances where no attention was given to the application of the most elementary principles of breeding hygiene the information, so far available, is that the percentage of mares producing foals is gradually on the decline and far below the average, with many individual mares diseased beyond the possibility of recovery.

Infectious Abortion in Cows and Mares. Of the 1,786 mares vaccinated in 47 different herds in 1924, fifteen aborted, but the *Bacterium abortivo-equinus* was not incriminated as the causal agent in these cases. Two of these abortions were caused by the *Strepococcus genitalium,* seven were due to bad feed, and one mare aborted twins. No cause could be assigned for the remaining five abortions. During the fall of 1925, the Streptococcus was found in the internal organs of five aborted fetuses, indicating that this organism is the cause of some abortions among mares. Tests for infectious abortion have been made of 1,005 cows in 82 different herds. Vaccine was prepared for 165 cows in 18 different herds, and bacterin for 913 cows in 55 different herds. One hundred and sixty-

five hogs in three different herds were given the bacterin treatment for infectious abortion.

Treatment of Pigs for Worms and Relationship to Gains. The objects of this test were to determine whether the worming of pigs aided their making faster and more economical gains, to ascertain if semi-solid buttermilk could be used as a worm expellant, and to determine if two treatments were better than the single treatment. The results showed no advantage in those lots of pigs receiving the worm treatment over the one not receiving the treatment. These results were at variance with the commonly accepted viewpoint and further study is required before definite conclusions can be drawn. Creamery buttermilk, valued at one cent per gallon, gave more economical and also faster gains than did semi-solid buttermilk or water used as a supplement to the grain mixture. Semi-solid buttermilk, fed in a dilution of 1 part to 40 parts of water by measure, did not have any appreciable effect upon the rapidity of gains when fed with a balanced ration. In this test, semi-solid buttermilk was not as effective as the worm capsule in expelling the round worms from the pigs.

Hogging Down Corn with and Without Supplements. The results of these tests indicate that mineral mixtures are desirable as a supplement for the hogging down of corn and for corn and soybeans grown together; that a bone meal mixture is more economical and gives more rapid gains than does a phosphate mineral mixture; that salt as a supplement for corn hogged down gives faster and more economical gains than when no suplement is provided; that tankage is not benefited by the addition of salt and limestone, and that a good mineral supplement is almost equal to tankage in the hogging down of corn.

Feeding Breeding Ewes. During the breeding season and preceding the lambing period, the Station flock of breeding ewes was fed soybean hay in addition to the standard grain ration of equal parts by weight of oats and bran. The consumption was approximately two pounds of soybean hay per

ewe daily. In this connection it was noted that the ewes refused to eat the coarse, woody part of the hay and that soybean hay proved to be slightly more constipating than alfalfa hay. This latter condition was corrected by the addition of approximately a half pound of corn silage per head per day. For the seventh consecutive year, there were no losses in the Station flock during the period of pregnancy. This freedom from loss probably may be attributed to the fact that the ration fed was properly balanced and contained plenty of protein and mineral matter for developing the unborn lamb; and that the ration contained sufficient amounts of succulent and laxative feeds to keep the ewes healthy.

Fattening Spring Lambs on Pasture. A comparison was made of bluegrass pasture and a mixture of oats and rape for fattening spring lambs. Beginning July 6, 1925, one week after weaning, 22 spring lambs were divided into two lots. All of these lambs were sheared. One lot of 9 lambs was placed on bluegrass pasture and the other lot of 13 lambs was placed on pasture consisting of a mixture of rape and oats, both pastures being in excellent condition. In addition, the lambs in each lot were fed a grain mixture consisting of 10 pounds rolled oats, 2 pounds bran and 1 pound pea-size linseed oil meal. The lambs on bluegrass pasture made an average gain of 3½ pounds each in 28 days. The lambs on rape and oats pasture made an average gain of 3½ pounds each in 28 days. The results of the 1924 and 1925 experiments show practically no difference in the rate of gain due to the character of the herbage in the two pastures.

Comparison of Gains in Sheared and Unsheared Lambs. To note the effect of shearing upon gains in lambs, 13 sheared and 7 unsheared spring lambs were pastured on rape and oats, beginning July 6, and were fed a grain mixture consisting of 10 pounds rolled oats, 2 pounds bran and 1 pound linseed oil meal. The sheared lambs made an average gain of 3½ pounds in 28 days and the unsheared lambs an average gain of 6 pounds in 28 days. No difference could be noted in the health and vigor of

the lambs. This result is contrary to the belief of sheep breeders that sheared lambs will gain more than unsheared lambs during the hot summer months.

Fattening Late Native Lambs. Seventy-two light lambs of mixed breeding and weighing 4,303 pounds were purchased on the local market July 8, at $12.50 per hundred pounds. The following morning, 36 of these lambs were given the bluestone drench for stomach worms and in the afternoon of the same day all lambs were placed on bluegrass pasture. No extra feed was given. The lambs were ewes and wethers of good quality, low set, rather blocky of build, and apparently a healthy lot of animals. One of the undrenched lambs disappeared after three weeks. During the first four weeks all these lambs made good gains. The next two weeks of the grazing period were exceedingly warm and dry and practically no gains were made by either lot. On August 18, the lambs were sold at auction. Seventeen of the lambs, six of them being from the undrenched lot, were too light to go as tops. They averaged 59 pounds and sold for $11.00 per hundred pounds. The remaining 54 lambs averaged 71.6 pounds and sold for $14.50 per hundred pounds.

	Drenched	Undrenched
Total gain per lamb	12.2 lbs.	7 lbs.
Average selling price per 100 lbs.	$13.90	$13.40
Average margin per lamb above original cost	$ 1.92	$ 1.16

Metabolism of the Chicken. It has been conclusively demonstrated that the hatchability of eggs will fall to zero in the absence of supplemental calcium carbonate, such as oyster shell or limestone, in the diet of hens. Analyses show that the absence of a calcium carbonate supplement from the diet of the mother hens not only diminishes the weight of both shell and contents of the eggs, but also diminishes the weight of the carcasses of the chicks, estimated moisture-free. Both quantity and percentage of calcium are less in chicks from the no-calcium hens and in weak chicks than in chicks from the

hens that received calcium carbonate and in strong ones, but the percentages and quantities of phosphorus did not show any striking differences. The percentages of protein in both white and yolk were sensibly the same in eggs from the hens that received supplemental calcium carbonate as in those from the hens from which this substance was withheld. This implies increased elaboration of protein by the hens that received calcium carbonate which, of course, was shown more strikingly by the increased egg-production of these hens.

Common Grains as Supplements to Skim-milk in Poultry Rations. The feeding experiments with Barred Plymouth Rocks, comparing corn, wheat and oats in various proportions as supplements to sour skim-milk, were concluded this year. The average of the three years' work shows clearly that very satisfactory egg production can be secured without the use of a dry mash when sour skim-milk is available at all times as a source of protein and when used to supplement the grain ration. There was only a slight difference in the egg production or in the cost of producing the eggs with the different grain mixtures fed. From the data obtained, it seems that the price of the various grains should be the main guide in selecting the grain mixture to be used. Corn and wheat gave the best results in winter and yearly egg production and in low cost of producing eggs. Corn, wheat and oats stood second in these respects. The results show that if corn is the only grain available, it may be used alone but where the other grains are available and reasonable enough in price, they can be added to the grain mixture to good advantage.

Effect of Shell-Forming Material on Egg Production. A comparison of the effect of oyster shell, ground limestone and pearl grit on egg production, when fed to general-purpose hens, indicates that ground limestone is as satisfactory a source of mineral for egg production as is oyster shell, substantiating similar conclusions reached previously with Leghorns. Altho more conclusive evidence is needed, it seems that since ground limestone is so cheap and plentiful, it should

play an important part in poultry feeding. However, only limestones low in magnesium should be used to replace oyster shell.

Condensed and Granulated Buttermilk as Supplements for the Laying Mash. This experiment was undertaken to test the advisability of reducing the amount of meat scrap in the mash and replacing it with some form of milk. From one year's test, it appears that a dry mash containing 20 per cent meat scrap is the more economical and efficient ration for commercial poultry flocks.

Feed Control. Due in a large measure to the scarcity of feeds and their resultant high cost, the consumption of concentrated feeds in the state was about ten thousand tons less in 1925 than in 1924.

Standards on special-purpose mixed feeds have been put into effect, Kentucky being the only state, to date, in which such standards are in full effect. Thru the adoption of such standards, it is estimated that thousands of dollars will be saved to the feeders of the state by the elimination of excess fibrous materials sold in the form of concentrates. In addition to the saving by the elimination of excess fiber or waste at concentrate prices, a probable greater saving will be effected by the replacement of the excess fiber or waste with materials that will add both to the quality and food value of the rations.

Analyses have been made of 870 samples of feed, over 200 of which number were sent in by consumers and dealers. Nine suits have been instituted in the federal courts and ten in the state courts for violations of the law.

Public Service Laboratories. The serological and bacteriological examinations made during the year number 45,843. Nine hundred and thirty-four food samples and 330 drug samples were analyzed, and 28,621 sterile containers were sent out. Of the samples analyzed, 521 were official food samples and 178 official drug samples. Requests for examinations were submitted by 1,032 physicians, representing every county in the state.

Creamery and Tester's License. Five hundred and ninety-two licenses authorizing their holders to buy milk and cream on the basis of butterfat content, have been issued. There are 598 licensed testers in Kentucky. Of this number 462 hold renewal licenses granted July 1, 1925, and 136 are new operators licensed since that date. Examinations for applicants for tester's license were held bi-monthly in Lexington, Cincinnati, Louisville, Bowling Green and Paducah. In addition, six special examinations were given. Notices of these examinations were sent to 431 persons, of whom 251, or 58 per cent appeared. Of those examined, 182, or 72 per cent made a passing grade of 75 per cent or higher. The grading of station operators on the basis of their work has been continued and enlarged upon this year so as to include all operators inspected. This grading system has been of help in the work of inspection and it has brought about more efficiency on the part of the operator. Court proceedings have been instituted against two creamery companies and their operators for operating without tester's license. In each of these cases, the courts collected a fine of $100 and costs from the creamery companies. A total of 14,550 pieces of glassware were retested, 36 pieces being rejected as inaccurate.

The fees received in the creamery and tester's license section amounted to $5,900.23, and the expenditures to $5,356.64, as itemized:

Salaries	$3,257.39
Labor	245.85
Postage and Stationery	245.13
Freight and express	6.03
Sundry supplies	51.62
Travel	1,527.62
Contingent	23.00
Total	$5,356.64

Robinson Substation. In an effort to ascertain the grasses best suited to the mountain section, some twenty to twenty-five acres of very steep land have been sown to various grasses.

Of all the grasses sown, thus far, orchard grass has shown the best growth.

An orchard test is being made of apples, peaches and cherries, a total of 437 trees having been set out on twelve acres of steep land previously terraced. Also plantings have been made of grapes and berries, 100 vines of the former and 3,000 plants of the latter.

Further improvements and grading have been made on the ten-acre tract at Quicksand. A stock barn, five poultry houses, a workshop and a hog house have been constructed on the farm, and all fences and gates necessary to the proper handling of stock have been built.

Forest boundaries of about 55 miles were retraced and marked, and over 150 corners set or marked. Seven miles of line have been painted. Trails fifteen miles in length were opened and maintenance work done on twenty miles. On the Rose Branch Block boundaries have been established, marked and mapped and the timber thereon estimated. A fifty-foot contour map has been constructed and a 10 per cent strip estimate made of all timber over six inches in diameter. Two plots of black walnut were planted by different methods, and a small seed bed started, but the results with the latter have not been very satisfactory.

At Camp Robinson, on the forest tract, a sewing and cooking school has been conducted, a one-day session being given each week for a period of fifteen weeks. Demonstrations in the practical preparation and serving of foods common to the mountain section, and instruction in making simple clothing have been given. Several meetings of particular interest to women and children have been conducted in various parts of the county. Interest has been aroused in poultry raising and fifty purebred cockerels have been distributed among farmers in exchange for "scrubs."

Formal dedicatory exercises for the Robinson Substation were held September 7, and much satisfaction and interest were manifested in its establishment.

Western Kentucky Substation. Work thus far has been largely confined to the development of facilities and to general preparation for the permanent experimental work to be undertaken. The 400 acres of land originally deeded to the University which have been augmented by the purchase of 60 additional acres by the University, required considerable work preparatory to launching the various experimental projects. This has included the razing of a number of old and dilapidated buildings, the grubbing of many of the fields, and the cutting out of fence rows, creek beds, sinkholes and gullies. Some grains, grasses and vegetables were grown during the past season, initiating certain tests and experiments in agronomy and horticulture. The residence and office building has been repaired and remodeled, and a dairy barn, a mule barn, a poultry house and a storage house have been constructed. New farm fences have been built and old fences reconstructed and repaired. A flock of poultry and a small dairy herd have been established, both of which will be used in experimental projects in these respective lines. This Substation was formally dedicated September 7, with appropriate exercises and with an estimated attendance of eight thousand or more persons.

New Projects. New projects undertaken this year are—

Investigation of the marketing of tobacco.

A study of farm organization and management thru cost accounts.

An investigation of the vitamins of kale.

An investigation of the metabolism of obesity

A study of membership problems of cooperative marketing associations.

Varying amounts of meat scrap for supplementing milk in the feeding of poultry.

Changes in Staff. The personnel of the Experiment Station is shown on page 2 of this report. The appointments and resignations for the year follow:

Appointments:

Lula M. Hale, field worker, Robinson Substation. May 1.

Robert Mathews, inspector of feeds and fertilizers. May 25.

Thomas Baird, assistant in farm management. July 1.

Philip Edwards, assistant bacteriologist, department of veterinary science. July 15.

F. E. Hull, assistant veterinarian. August 26.

E. C. Johnson, assistant in marketing. September 1.

Mariel Hopkins, head, department of home economics. September 1.

Statie Erikson, assistant, department of home economics. September 1.

W. A. Anderson, Jr., microscopist, department of feed control. November 23.

Resignations:

R. E. Tolle, inspector, feeds and fertilizers. May 2.

D. A. Sanders, assistant veterinarian. July 1.

E. A. Caslick, assistant veterinarian. August 16.

Ethel Snyder, laboratory assistant, department of veterinary science. September 1.

P. H. Senn, microscopist, department of feed control. October 1.

Library. The total accessions at the close of 1925 amounted to 10,802, or 324 volumes added during the year. The periodicals subscribed for number 139 domestic and 33 foreign. In addition to these, the library received by gift and thru exchange some 41 agricultural journals from abroad.

Publications.

Bulletins

No.

257 Commercial feeding stuffs in Kentucky in 1924. J. D. Turner, H. D. Spears and W. G. Terrell. February, 1925.

258 The relation of some chemical constituents to the grades of Kentucky tobacco. O. M. Shedd. April, 1925.

259 Farming with bluegrass. J. B. Hutson and E. L. Langsford. July, 1925.

260 Sources of animal protein for laying hens. J. Holmes Martin. August, 1925.

261 An economic study of 270 farms in Union and Henderson Counties. W. D. Nicholls. November, 1925.

262 Root-rot of tobacco in Kentucky and its control (a progress report). W. D. Valleau, Ralph Kenney and E. J. Kinney. December, 1925.

263 Analyses of commercial fertilizers. H. E. Curtis, H. R. Allen and Lelah Gault. December, 1925.

Circulars:

35 Beekeeping for beginners. H. Garman. March, 1925.

Report:

Thirty-seventh annual report of the Experiment Station —1924. Thomas P. Cooper.

Scientific Papers (In print):

The relation of cooperative marketing to the adjustment of agricultural production. O. B. Jesness. Journ. Farm Ecs. April, 1925.

The plan and organization of cooperatives. O. B. Jesness. Journ. Farm Ecs. July, 1925.

The occurrence of copper, manganese, zinc, nickel and cobalt in soils, plants and animals, and their possible function as vital factors. J. S. McHargue. Journal of Agricultural Research, Vol. 30, No. 2, January 15, 1925, pp. 193-196.

The association of copper with substances containing the fat-soluble A vitamin. J. S. McHargue. American Journal of Physiology, Vol. 72, No. 3, May, 1925. pp. 583-594.

The significance of the occurrence of copper, manganese and zinc in forage crops and foods. J. S. McHargue. Journal of the American Society of Agronomy, Vol. 17, No. 6, June, 1925. pp. 368-372.

Manganese and plant growth. J. S. McHargue. Read at the annual meeting of the American Chemical Society at Los Angeles, Cal., August, 1925, in the symposium on the chemistry of plant growth.

Chemical studies of the oviduct of the hen. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Amer. Jour. Physiol.. Vol. LXXI, No. 2, Jan., 1925. pp. 349-352.

Relation of calcium restriction to the hatchability of eggs. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Amer. Jour. of Physiol., Vol. LXXI, No. 3, February, 1925. pp. 543-547.

Concerning the mode of transference of calcium from the shell of the hen's egg to the embryo during incubation. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Amer. Jour. Physiol., Vol. LXXII, No. 2. April, 1925, pp. 253-255.

Comparative analyses of the droppings of laying hens with and without a calcium carbonate supplement in the diet. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Poultry Science, Vol. IV, No. 5, June-July, 1925, pp. 165-170.

Effect of a calcium carbonate supplement in the diet of hens, on the weight, protein content and calcium content of the white and yolk of eggs. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Amer. Jour. Physiol., Vol. LXXII, No. 3, May, 1925, pp. 458-463.

Phenolphthalol, its preparation and reaction towards oxidases and peroxidases. G. Davis Buckner. Amer. Jour. Physiol., Vol. LXXIV, No. 2, October, 1925, pp. 354-358.

Anaphylaxis and hydrogen ion concentration. Daniel J. Healy, Howell D. Spears and Louise B. Healy. Read at the annual meeting of the Kentucky Academy of Science, May, 1925.

The hydrogen ion concentration and basicity of egg yolk and egg white. D. J. Healy and A. M. Peter. Journal of Physiology, Vol. 74, No. 2, October, 1925. pp. 363-368.

Analyses of rainfall from a protected and an exposed gage, for sulfur, nitrate nitrogen and ammonia. E. M. Johnson. Journ. Soc. Agron., Vol. 17, No. 10, pp. 591-593. October, 1925.

Note on the increased growth of bluegrass from associated growth of sweet clover. P. E. Karraker. Journal Am. Soc. of Agron., Vol. 17, No. 12, December, 1925, pp. 813-814.

The following have not yet been published, but have been accepted or are in an advanced state of preparation:

Influence of sulfur and gypsum on the solubility of potassium in soils and on the quantity of this element removed by plants. O. M. Shedd.

Further evidence that small quantities of copper, manganese and zinc are factors in the metabolism of animals. J. S. McHargue.

Calcium and phosphorus content of strong and weak chicks from hens with and without a calcium carbonate supplement in their diet. G. Davis Buckner, J. Holmes Martin and A. M. Peter. Accepted by the American Journal of Physiology.

Relation of calcium restriction to the hatchability of eggs. G. Davis Buckner, J. Holmes Martin and A. M. Peter. To be published as a research bulletin of the Experiment Station.

The exudate from nutrient agar slants—the so-called water of condensation. D. J. Healy. Accepted by the American Journal of Bacteriology.

Corn root-rot—a soil-borne disease. W. D. Valleau, P. E. Karraker and E. M. Johnson. For Journal of Agricultural Research.

A method of growing corn seedlings (*Zea mays*) free from seed-borne organisms. W. D. Valleau and E. M. Johnson. For Journal of Agricultural Research.

A method for the elimination of red blood cells as confusing factors in the diagnosis of rabies. Earl K. Borman.

FINANCIAL STATEMENT

KENTUCKY AGRICULTURAL EXPERIMENT STATION

In Account with the United States Appropriations, 1924-25:

	Hatch Fund	Adams Fund
Receipts from the Treasurer of the United States, as per appropriations for fiscal year ending June 30, 1925, under acts of Congress approved March 2, 1887 (Hatch Fund) and March 16, 1906 (Adams Fund)	$15,000.00	$15,000.00
By Salaries	$14,873.99	$14.960.21
Labor		
Stationery and office supplies		
Scientific supplies, consumable		
Feeding stuffs		
Sundry supplies		
Fertilizers		
Communication service		
Travel expenses	126.01	39.79
Transportation of things		
Publications		
Heat, light, water, and power		
Furniture, furnishings, and fixtures		
Library		
Scientific equipment		
Livestock		
Tools, machinery, and appliances		
Buildings and land		
Contingent expenses		
Balance		
Total	$15,000.00	$15,000.00

We, the undersigned, duly appointed Auditors of the corporation, do hereby certify that we have examined the books and accounts of the Kentucky Agricultural Experiment Station for the fiscal year ended June 30, 1925; that we have found the same well kept and classified as above; that the balance brought forward from the preceding year was none on

the Hatch Fund and none on the Adams Fund; that the receipts for the year from the Treasurer of the United States were $15,000.00 under the act of Congress of March 2, 1887, and $15,000.00 under the act of Congress of March 16, 1906, and the corresponding disbursements $15,000.00 and $15,000.00; for all of which proper vouchers are on file and have been by us examined and found correct, leaving balances of none and none.

And we further certify that the expenditures have been solely for the purposes set forth in the acts of Congress approved March 2, 1887, and March 16, 1906, and in accordance with the terms of said acts, respectively.

Signed:

LOUIS E. HILLENMEYER,
H. M. FROMAN,
Auditors.

(Seal of Institution)
Attest:
TERESA BUCHIGNANI,
Custodian of the Seal.

METEOROLOGICAL SUMMARIES

For the Year 1925

Compiled from the Records of the U. S. Weather Bureau Station, Lexington, Ky.

ANNUAL METEOROLOGICAL SUMMARY

Month	Temperature, Degrees Fahrenheit							Relative Humidity Per cent 7 a. m.	Precipitation, in Inches				Per cent of Sunshine	Wind					Number of Days												
	Mean			Extreme												Maximum For 5 mins.										Max. Temp.		Min. Temp.		
	Maximum	Minimum	Monthly	Maximum	Date	Minimum	Date		Total	Maximum in 24 hours	Date	Total Snowfall, Ins.		Average Hourly Velocity	Prevailing Direction	Velocity	Direction	Date	Gales, 40 miles per hour or over	Clear	Partly Cloudy	Cloudy	Precipitation of .01 inch or more	With trace or more of snow	Thunderstorms	Dense fog	90 deg. or above	Freezing or below	Freezing or below	Zero or below
January	40.1	25.6	32.8	57	7	—4	28	85	3.41	0.89	26-27	5.1	38	13.9	SW	35	SW	7	0	12	1	18	13	7	0	4	0	5	26	1
February	52.2	33.9	43.0	71	8	13	27	82	3.02	1.34	1-2	1.5	41	15.6	SW	48	NW	26	5	8	9	11	11	3	3	0	0	1	12	0
March	57.1	36.1	46.6	78	9	8	8	79	3.45	1.06	14	0.3	42	15.7	NW	54	NW	27	6	10	9	12	10	4	3	0	0	1	11	0
April	69.1	49.2	59.2	90	24	33	1	75	2.49	0.78	14	0	51	13.0	SW	44	SW	19	3	14	5	11	12	0	8	0	0	0	0	0
May	69.6	50.1	59.8	88	31	36	25	75	3.56	1.80	10-11	T	47	12.4	SW	50	SW	16	2	7	15	9	8	2	3	0	0	0	0	0
June	85.0	66.7	75.8	97	4	56	11	76	3.96	1.77	23-24	0	60	11.8	SW	39	N	6	0	15	8	7	8	0	9	0	4	0	0	0
July	84.0	65.9	75.0	97	3	58	31	78	3.63	1.32	20-21	0	54	10.7	SW	52	NW	3	1	13	13	5	12	0	10	0	4	0	0	0
August	86.1	66.3	76.2	95	17	54	1	73	1.15	0.48	12-13	0	65	10.4	NE	38	SW	2	0	15	14	2	7	0	8	0	9	0	0	0
September	85.6	66.7	76.2	99	9	52	23	75	1.70	0.86	12-13	0	43	11.2	SW	35	SW	20	0	9	10	11	11	0	4	1	12	0	0	0
October	57.2	43.3	50.2	75	4	21	29	87	5.83	2.78	16-17	2.8	17	11.4	SW	38	W	26	0	3	4	24	19	3	1	0	0	0	7	0
November	51.2	35.3	43.2	68	7	20	24	85	4.52	1.52	26-27	0.3	35	14.5	SW	56	SW	7	2	8	5	17	8	2	1	1	0	1	11	0
December	39.0	24.7	31.8	62	4	—3	27	85	0.80	0.62	4	0.7	34	14.4	SW	38	SW	6	0	10	5	16	8	5	0	3	0	8	22	2
					Sept		Jan.				Oct.							Nov												
The Year	64.7	47.0	55.8	99	9	—4	28	80	37.52	2.78	16-17	10.7	44	13.0	SW	56	SW	7	19	124	98	143	127	26	50	9	29	16	89	3

MONTHLY AND ANNUAL MEAN TEMPERATURE

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1872											37	27	
1873	30	35	42	53	66	74	75	74	67	53	40	39	54.0
1874	36	38	44	46	66	77	78	75	71	57	45	38	56.0
1875	27	29	42	49	64	72	76	71	64	52	43	43	52.7
1876	41	39	41	52	65	72	77						
1887											44	35	
1888	31	36	41	56	63	72	76	74	63	51	46	37	54.0
1889	37	32	46	55	63	69	75	72	65	52	43	50	55.0
1890	44	45	39	56	63	77	76	71	67	53	49	37	56.6
1891	37	41	40	57	62	76	73	73	72	55	43	43	56.0
1892	28	41	39	54	63	76	75	75	68	57	41	33	54.1
1893	23	36	43	57	61	72	79	74	70	57	43	37	54.4
1894	38	34	49	54	62	75	76	76	71	58	41	37	55.9
1895	28	23	43	56	62	75	73	76	73	52	45	37	53.7
1896	34	35	38	62	71	72	75	75	67	54	48	38	55.9
1897	30	37	48	53	59	72	76	74	72	64	46	37	55.7
1898	38	36	49	50	65	74	76	76	72	56	43	33	55.8
1899	34	24	42	56	67	75	77	77	68	61	48	33	55.1
1900	36	31	39	55	66	72	77	79	73	65	45	37	56.3
1901	34	29	44	49	63	74	80	74	67	58	40	31	53.6
1902	32	25	45	53	68	71	77	74	67	59	53	34	54.8
1903	32	36	50	53	68	68	77	74	70	57	40	28	54.4
1904	30	31	46	48	64	72	74	74	69	57	44	34	53.5
1905	24	25	49	54	66	72	75	74	68	55	44	35	53.5
1906	37	32	36	57	64	72	74	76	71	55	45	36	54.5
1907	40	32	52	45	59	69	76	73	68	53	42	37	53.8
1908	33	33	50	55	65	72	76	75	72	58	48	38	56.1
1909	37	41	43	54	62	73	73	74	66	53	53	28	54.6
1910	32	31	54	54	59	69	75	73	70	60	40	29	53.7
1911	38	40	43	52	70	74	76	76	72	58	40	41	56.6
1012	23	28	39	57	63	69	75	72	70	59	44	56	53.1
1913	42	33	44	53	65	73	78	77	69	56	49	38	56.5
1914	37	29	40	54	66	76	78	75	67	59	46	30	54.6
1915	32	40	36	59	62	70	74	70	70	60	49	36	54.8
1916	40	33	41	52	67	69	78	76	67	58	47	34	55.2
1917	35	32	44	54	57	70	74	74	67	50	44	25	52.3
1918	20	38	49	52	69	72	73	79	62	61	44	43	55.2
1919	37	36	46	54	62	76	79	74	72	64	45	31	56.3
1920	30	33	45	50	62	71	74	72	70	62	43	36	54.1
1921	37	38	55	58	65	76	80	75	73	57	48	39	58.4
1922	33	38	47	57	68	75	76	75	73	61	47	39	57.3
1923	39	32	43	53	63	74	77	74	69	56	45	45	55.8
1924	30	33	39	55	58	73	73	75	64	62	45	34	53.5
1925	33	43	47	59	60	76	75	76	76	50	43	32	55.8

TEMPERATURE EXTREMES

Month	Highest	Year	Day	Lowest	Year	Day
January	72	1906	21	—14	1918	12
February	75	1918	28	—20	1899	13
March	85	1910	24	— 1	1873	4
April	90	1925	24	15	1875	18
May	93	1911	28	30	1876	1
June	99	1914	27	40	1910	3
July	102	1901	22	51	1891	9
August	100	1918	6	46	1915	31
September	99	1925	9	32	1899	30
October	89	1919	2	21	1925	29
November	78	1895	7	2	1872	29
December	71	1875	31	— 9	1917	10

MONTHLY AND ANNUAL PRECIPITATION

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Ann.
1872											1.21	3.30	
1873	2.53	4.05	3.73	2.89	6.05	4.49	3.37	2.94	1.60	5.47	1.92	4.48	43.52
1874	5.41	4.89	5.90	6.81	0.79	3.55	6.26	1.57	2.89	0.92	4.27	3.83	47.09
1875	2.61	3.12	6.18	2.06	2.43	4.16	11.24	0.62	1.72	2.37	5.87	3.68	46.06
1876	6.06	1.66	3.63	4.20	2.16	4.13	3.84						
1887											3.02	2.71	
1888	4.39	2.93	5.82	3.17	3.29	2.97	4.21	8.76	1.22	3.02	5.15	1.88	46.81
1889	5.66	1.78	1.63	1.52	3.53	3.49	5.82	1.15	6.79	3.06	5.34	1.73	41.50
1890	5.34	8.13	9.91	3.59	4.71	7.43	3.14	7.32	1.82	2.38	3.54	4.05	61.36
1891	4.70	4.36	7.63	1.85	1.17	5.33	3.23	6.48	1.26	1.33	5.38	2.82	45.51
1892	2.35	3.10	4.01	6.57	5.32	3.81	6.22	3.28	4.10	0.45	3.72	3.03	45.96
1893	2.10	4.44	3.30	5.81	3.88	4.24	3.11	1.86	2.25	5.59	3.36	2.61	42.55
1894	3.58	3.33	2.13	4.19	3.81	4.44	0.87	3.67	4.05	1.40	1.38	3.45	36.32
1895	5.60	0.52	2.79	3.17	4.05	2.93	5.07	1.56	0.33	1.28	2.52	5.50	35.32
1896	1.25	3.15	5.41	0.40	3.20	3.74	10.39	3.37	4.25	1.27	4.30	2.56	43.29
1897	2.59	6.33	6.55	5.80	4.48	4.77	4.34	3.21	0.80	0.38	4.83	5.11	49.19
1898	9.56	2.20	8.18	3.29	6.13	7.94	5.72	2.99	3.55	5.27	2.89	2.80	60.52
1899	6.69	2.84	8.61	2.16	3.63	2.55	0.97	4.18	1.90	2.09	1.70	2.92	40.24
1900	2.13	3.17	1.98	1.23	3.54	2.19	2.80	5.75	1.85	0.79	6.38	1.86	33.67
1901	1.49	0.62	2.23	4.52	2.67	3.70	2.61	3.74	2.18	1.33	1.73	3.50	30.32
1902	4.77	0.90	2.92	1.27	2.43	5.19	2.33	1.89	2.60	2.11	3.09	6.60	36.10
1903	1.68	6.16	3.24	3.29	1.75	2.71	2.62	1.49	0.81	2.12	2.84	1.99	30.70
1904	1.92	2.38	4.75	3.08	2.60	2.51	3.13	2.44	1.71	0.57	0.53	3.10	28.72
1905	2.04	2.13	5.87	2.87	5.54	3.31	4.94	4.11	3.20	3.45	3.58	4.13	45.17
1906	2.29	1.84	6.45	1.11	3.15	4.68	3.89	4.92	5.03	0.74	3.95	4.54	42.59
1907	9.06	1.89	4.13	1.83	3.89	3.65	4.42	2.07	2.72	2.76	2.67	2.28	41.37
1908	1.85	4.81	8.17	4.99	4.20	2.12	3.60	2.98	0.38	0.72	1.65	2.13	37.60
1909	3.35	6.86	3.97	6.72	4.15	5.41	5.98	1.26	4.88	2.05	1.96	2.77	49.36
1910	4.46	4.11	0.46	4.22	6.24	5.92	7.66	4.15	7.92	1.67	1.72	2.81	51.34
1911	2.44	2.21	2.31	4.46	1.07	3.01	0.92	2.84	4.37	3.67	3.84	6.20	37.34
1912	1.78	2.50	4.36	6.89	5.11	2.15	4.70	3.23	2.09	0.51	1.02	3.66	38.00
1913	10.35	2.61	6.04	2.41	4.32	3.29	2.43	1.00	1.76	3.40	4.00	2.74	44.35
1914	2.50	3.87	2.24	2.23	1.65	4.77	2.63	4.69	1.82	5.32	1.62	4.40	37.74
1915	4.38	1.12	1.49	0.65	7.23	3.20	5.72	6.03	3.74	0.81	3.90	6.67	44.94
1916	5.65	3.40	3.30	1.01	2.92	5.33	1.72	2.34	2.75	2.04	1.25	3.63	35.34
1917	5.67	2.12	5.48	3.97	3.51	3.54	2.80	1.94	2.46	2.36	1.03	1.97	36.85
1918	4.46	1.92	1.55	2.09	4.13	3.61	2.01	2.68	1.41	4.57	2.24	4.83	35.50
1919	2.48	1.61	3.71	3.51	6.38	4.49	2.28	2.39	1.12	7.95	8.50	6.70	51.12
1920	5.26	2.11	4.62	6.42	2.51	2.39	1.73	6.71	4.88	2.75	2.22	1.40	43.00
1921	3.24	2.62	5.06	3.28	1.60	2.16	1.04	3.88	5.10	2.46	6.89	5.74	43.07
1922	1.87	3.12	7.75	4.46	3.10	2.44	2.13	2.20	5.99	1.25	0.88	5.67	40.86
1923	6.63	4.40	4.65	5.43	1.66	3.55	5.01	4.02	1.51	0.56	2.71	6.50	46.63
1924	5.00	2.60	2.42	3.75	3.04	4.04	2.77	2.28	3.89	0.11	1.32	5.95	36.81
1925	3.41	3.03	3.45	2.49	3.56	3.96	3.63	1.15	1.70	5.83	4.52	0.80	37.52

EXTREMES OF PRECIPITATION AND WIND

Month	PRECIPITATION			WIND			
	Greatest in 24 hrs.	Year	Day	Max. Vel.	Dir.	Year	Day
January	3.50	1913	11	60	sw	1891*	1
February	3.04	1909	23–24	60	sw	1890*	25
March	3.61	1913	25–26	68	sw	1919	17
April	3.24	1909	29–30	64	sw	1909	29
May	2.61	1898	6–7	60	nw	1889*	12
June	4.45	1898	26–27	60	n	1890*	29
July	4.02	1875	11–12	58	nw	1915	30
August	2.98	1915	1-2	72	s	1918	6
September	5.45	1922	3	68	w	1889	8
October	2.78	1925	16–17	50	nw	1904*	21
November	3.95	1919	25-26	62	s	1895*	26
December	3.63	1919	6	60	sw	1895*	26

*Also in subsequent years.

THIRTY-EIGHTH ANNUAL REPORT

Of The

Kentucky Agricultural Experiment Station

FOR THE YEAR 1925

PART II

Bulletins 257 to 263

Circular 35

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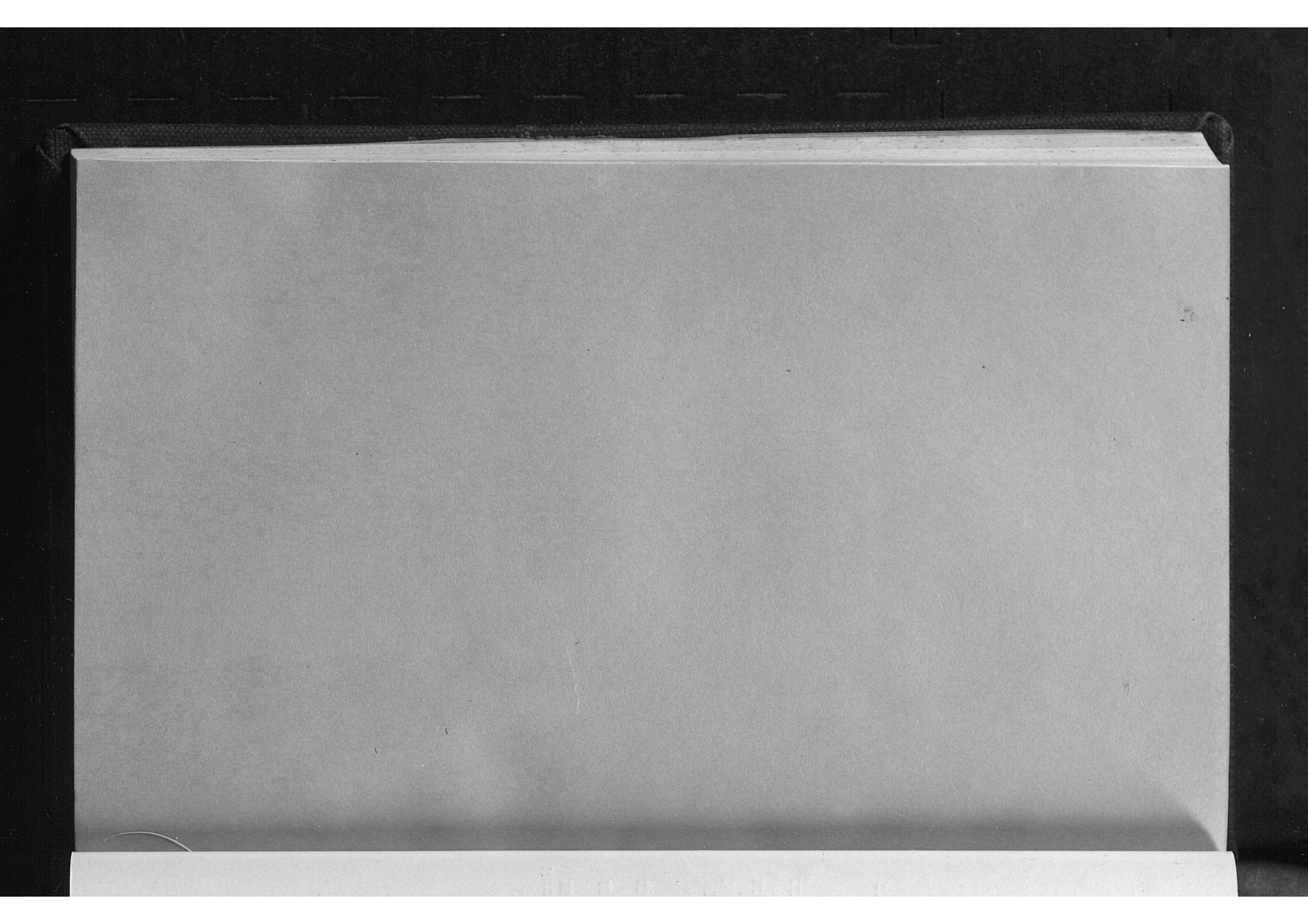

Kentucky

Agricultural Experiment Station

University of Kentucky

COMMERCIAL FEEDING STUFFS IN KENTUCKY IN 1924

BULLETIN NO. 257

Lexington, Ky.

February, 1925

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***Assigned by the U. S. Department of Agriculture.

BULLETIN NO. 257

Commercial Feeding Stuffs in Kentucky in 1924.

By J. D. TURNER, H. D. SPEARS and W. G. TERRELL.*

Kentucky feeders of live stock, during the year 1924, purchased more than 270,000 tons of commercial feeds, at an estimated retail price close to $15,000,000.00. Of this amount, about 30% was produced in Kentucky and 70% was imported into the State. The price paid for commercial feeds alone, not including whole grains and hays consumed in the State, based on the 1920 U. S. Census, equals about one-tenth the value of the total live stock in the State; or about two-fifths the value of the horses; a little less than half the value of the mules; almost equal the value of the beef cattle; a little less than half the value of the dairy cattle; twice the value of the sheep; about equal the value of the swine; and almost double the value of the poultry.

These feeds are grouped according to class and tonnage:

Dairy feeds	38,105 tons
Horse feeds	26,595 tons
Ground barley and oats	125 tons
Corn and oat chop	225 tons
Stock feeds	5,720 tons
Poultry grains	32,070 tons
Poultry mash	10,910 tons
Calf meal	525 tons
Hog feed	785 tons
Mixed feeds (corn and wheat by-products)	38,520 tons
Mixed wheat feed	28,570 tons

*Acknowledgment.—The writers take pleasure in acknowledging the efficient work of R. W. Jones, R. E. Tolle and Fred W. Fitschen, inspectors, who made the official inspections and collected samples for analysis.

Miscellaneous mixed wheat feeds	7,090 tons
Wheat middlings or shorts	21,680 tons
Wheat bran	9,760 tons
Corn feed meal	2,388 tons
Cracked corn, chop, etc.	22,515 tons
Cottonseed meal—all grades	13,725 tons
Linseed oil meal	1,355 tons
Hominy feed	5,720 tons
Tankage	1,155 tons
Meat meal, meat scraps, etc.	1,205 tons
Ground oats	760 tons
Ground barley	262 tons
Red dog	498 tons
Barley feed	125 tons
Brewers' grains	250 tons
Alfalfa meal	250 tons
Ground wheat	225 tons
Dried beet pulp	325 tons
Crushed ear corn	175 tons
Oat by-product	175 tons
Corn germ oil meal	325 tons
Miscellaneous	500 tons

The plan of conducting the work of the Department of Feed Control is two-fold: educational and regulatory. From an educational standpoint, the department has never been more in demand for information on feeds, their preparation and use, by both the feeder and manufacturer, than at the present time. The feeder is seeking to know the needs of his animals and the manufacturer is studying the requirements of the feeder and is endeavoring to meet those requirements in the products he makes. The general spirit of cooperation of the manufacturer and the feeder has never been better in the feed control service of the State. The educational development has been progressing steadily and this is the happy and pleasant side of the work. On the other hand, the control end is not without its dark and unpleasant side. From what follows it will be noted that it is often necessary for the department to call into action the force of the law that the interest of the feeder and honest manufacturer may be protected and the interest of the industry itself. During 1924, many shipments were held from the market pend-

ing labeling adjustments, some shipments were withdrawn on account of irregularities and twenty-five prosecutions were instituted for adulteration, misbranding and other infractions of the law.

There are many low-grade feeds on the Kentucky market due largely to competition between manufacturers and the willingness of feeders to buy cheap feeds. Many of the leading manufacturers say they are forced, against their own wishes, to put out cheap feeds because of the competition with other manufacturers using low-grade products. There is always an element in the feed business that will take chances with questionable practices in manufacturing cheap feeds and the honest manufacturer is inclined to make a similar class of feeds to meet this competition. The feeder is easily caught by some fancy name and slightly less price than the cost of a good, substantial well-balanced feed. Often he pays about the same price for low-grade materials, such as oat hulls, ground hays, elevator sweepings and dust, cottonseed hulls, clipped oat by-product, barley hulls, flax plant by-product and grain screenings in his feeds, as he does for high-grade materials. As long as he continues to make his purchases on name and price rather than on quality, cheap feeds will be made for him and he will continue to pay dearly.

Some of the adulterants used in feeds are not important enough commercially in Kentucky, to influence materially the quality of feeds. Some of these materials are ground corn stalks, barley hulls, buckwheat hulls, sorghum bagasse and ground straws. There are other adulterants that are commonly used in some sections of the country but do not appear frequently in Kentucky feeds. These are peanut hulls, rice hulls, cottonseed hulls, ground corn cob and cocoa shells. There is, however, quite a list of adulterants used in feeds sold in Kentucky. These are materials like flax plant by-product or refuse, oat hulls, in some form or another, as oat feed or clipped-oat by-product, elevator dust and sweepings and the so-called "grain screenings" under the guise of which and thru which all kinds of fibrous materials and refuse are used.

Flax plant by-product is produced from flax in the manufacture of rugs. It is a very fibrous material composed largely of flax stems and some flax pods and seeds. It resembles alfalfa meal and is often used as a substitute for that product. It has about the same feeding value as timothy hay. Analyses of the different lots range from 6.50% to 8.75% protein, 2.2% to 3.45% fat and 37.45% to 44.50% fiber.

Oat hulls are familiar to most every feeder. They make their appearance in feeds usually in the form of oat feed, clipped oat by-product and screenings. They are a fibrous material and the average analysis shows something like 3.7% protein, 1.8% fat and 29.5% fiber.

Clipped-oat by-product comes from grain elevators and oatmeal mills. It is produced by clipping oats to increase their weight for commercial purposes, as heavy oats command a better price. At grain elevators and oatmeal mills, by means of machines known as "clippers," the light ends and part of the hulls are broken off and this material, including the chaff and the other residues from the clipping process, is collected and is known commercially as "clipped-oat by-product." It varies in chemical composition, the average being about 6.8% protein, 2% fat and 28% fiber. It is a good absorbent of molasses and is frequently used in feeds containing molasses.

Elevator dust and sweepings are accumulations of dust, cleanings, grain hairs, sweepings and such materials from cleaning grains in elevators, separating machines and mills. It is light and fluffy in appearance and contains the floor sweepings and grain cleanings, and consequently varying amounts of dirt. It varies in physical and chemical composition and has no standard of quality. It is used directly to adulterate feeds and is used also in mixing with other materials such as screenings to adulterate feeds. It has such a complex nature that it is a very difficult matter to detect its presence in a feed composed of a number of materials and especially feeds containing screenings.

"Grain screenings" is a broad expression used to cover a product which varies greatly in both chemical and physical composition. There is no grade or standard for screenings. This

product varies so widely in composition that some lots are high in feeding value while others are low and questionable as feed materials. Elevators at grain stations often "re-work" the screenings by putting them thru several processes of separation. The grains—sound, broken and shriveled—are removed. The remainder is separated into wild mustard, wild buckwheat, weed seeds, chaff and foreign matter. The materials are then disposed of in various ways. The grain usually is sold for use in poultry feeds. The mustard is sold to crushers for its oil content. The chaff, weed seeds and wild buckwheat are ground and sold to feed manufacturers for use in stock feeds. Investigations by the department show that screenings, in most every instance and in whatever form of separation, are sold under the names of "grain screenings" or "ground and bolted grain screenings" or "recleaned ground and bolted grain screenings." Investigations also show that these screenings vary in quality very much, both chemically and physically, ranging from a very wholesome material to worthless and even dangerous as a feed. For example, examinations of some lots of screenings showed them to contain only a few weed seeds and little foreign matter; others 25 to 30% weed seeds; while others contained still higher proportions and some were made up entirely of weed seeds and foreign matter. Many lots of screenings contain poisonous weed seeds and, of course, are dangerous to feed to stock in appreciable amounts.

The main objection to the use of screenings is the illegal manner in which they are used. All sorts of materials, such as elevator dust, sweepings, hulls of various kinds, refuse and waste and other fibrous materials are used even to adulterate screenings and the entire product, finely ground, is sold under the name of "grain screenings," or "ground and bolted grain screenings." As long as the feeder will buy cheap and trashy feeds and pay a price for them all out of proportion to that of a good honest feed, these feeds will be made and offered to the public.

A feeder should carefully study the requirements of his animals and select his feeds to meet these requirements. He

should buy his feeds from reputable concerns and see that they are labeled with a Kentucky official label. The following suggestions will be helpful to those who are doubtful as to the needs of their animals and what will supply those needs:

1. Ascertain what the animals need and what will supply these needs, as no animal will give good results without proper food.
2. If in doubt as to what the animals need, consult the Experiment Station.
3. Buy no commercial feed that is not registered and tagged with a Kentucky official tag. Note carefully the system of tagging.
4. Read and study carefully the information given on the official tag.
5. High-grade feeds are the most economical.
6. Many commercial feeds sold in Kentucky are cheap, inferior and unbalanced, and do not supply the animal with proper nourishment, thus resulting in a hardship to the animal and a loss to the owner as well.
7. The value of a feed depends upon that portion of the nutrient which an animal, under ordinary conditions, can digest and take into its system for building up the growth, keeping up the heat and energy and repairing the natural waste of the body.
8. An excessive amount of food not only overtaxes the digestive organs and invites disease, but is an absolute waste as well.
9. An insufficient amount of nutrients causes loss by producing debility from want of necessary nutrition, and thus causes inability to perform the desired amount of work.
10. Unless the food is properly balanced, one set of tissues will receive an abundance of nourishment, while another set, which may be of more importance, will not receive a sufficient amount.
11. The kind and character of feed an animal requires depends entirely upon the use to which that animal is going to put the food.
12. The amount of crude protein, fat and fiber in a feed serves only as a general guide in selecting a feeding stuff. The buyer should base his final conclusion on the source, character and amount of digestible nutrients.
13. Cane molasses often makes an excellent addition to a feed, giving both added food value and palatability, but it is used too frequently for the purpose of covering up adulterants (cheap and trashy materials) in mixed feeds and in what are commonly called "sweet' or "molasses feeds."
14. For further information, see standard textbooks on feeds and feeding or Kentucky Experiment Station Bulletin No. 249.

EXPLANATION.

In previous bulletins of the department the results have been compiled into tables and each kind of feed grouped according to its class and character. In publishing the results of analyses, the manufacturers' guaranties were published alongside of our findings so that comparisons could be made. This has appeared to be the most comprehensive way of issuing the results. However, the bulletins have become so bulky that to continue this method makes too large and cumbersome a volume to distribute freely thru the mails. It has been thought best, therefore, to try another method of reporting the results in less voluminous form, that would be fair to all concerned.

The names of the manufacturers whose feeds have been analyzed are given in alphabetical order in the following pages. The results are summarized without stating percentages found by analysis. If a brand of feed was found to be up to the standard guaranteed, or even exceeded it, the term "equaled guaranty" is used. In the same manner, if a feed is not up to the standard guaranteed, the results are summarized in statements like the following: "too low in protein," "too low in fat," "too high in fiber," "adulterated," "misbranded," "list of ingredients not as guaranteed," and other brief statements of facts.

Acme-Evans Co., Indianapolis, Ind. Inspection samples analyzed, 20.

Acme Feed, 9; all but 1 equaled chemical guaranty; 2 contained oat hulls.

Acme Ground Oats, 3; too high in fiber and made of low-grade oats.

Acme Middlings and Screenings, 2; equaled guaranty.

Producer Chop, 2; adulterated and below guaranty in every respect.

Acme Cracked Corn, 1; equaled guaranty.

Acme Stock Feed, 1; adulterated and below guaranty in every respect.

Acme Hominy Feed, 1; equaled guaranty.

E-Z Scratch Feed, 1; buckwheat added.

The Acme Mills, Hopkinsville, Ky. Inspection samples analyzed, 5.

Wheat Shorts, 1; equaled guaranty.

Supreme Hog Feed, 1; equaled guaranty.

Butternut Dairy Feed, 1; equaled guaranty.
Ky.'s Choice Mixed Wheat Feed, 1; equaled guaranty.
Heavy Work Horse & Mule Feed, 1; equaled guaranty.

Adairville Milling Co., Adairville, Ky. Inspection samples of shipstuff analyzed, 3; all too low in protein.

Alba Manufacturing Co., Aurora, Ill. Inspection sample of Alba Blood analyzed, 1; no guaranty; sample showed 91.38% protein.

Alfocorn Milling Co., St. Louis, Mo. Inspection samples analyzed, 5.
Diamond X Scratch Feed, 1; oats, rye, buckwheat and weed seeds added.
Diamond "D" Scratch Feed, 1; oats and rye added.
Red Dot Scratch Feed, 1; oats, rye, wheat, and weed seeds added; no kaffir nor milo present.
Full Pail Dairy Feed, 1; ingredients not as guaranteed; no brewers' grains, corn gluten feed or rice bran; oat hulls and weed seeds added.
Ambrosia Horse & Mule Feed, 1; equaled guaranty.

The Allen & Wheeler Co., Troy, O. Inspection samples analyzed, 2.
Trojan Middlings and Screenings, 1; equaled guaranty.
A-1 Farm Feed, 1; equaled guaranty.

American Hominy Co., Indianapolis, Ind. Inspection sample of Homco Hominy Feed analyzed, 1; equaled guaranty.

The American Linseed Co., Chicago, Ill. Inspection samples of Old Process Oil Meal analyzed, 2; equaled guaranty.

American Milling Co., Peoria, Ill. Inspection samples analyzed, 10.
Sucrene Dairy Feed, 2; equaled chemical guaranty but contained excess oat hulls and weed seeds.
American Dairy Ration, 1; equaled guaranty.
Sucrene Horse Feed, 2; 1 equaled guaranty but the other was misbranded as to ingredients.
Kick-A-Poo Horse Feed, 1; below guaranty and misbranded as to ingredients.
Tip Top Scratch Feed, 1; only trace of sunflower seed.
Union Feed, 1; contained weed seeds.
Tip Top Sugared Feed, 2; 1 equaled guaranty, but the other misbranded as to the ingredients.

The Ansted & Burk Co., Springfield, O. Inspection samples analyzed, 5.
Virginia Farm Feed, 1; equaled guaranty.
Humpty Dumpty Poultry Mash, 1; equaled guaranty.
K. D. Feed Meal, 1; too low in protein.
H. D. Scratch Feed, 1; equaled guaranty.
Middlings and Screenings, 1; equaled guaranty.

Arcady Farms Milling Co., Chicago, Ill. Inspection samples of Sunkist Scratch Feed analyzed, 2; adulterated with weed seeds 10 and 25%; only traces of oats, kaffir and sunflower seed.

Archer-Daniels Linseed Co., Minneapolis, Minn. Inspection samples of Old Process Ground Oil Cake analyzed, 2; one equaled guaranty; the other too low in protein.

Armour Fertilizer Works, Chicago, Ill. Inspection samples analyzed, 3.
Armour's 60% Meat Meal, 2; equaled guaranty.
Blood Meal, 1; equaled guaranty.

Ashland Milling Co., Ashland, Ky. Inspection samples of Eureka Feed analyzed, 2; 1 contained oat hulls and too low in fat; the other equaled guaranty.

W. J. Askew & Co., Georgetown, Ky. Inspection sample of "Ask-U" Dairy Feed analyzed, 1; equaled guaranty.

Aubrey & Co., Louisville, Ky. Inspection samples analyzed, 13.
Red "A" Horse Feed, 1; too low in fat.
85% Grain Horse Feed, 2; equaled guaranty.
95% Grain Horse Feed, 1; equaled guaranty.
Dandy Horse Feed, 2; too low in protein and fat.
Blackhawk Feed, 1; weed seeds added.
Blackhawk Mixed Wheat Feed, 1; too low in protein and contained weed seeds.
Aubrey's Wheat Bran, 1; weed seeds added.
Dandy Dairy Feed, 1; ingredients not as guaranteed; weed seeds added; misbranded.
Hominy Feed, 1; sample corn feed meal; misbranded.
Aubrey's Brewers' Grains, 1; too low in protein and too high in fiber.
Rice Bran, 1; equaled guaranty.

The Auburn Mills, Auburn, Ky. Inspection samples analyzed, 2.
Shorts, 1; too low in protein and fat.
Mill Run Feed, 1; equaled guaranty.

Aviston Milling Co., Aviston, Ill. Inspection sample of "Rich As Gold" analyzed, 1; equaled guaranty.

J. J. Badenoch Co., Chicago, Ill. Inspection samples analyzed, 4.
Honey Bee Dairy Feed, 2; equaled guaranty.
C-Em-Grow Hog Feed, 1; equaled guaranty.
Velvet Horse Feed, 1; too high in fiber; weed seeds added.

Ballard & Ballard Co., Louisville, Ky. Inspection samples analyzed, 5.
Kentucky Farm Feed & Screenings, 3; equaled guaranty.
Mixed Wheat Feed & Screenings, 1; equaled guaranty.
Red Mule Feed, 1; equaled guaranty.

Baskett Grain Co., Henderson, Ky. Inspection samples analyzed, 3.
Wheat Middlings and Screenings, 1; equaled guaranty.
Uncle Tom's Mixed Feed, 1; equaled guaranty.
Purity Egg Mash, 1; equaled guaranty.

J. H. Baughman & Co., Stanford, Ky. Inspection sample of Baughman's Hen Feed analyzed, 1; too low in fat.

W. C. Binns, Herndon, Ky. Inspection sample of Eclipse Hog Feed analyzed, 1; too low in fat.

Bisbee Linseed Co., Chicago Heights, Ill. Inspection sample of 34% Oil Meal analyzed, 1; equaled guaranty.

Black & White Milling Co., E. St. Louis, Ill. Inspection samples analyzed, 9.

Cock O' the Walk Scratch Feed, 2; both samples misbranded as to ingredients.

16½% Dairy Feed, 1; excess of oat hulls; too low in protein.

Wheat Middlings and Screenings, 1; equaled guaranty.

Scratch Feed, 1; rye and oats added.

Horse Feed, 4; 2 too low in protein.

The Blake Milling Co., Edwardsville, Ill. Inspection sample of Winter Wheat Mixed Feed and Screenings analyzed, 1; equaled guaranty.

Blachford Calf Meal Co., Waukegan, Ill. Inspection sample of Blatchford's Calf Meal analyzed, 1; equaled guaranty.

Blish Milling Co., Seymour, Ind. Inspection samples of Bull's Eye Mixed Wheat Feed analyzed, 4; equaled guaranty.

Bluegrass-Elmendorf Grain Corporation, Lexington, Ky. Inspection samples analyzed, 4.

"Bluegrass" Peerless Cow Feed, 3; 2 too low in protein; all too low in fat.

"Bluegrass" Tango Horse Feed, 1; too low in protein.

Boston Flour Mills, Boston, Ky. Inspection samples of Mixed Feed analyzed, 3; 2 too low in protein.

Bowling Green Milling Co., Bowling Green, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in protein.

Boyle Roller Mills, Junction City, Ky. Inspection samples of Mixed Feed analyzed, 2; equaled guaranty.

C. S. Brent Seed Co., Lexington, Ky. Inspection sample of Kackle Scratch Feed analyzed, 1; too low in protein.

F. W. Brode Corporation, Memphis, Tenn. Inspection sample of Owl Brand 41% Cottonseed Meal analyzed, 1; too low in protein and too high in fiber.

Chas. Broeker & Co., Owensboro, Ky. Inspection samples analyzed, 3.

Mixed Feed, 1; equaled guaranty.

Hominy Feed, 2; too low in protein.

Buckeye Cotton Oil Co., Cincinnati, O. Inspection samples of 36% Cottonseed Feed analyzed, 3; 1 too low in protein; all dark color.

Burnside Roller Mills, Burnside, Ky. Inspection sample of Mixed Feed analyzed, 1; much too low in protein.

Cadick Milling Co., Grandview, Ind. Inspection samples analyzed, 4.

Shipstuff, 2; 1 adulterated with finely ground corn bran.

Mixed Wheat Feed, 2; equaled guaranty.

Cameron's Mill, Carrollton, Ky. Inspection sample of Cameron's Shipstuff analyzed, 1; sample whole ground wheat.

Cannelton Flour Mills, Cannelton, Ind. Inspection samples of Shipstuff and Screenings analyzed, 3; equaled guaranty.

Carlisle Milling Co., Carlisle, Ky. Inspection sample of Shipstuff analyzed, 1; equaled guaranty.

Cate Milling Co., Hopkinsville, Ky. Inspection sample of Wheat Bran and Shorts analyzed, 1; equaled guaranty.

Cecilian Mliling Co., Cecilia, Ky. Inspection samples analyzed, 3.
Mixed Feed, 1; equaled guaranty.
Flour Middlings, 2; too low in protein and fat.

Chattanooga Feed Co., Chattanooga, Tenn. Inspection samples analyzed, 3.
Signal Fine Feed, 1; adulterated with oat hulls; too low in fat and too high in fiber.
Red Star Fine Feed, 1; corn product guaranteed but not present.
41% Cottonseed Meal, 1; too low in protein.

Cincinnati Grain & Hay Co., Cincinnati, O. Inspection samples analyzed, 15.
"No Better" Horse & Mule Feed, 3; equaled guaranty.
Hominy Feed, 2; 1 too low in fat.
Wheat Middlings, 2; equaled guaranty.
Oil Meal, 1; equaled guaranty.
Barley By-Product, 1; equaled guaranty.
"No Better" Dry Dairy Ration, 1; too low in protein; weed seeds added; no oil meal and hominy meal present.
Standard Dairy Sweets, 1; too high in fiber.
"No Better" Dry Egg Mash, 1; too low in protein.
60% Digester Tankage, 1; equaled guaranty.
Rye Middlings, 1; the sample is rye flour and below guaranty in every respect.
50% Meat Scraps, 1; equaled guaranty.

R. G. Clarke & Co., Memphis, Tenn. Inspection samples of "Red Ribbon" 41% Cottonseed Meal analyzed, 3; equaled guaranty.

Clarkson Milling Co., Clarkson, Ky. Inspection sample of Wheat Shorts analyzed, 1; too low in protein and fat.

Clell Coleman & Sons, Burgin, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

The Colton Bros. Co., Bellefontaine, O. Inspection samples analyzed, 4.
King Mixed Feed, 1; equaled guaranty.
Wheat Middlings and Screenings, 1; too low in fat.
Pure Flaked Corn and Oat Feed, 1; equaled guaranty.
King Farm Feed, 1; equaled guaranty.

Community Roller Mills, Calhoun, Ky. Inspection sample of Mixed Wheat Feed analyzed, 1; equaled guaranty.

The Corno Mills Co., E. St. Louis, Ill. Inspection samples analyzed, 23.
- Corno Laying Mash, 4; equaled guaranty, except 1 had no alfalfa meal.
- Corno Dairy Feed, 4; equaled guaranty.
- Corno Premium Feed, 2; equaled guaranty.
- Corno Sweet Dairy Feed, 1; equaled guaranty.
- Corno Sweet Feed, 1; equaled guaranty.
- Nutro Dairy Feed, 3; equaled guaranty.
- Corno Oat By-Product, 1; equaled guaranty.
- Corno Feeding Oatmeal, 1; equaled guaranty.
- Corno Rolled Oats, 1; equaled guaranty.
- Corno Stock Feed, 3; 2 too low in protein and fat; 1 too high in fiber.
- Shamrock Laying Mash, 1; equaled guaranty.
- Pawnee Premium Feed, 1; equaled guaranty.

Corn Products Refining Co., New York, N. Y. Inspection samples analyzed, 2.
- Buffalo Corn Gluten Feed, 1; equaled guaranty.
- Diamond Corn Gluten Meal, 1; equaled guaranty.

The Cottonseed Products Co., Louisville, Ky. Inspection samples of "Eagle Brand" 41% Cottonseed Meal analyzed, 4; 1 too low in protein and 3 too high in fiber.

Crescent Roller Mills, Taylorsville, Ky. Inspection samples of Shipstuff analyzed, 3; equaled guaranty.

Diamond Mills, Evansville, Ind. Inspection samples analyzed, 5.
- Evansville Dairy Feed, 2; 1 adulterated with flax plant by-product and below guaranty in protein; the other misbranded and too low in protein.
- Evansville Scratch Feed, 1; equaled guaranty.
- Red Crown Horse & Mule Feed, 1; equaled guaranty.
- Diamond Brand 60% Tankage, 1; equaled guaranty.

The Albert Dickinson Co., Chicago, Ill. Inspection sample of Oasis Horse Feed analyzed, 1; equaled guaranty.

Dixie Mills Co., E. St. Louis, Ill. Inspection samples analyzed, 2.
- Dixie Hog Feed, 1; too low in protein; no rice bran nor copra meal, though guaranteed.
- Dixie Horse & Mule Feed, 1; too low in protein.

The Dorsel Co., Newport, Ky. Inspection sample of Corn Feed Meal analyzed, 1; equaled guaranty.

Dreyer Commission Co., St. Louis, Mo. Inspection samples analyzed, 3.
- Mixed Wheat Feed, 2; equaled guaranty.
- Wheat Bran and Screenings, 1; equaled guaranty.

T. W. Duncan, LaGrange, Ky. Inspection sample of Hy-Klas Poultry Mash analyzed, 1; too high in fiber.

Dunlop Milling Co., Clarksville, Tenn. Inspection samples analyzed, 5.
Middlings, 4; equaled guaranty.
Wheat Bran and Screenings, 1; equaled guaranty.

Dunmor Milling Co., Dunmor, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in protein.

Eagle Roller Mills, Lawrenceburg, Ky. Inspection sample of Shipstuff analyzed, 1; equaled guaranty.

Early & Daniel Co., Cincinnati, O. Inspection samples analyzed, 28.
Tuxedo Dairy, 7; equaled guaranty.
Tuxedo Hog Ration, 2; equaled guaranty.
Tuxedo Chop, 2; 1 had cottonseed meal added; no barley grains.
Tuxedo Poultry Fattener, 1; oil meal added.
Tuxedo Developer, 1; rye and oats added.
Tuxedo Egg Mash, 1; equaled guaranty.
Tuxedo 60% Tankage, 2; equaled guaranty.
Eadan Dairy Feed, 2; 1 too low in protein.
Rex Scratch, 1; equaled guaranty.
41% Cottonseed Meal, 2; 1 too low in protein and too high in fiber.
Cerealia Sweets, 2; equaled guaranty.
Corn Feed Meal, 1; equaled guaranty.
Ducome Stock Feed, 1; wheat bran and alfalfa meal added.
Ground Oats, 1; equaled guaranty.
Ground Rye, 1; equaled guaranty.
Ground Barley, 1; too low in protein.
Alfalfa Meal, 1; equaled guaranty.

Edinger & Co., Louisville, Ky. Inspection samples analyzed, 4.
Arrow Egg & Growing Mash, 1; oil meal and bone meal added; too high in fiber.
Arrow Old Process Ground Oil Cake, 1; too low in protein.
Arrow Digester Tankage, 1; too low in protein.
Arrow Horse & Mule Feed, 1; too low in fat; no barley.

Elevator Milling Co., Springfield, Ill. Inspection sample of Ideal Hominy Feed analyzed, 1; equaled guaranty.

The Elite Roller Mills, Elkton, Ky. Inspection samples of Cream Dairy Feed analyzed, 3; 1 sample ingredients not as guaranteed.

T. M. Ellis Milling Co., Russellville, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in fat.

Eminence Milling Co., Eminence, Ky. Inspection samples analyzed, 4.
Leader Mixed Feed, 3; all adulterated and too low in protein.
Leader Dairy Feed, 1; too low in protein and too high in fiber.

The Evansville Packing Co., Evansville, Ind. Inspection samples of 60% Feeding Tankage analyzed, 6; 1 too low in protein.

The Eversole Co., London, Ky. Inspection sample of Kentucky Pride analyzed, 1; too low in protein and fat.

Exchange Milling Co., Sturgis, Ky. Inspection sample of Mixed Brans analyzed, 1; too low in protein and fat.

Falls City Ice & Beverage Co., Louisville, Ky. Inspection sample of Brewers' Grains analyzed, 1; equaled guaranty.

Oscar Farmer & Sons, Louisville, Ky. Inspection samples of "We Kno" Feed analyzed, 3; equaled guaranty.

Farmers & Merchants Milling Co., Brooksville, Ky. Inspection sample of Mixed Wheat Feed analyzed, 1; equaled guaranty.

Faywood Milling Co., Faywood, Ky. Inspection sample of Chick-O Feed analyzed, 1; ingredients not as guaranteed.

Federal Mill & Elevator Co., Lockport, N. Y. Inspection sample of Lucky Hard Wheat Middlings and Screenings analyzed, 1; equaled guaranty.

J. H. Fedders & Sons, Covington, Ky. Inspection samples analyzed, 2.
Wheat Middlings, 1; adulterated with wheat bran.
Whole Wheat Feed, 1; equaled guaranty.

Ferger Bros., Cincinnati, O. Inspection samples analyzed, 3.
Wheat Middlings, 2; adulterated with wheat bran; too high in fiber.
Tip Top Wheat Feed, 1; equaled guaranty.

Ferncliff Feed & Grain Co., Louisville, Ky. Inspection samples analyzed, 12.
P. D. Q. Horse & Mule Feed, 2; excess oat hulls; too low in protein; too high in fiber.
P. D. Q. Egg Mash, 2; too low in protein and too high in fiber.
P. D. Q. Special Feed, 1; equaled guaranty.
P. D. Q. Dairy Feed, 1; oat hulls and weed seeds added.
P. D. Q. Scratch Feed, 1; equaled guaranty.
Cracker Jack Wheat Shorts, 2; equaled guaranty.
Cracker Jack Horse & Mule Feed, 1; equaled guaranty.
Cracker Jack Sweet Meal, 1; too low in protein.
Cracker Jack Special Feed, 1; equaled guaranty.

The Fleischmann Co., Cincinnati, O. Inspection sample of Dried Malt Grains analyzed, 1; equaled guaranty.

Flemingsburg Mills, Flemingsburg, Ky. Inspection sample of Wheat Bran analyzed, 1; too low in protein and fat.

E. H. Fletcher & Co., Nashville, Tenn. Inspection samples analyzed, 3.
Wheat Shorts, 2; equaled guaranty.
Lay More Scratch Feed, 1; ingredients not as guaranteed.

Flynn Bros. Grain & Feed Co., St. Louis, Mo. Inspection samples analyzed, 3.
Mixed Wheat Feed, 2; equaled guaranty.
Wheat Middlings, 1; equaled guaranty.

Henry Fruechtenicht, Louisville, Ky. Inspection samples analyzed, 4.
Blue Grass Horse Feed, 2; 1 too low in protein.
Blue Grass Dairy Feed, 1; ingredients not as guaranteed.
Blue Grass Poultry Feed, 1; too low in protein; no sunflower seed.

Fuhrer-Ford Milling Co., Mt. Vernon, Ind. Inspection sample of Wheat Shorts analyzed, 1; equaled guaranty.

Galesburg Molasses Feed Co., Galesburg, Ill. Inspection sample of Galesburg Special Scratch analyzed, 1; too low in fat; ingredients not as guaranteed.

Garrard Milling Co., Lancaster, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in protein and fat.

General Commission Co., Kansas City, Mo. Inspection sample of Heart of America Mixed Feed analyzed, 1; too low in protein and fat; inferior product.

Germantown Milling Co., Germantown, Ky. Inspection sample of Shipstuff analyzed, 1; equaled guaranty.

Gilster Milling Co., Chester, Ill. Inspection sample of Wheat Bran analyzed, 1; equaled guaranty.

Glasgow Milling Co., Glasgow, Ky. Inspection sample of Mixed Wheat Feed analyzed, 1; equaled guaranty.

Glass Milling Co., Wilmore, Ky. Inspection sample of Glass Hi-Grade Feed analyzed, 1; equaled guaranty.

Edw. F. Goeke Sons, Evansville, Ind. Inspection samples analyzed, 7.
Big Gee Wheat Shorts, 2; 1 adulterated with wheat bran and too low in protein and fat.
Big Gee Chick Feed, 1; equaled guaranty.
Big Gee Horse & Mule Feed, 1; equaled guaranty.
Big Gee Scratch Feed, 1; misbranded as to ingredients and too low in fat.
Big Gee Egg Mash, 1; equaled guaranty.
Standard Scratch Feed, 1; wheat and weed seeds added.

Golden Grain Milling Co., E. St. Louis, Ill. Inspection samples analyzed, 7.
Golden Grain Milk Producer, 5; 1 too low in protein and fat; 2 too high in fiber.
Competitive Scratch Feed, 1; misbranded as to ingredients.
Golden Grain Calf Meal, 1; equaled guaranty.

Gordonsville Milling Co., Gordonsville, Ky. Inspection samples analyzed, 2.
Wheat Shorts, 1; too low in protein and fat.
Ground Wheat, 1; equaled guaranty.

Green Bros., Falls of Rough, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Gwinn Bros. & Co., Huntington, W. Va. Inspection samples analyzed, 3.
Fancy White Wheat and Rye Middlings, 2; too low in protein and fat; corn bran added.
Farm Feed, 1; equaled guaranty.

Hales & Edwards Co., Chicago, Ill. Inspection sample of Morning Glory Scratch Feed analyzed, 1; misbranded as to ingredients guaranteed.

Hall Seed Co., Louisville, Ky. Inspection samples analyzed, 6.
Climax Dairy Feed, 3; 2 contained excess of oat hulls.
Elk Dairy Feed, 1; weed seeds added.
Premium Dairy Feed, 1; equaled guaranty.
Halco Dairy Feed, 1; too low in protein; added grain screenings; much inferior to guaranty.

Hardinsburg Mill & Elevator Co., Hardinsburg, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Harlan-Lowe Milling Co., Bardwell, Ky. Inspection samples of "Harlomco" Mill Run analyzed, 2; equaled guaranty.

R. L. Harrison & Sons, Bagdad, Ky. Inspection samples of Empress analyzed, 2; too low in protein.

P. H. Harsha Milling Co., Portsmouth, O. Inspection sample of Magnolia Mixed Feed analyzed, 1; equaled guaranty.

Herbert Hawkins, Paducah, Ky. Inspection samples analyzed, 3.
Cockadoo Hen Scratch, 2; equaled guaranty.
Critic Mixed Wheat Feed, 1; equaled guaranty.

Edwin C. Hawkins, Paducah, Ky. Inspection samples analyzed, 2.
Aristocrat Mixed Feed, 1; equaled guaranty.
Golden Grain, 1; too low in protein and fat.

C. E. Haynes Milling Co., Waverly, O. Inspection samples of Wavo Mixed Feed analyzed, 2; too low in protein.

The Heldt Co., Evansville, Ind. Inspection samples analyzed, 2.
Thelco Mixed Wheat Feed, 1; equaled guaranty.
Thelco Wheat Shorts, 1; equaled guaranty.

Herndon-Carter Co., Louisville, Ky. Inspection sample of "H. C. Co. Brand" Scratch Feed analyzed, 1; misbranded as to ingredients guaranteed.

W. E. Hess & Co., Louisville, Ky. Inspection samples of Hess Egg Mash analyzed, 2; too low in protein and fat.

Home Milling Co., Greenville, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in fat.

Hopkins Fertilizer Co., New Albany, Ind. Inspection samples analyzed, 2.
Pigrow, 1; too low in protein.
Hopkins Meat Scraps, 1; equaled guaranty.

Hopkinsville Milling Co., Hopkinsville, Ky. Inspection samples of Wheat Middlings analyzed, 2; both too high in fiber; 1 too low in protein.

Horse Cave Mills, Horse Cave, Ky. Inspection samples of Pure Bran and Shorts analyzed, 5; 1 too low in protein; 1 too low in fat.

Humphreys-Godwin Co., Memphis, Tenn. Inspection samples analyzed, 11.

Danish Brand Cottonseed Feed, 4; 2 too high in fiber.

"Dixie Brand" Cottonseed Meal, 7; equaled guaranty except 1 too low in protein and too high in fiber.

Igleheart Bros., Evansville, Ind. Inspection samples of Pure Wheat Middlings analyzed, 2; 1 too low in fat.

Illinois Feed & Elevator Co., Bloomington, Ill. Inspection samples analyzed, 3.

Whole Ground Oats, 2; equaled guaranty.

Whole Ground Barley, 1; equaled guaranty.

International Sugar Feed No. 2 Co., Memphis, Tenn. Inspection samples analyzed, 5.

International Special Dairy Feed, 2; 1 ground weed seeds added; 1 too low in fat.

International Jewel Mixed Feed, 1; largely oat hulls; too low in fat.

Wheat Grey Shorts and Screenings, 1; too high in fiber.

International Makemeat Hog Feed, 1; equaled guaranty.

Jellico Grocery Co., Jellico, Tenn. Inspection sample of Cyclone Horse & Mule Feed analyzed, 1; equaled guraanty.

W. B. Johnson & Co., Memphis, Tenn. Inspection sample of "Supreme Brand" Cottonseed Meal analyzed, 1; too low in protein.

The E. Kahn's Sons Co., Cincinnati, O. Inspection sample of Digester Tankage analyzed, 1; equaled guaranty.

Kasco Mills, Toledo, O. Inspection samples analyzed, 4.

Kasco Flour Middlings, 1; too low in protein; weed seeds added.

Kasco Corn Feed Meal, 1; equaled guaranty.

Cracked Corn, 1; too low in fat.

Beats All Milk Grains, 1; equaled guaranty.

Kehlor Flour Mills Co., St. Louis, Mo. Inspection sample of Brilliant Grey Wheat Middlings analyzed, 1; equaled guaranty.

Keister Milling Co., Huntington, W. Va. Inspection samples analyzed, 2.

Lotus Wheat and Rye Middlings, 1; too high in fiber; grain screenings added.

Fancy White Middlings, 1; too low in protein and fat.

George Keller, Newport, Ky. Inspection samples analyzed, 8.

Corn and Oat Chops, 2; 1 too low in protein.

Ground Barley, 1; equaled guaranty.

Ground Oats, 1; equaled guaranty.
Ground Rye, 1; equaled guaranty.
Corn Feed Meal, 1; equaled guaranty.
Middlings and Screenings, 1; equaled guaranty.
Mixed Wheat Feed and Screenings, 1; equaled guaranty.

Kentucky Farm Bureau Federation, Louisville, Ky. Inspection samples of Farm Bureau Fulpail Dairy Ration 20%, analyzed, 2; equaled guaranty except 1 contained weed seeds and did not contain peanut meal.

Kentucky Feed & Grain Co., Louisville, Ky. Inspection samples analyzed, 36.

Marshall's 24% Dairy Feed, 5; 2 equaled guaranty; 2 too low in protein; 2 adulterated with screenings and weed seeds; 1 adulterated with flax plant by-product.
Kentucky Star Horse & Mule Feed, 3; 2 adulterated with screenings; 1 with flax plant by-product.
Premo Poultry Mash, 3; 1 too low in protein, 1 too low in fat; 2 ingredients not as guaranteed.
Success Horse & Mule Feed, 3; 1 equaled guaranty; 2 adulterated with flax plant by-product.
Success Middlings, 4; 1 equaled guaranty; 3 adulterated with ground wheat bran.
Marshall's Horse & Mule Feed, 2; equaled guaranty.
Kentucky Star Dairy Feed, 2; both adulterated with flax plant by-product and weed seeds; 1 too low in protein.
Premo Baby Chick Feed, 2; contained weed seeds; ingredients not as guaranteed; 1 too low in protein.
Premo Laying Mash, 2; both contained screenings and weed seeds.
Premo Dairy Feed, 2; both adulterated with flax plant by-product, screenings and weed seeds; 1 too low in protein.
Success 24% Dairy Feed, 1; adulterated with flax plant by-product; ingredients not as guaranteed.
Premo Growing Mash, 1; too low in fat; contained screenings and weed seeds.
Premo Baby Chick Feed, 1; ingredients not as guaranteed.
Premo Horse & Mule Feed, 1; screenings added.
Premo Hog Meal, 1; equaled guaranty.
Marshall's Sheep Feed, 1; too low in protein; contained weed seeds.
Ground Oats, 1; equaled guaranty.

Kentucky Chemical Manufacturing Co., Covington, Ky. Inspection sample of K. C. Special Meat Scraps analyzed, 1; equaled guaranty.

King Midas Milling Co., Minneapolis, Minn. Inspection samples analyzed, 3.
Cloverleaf Pure Flakes, 1; equaled guaranty.
Standard Feed, 1; contained weed seeds.
Snowball Wheat Flour Middlings, 1; too high in fiber.

Burg Kinner, Greenup, Ky. Inspection sample of Flour Middlings analyzed, 1; sample was wheat middlings.

Klarer Provision Co., Louisville, Ky. Inspection samples of Digester Meat and Bone Tankage analyzed, 2; equaled guaranty.

Chas. A. Krause Milling Co., Milwaukee, Wis. Inspection samples analyzed, 2.
Badger 16½% Sweet Dairy Feed, 1; too high in fiber.
Amerikorn Dairy Ration, 1; equaled guaranty.

Krey Packing Co., St. Louis, Mo. Inspection samples of X-Ray Digester Tankage analyzed, 2; too low in protein.

Kuttawa Milling Co., Kuttawa, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

The Ladish Co., Milwaukee, Wis. Inspection sample of Yellow Corn Feed Meal analyzed, 1; adulterated with ground screenings and oat hulls; shipment refused sale.

The Larabee Flour Mills Corporation, Kansas City, Mo. Inspection samples of Red Dog Flour analyzed, 3; equaled guaranty.

The Larrowe Milling Co., Detroit, Mich. Inspection samples analyzed, 4.
Larro, 3; equaled guaranty.
Larrowe Hog Feed, 1; equaled guaranty.

Lawrenceburg Roller Mills Co., Lawrenceburg, Ind. Inspection sample of "Snowflake" Middlings analyzed, 1; equaled guaranty.

Lexington Roller Mills Co., Lexington, Ky. Inspection samples analyzed, 4.
"Thoroughbred" Feed, 2; equaled guaranty.
Hen Fruit (Chick Size), 1; too low in protein and fat; ingredients not as guaranteed.
Queen Bess Dairy Feed, 1; contained weed seeds.

Lewisburg Milling Co., Lewisburg, Ky. Inspection sample of Wheat Bran analyzed, 1; too low in protein and contained corn bran.

Loretto Mill Co., Loretto, Ky. Inspection sample of Shipstuff analyzed, 1; equaled guaranty.

Louisiana State Rice Milling Co., New Orleans, La. Inspection samples of Rice Bran analyzed, 2; too high in fiber.

Louisville Cereal Mill Co., Louisville, Ky. Inspection samples analyzed, 4.
Nonesuch Poultry Feed, 2; only trace sunflower seed in each.
Supreme Poultry Fattening Food, 1; much too low in protein.

Plymouth Crate Fattening Station Feed, 1; too low in protein and fat; too high in fiber.

Louisville Milling Co., Louisville, Ky. Inspection samples analyzed, 4.
Sonny South Wheat Shorts and Screenings, 2; equaled guaranty.
Sonny South Mixed Wheat Feed and Screenings, 1; equaled guaranty.
Sonny South Hominy Feed, 1; too low in fat.

Louisville Seed Co., Louisville, Ky. Inspection samples analyzed, 4.
Gold Medal Dairy Feed, 2; both adulterated with flax plant by-product; 1 too low in protein; misbranded.
Gold Medal Scratch Feed, 1; equaled guaranty.
Paragon Horse & Mule Feed, 1; equaled guaranty.

L. B. Lovitt & Co., Memphis, Tenn. Inspection samples of "Lovitt Brand" Cottonseed Meal analyzed, 2; 1 too low in protein and too high in fiber.

Lycan & Purcell, LaFayette, Ky. Inspection sample of Wheat Bran analyzed, 1; equaled guaranty.

Magnolia Flour Mills, Maysville, Ky. Inspection sample of Mill Run Mixed Wheat Feed analyzed, 1; equaled guaranty.

The B. Manischewitz Co., Cincinnati, O. Inspection samples of Matzo Sweepings analyzed, 2; 1 too low in protein and fat.

The Mann Bros. Co., Buffalo, N. Y. Inspection sample of Argentine Linseed Oil Meal analyzed, 1; equaled guaranty.

Marfield Grain Co., Minneapolis, Minn. Inspection sample of Barley Feed and Screenings analyzed, 1; too high in fiber.

Marianna Sales Co., Memphis, Tenn. Inspection samples of White Mule Brand 41% Cottonseed Meal analyzed, 5; 1 too low in protein.

Marion Milling Co., Marion, Ky. Inspection samples analyzed, 2.
Winter Wheat Middlings, 1; equaled guaranty.
Mixed Wheat Feed and Screenings, 1; equaled guaranty.

L. D. McCarley & Co., Auburn, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in protein.

Memphis Cotton Hull Fibre, Memphis, Tenn. Inspection sample of Cottonseed Feed analyzed, 1; equaled guaranty.

Memphis Cottonseed Products Co., Memphis, Tenn. Inspection samples of Durham 41% analyzed, 2; 1 too high in fiber.

Miami Elevator, Elizabethtown, O. Inspection samples of Miami Dairy Feed analyzed, 5; 3 equaled guaranty; 2 highly adulterated with oat hulls and flax plant by-product and foreign material.

Midget Milling Co., Providence, Ky. Inspection sample of Flavo Mixed Feed analyzed, 1; too low in protein.

Model Roller Mills Co., Smith's Grove, Ky. Inspection samples of Mixed Feed analyzed, 2; 1 had excess of screenings and too low in fat.

Morganfield Roller Mills, Morganfield, Ky. Inspection samples analyzed, 4.
White Rose Scratch, 2; too low in fat; ingredients not as guaranteed.
White Rose Shorts, 1; sample low grade flour and too low in protein and fat.
White Rose Mixed Feed, 1; equaled guaranty.

Morris & Co., Chicago, Ill. Inspection samples of Big Sixty Meat Meal Digester Tankage analyzed, 2; equaled guaranty.

C. Morrison & Son, Glasgow, Ky. Inspection sample of Mixed Feed analyzed, 1; too low in protein and fat.

Morristown Flour Mills, Morristown, Tenn. Inspection samples analyzed, 2.
Corn Feed Meal, 1; screenings added; too low in fat.
Mixed Wheat Feed, 1; equaled guaranty.

Mountain City Mill Co., Chattanooga, Tenn. Inspection sample of Blue Cow Fine Feed analyzed, 1; equaled guaranty.

Mystic Mills, Sioux City, Ia. Inspection samples analyzed, 4.
Blackhawk Poultry Feed, 1; ingredients not as guaranteed.
Mohawk Poultry Feed, 1; weed seeds added.
Sioux Developing Feed, 1; oats and weed seeds added.
Sioux Chick Feed, 1; weed seeds added.

National Feed Co., St. Louis, Mo. Inspection samples analyzed, 2.
Hominy Feed, 1; too high in fiber.
Wheat Bran and Screenings, 1; too high in fiber.

R. N. Neal & Co., Memphis, Tenn. Inspection sample of Triangle Brand 41% Cottonseed Meal analyzed, 1; equaled guaranty.

New Era Mills, Allensville, Ky. Inspection samples analyzed, 2.
Mixed Feed, 1; excess of corn bran; too low in protein and fat.
Ground Wheat Feed, 1; sample is mixed wheat feed.

The Newsome Feed & Grain Co., Pittsburg, Pa. Inspection samples of Palmo Midds analyzed, 2; 1 too low in protein.

Nolin Milling Co., Nolin, Ky. Inspection samples of Shipstuff analyzed, 2; 1 too low in protein, the other too high in fiber.

Northern Illinois Cereal Co., Chicago, Ill. Inspection samples analyzed, 2.
Gold Medal Scratch Feed, 1; weed seeds and inferior wheat added.
Gold Medal Chick Grains, 1; too low in fat.

W. C. Nothern, Memphis, Tenn. Inspection sample of Bee Brand Cottonseed Meal analyzed, 1; equaled guaranty.

Nowak Milling Corporation, Buffalo, N. Y. Inspection samples analyzed, 8.
Marathon Laying Mash (with Buttermilk), 1; equaled guaranty
Marathon Dairy Feed, 1; equaled guaranty.
Marathon Horse Feed, 1; equaled guaranty.

Fidelity Dairy Feed, 1; equaled guaranty.
Domino 24½% Dairy Feed, 1; equaled guaranty.
Domino Fancy Sifted Cracked Corn, 1; equaled guaranty.
Domino Butterine Dairy Feed, 1; predominating ingredient is screenings with weed seeds.
Pep-O-Lene Horse Feed, 1; equaled guaranty.

Owensboro Milling Co., Owensboro, Ky. Inspection sample of Star Dairy Feed analyzed, 1; too low in protein.

Paducah Milling Co., Paducah, Ky. Inspection samples analyzed, 3.
Wheat Shorts, 1; adulterated with corn bran, wheat bran and screenings; too low in protein and fat; too high in fiber.
Laying Mash, 1; equaled guaranty.
Dairy Feed, 1; equaled guaranty.

Paris Milling Co., Paris, Ky. Inspection samples of Mixed Feed analyzed, 2; equaled guaranty.

Parks & Son, Richmond, Ky. Inspection sample of "Cream of Cream" Dairy Feed analyzed, 1; misbranded and too low in protein.

Park & Pollard Co., Chicago, Ill. Inspection samples analyzed, 2.
Wizard Scratch Grains, 1; ingredients not as guaranteed.
"Stevens 44" Dairy Ration, 1; too low in protein; ingredients not as guaranteed.

Parksville Roller Mills, Parksville, Ky. Inspection sample of Mixed Feed analyzed, 1; sample a good mixed wheat feed.

Pembroke Milling Co., Pembroke, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Pendleton Flour Mills, Falmouth, Ky. Inspection sample of Mixed Wheat Feed analyzed, 1; equaled guaranty.

Peoples Roller Mills, Sebree, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Perin-Brouse-Skidmore Grain & Milling Co., Cincinnati, O. Inspection samples analyzed, 3.
Whole Ground Wheat, 1; equaled guaranty.
V. G. Malted Stock Feed, 1; too high in fiber.
Choice Hominy Feed, 1; too low in protein.

M. C. Peters Mill Co., Omaha, Nebr. Inspection samples of Peters Arab Horse Feed analyzed, 2; equaled guaranty.

Philpot Mills, Philpot, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Phoenix Flour Mills, Evansville, Ind. Inspection samples analyzed, 3.
Wheat Shorts & Screenings, 2; equaled guaranty.
Mixed Wheat Feed & Screenings, 1; equaled guaranty.

Pink & Co., Cairo, Ill. Inspection sample of Wheat Bran and Screenings analyzed, 1; equaled guaranty.

Pioneer Mills, Louisville, Ky. Inspection sample of Pioneer Scratch Feed analyzed, 1; misbranded as to ingredients.

Polo Mills Co., E. St. Louis, Ill. Inspection samples of Diamond Dairy Feed analyzed, 2; 1 too low in protein, too high in fiber and had excess of weed seeds; other equaled guaranty.

R. C. Poage Milling Co., Ashland, Ky. Inspection samples analyzed, 2.
Standard Feed, 1; too low in protein.
Wheat Middlings, 1; equaled guaranty.

Prairie State Milling Co., Chicago, Ill. Inspection sample of Early Egg Scratch analyzed, 1; misbranded; contained grain screenings, weed seeds, inferior wheat and pin oats.

Pratt Food Co., Philadelphia, Pa. Inspection samples analyzed, 4.
Pratt's Supreme Horse Feed, 1; equaled guaranty.
Pratt's Victory Laying Mash with Buttermilk, 1; equaled guaranty.
Pratt's Victory Dairy Ration, 1; equaled guaranty.
Pratt's Special Scratch Feed, 1; equaled guaranty.

Purity Oats Co., Chicago, Ill. Inspection samples analyzed, 2.
Iowa Dairy Feed, 1; equaled guaranty.
Iowa Scratch Feed, 1; oats and weed seeds added.

The Quaker Oats Co., Chicago, Ill. Inspection samples analyzed, 5.
Ful-O-Pep Chick Starter, 1; equaled guaranty.
Ful-O-Pep Growing Mash, 1; equaled guaranty.
Sugared Schumacher Feed, 1; equaled guaranty.
Big "Q" Dairy Feed, 1; equaled guaranty.
Buckeye Feed, 1; equaled guaranty.

Ralston Purina Co., St. Louis, Mo. Inspection samples analyzed, 11.
Purina Cow Chow Feed, 3; equaled guaranty.
Purina Chicken Chowder Feed, 2; equaled guaranty.
Purina Chick Startena (with Buttermilk), 1; equaled guaranty.
Purina Chicken Fatena Feed, 1; too low in fat.
Purina Omolene Feed, 1; equaled guaranty.
Star Special Feed, 1; too high in fiber.
Bulky Las Feed, 1; too high in fiber.
XX Good Feed with Molasses, 1; equaled guaranty.

Randolph Milling Co., Bandana, Ky. Inspection sample of O'Joy analyzed, 1; equaled guaranty.

Rapier Sugar Feed Co., Owensboro, Ky. Inspection samples analyzed, 23.
Rapier's Creamo Dairy Feed, 6; 4 contained foreign fibrous materials through use of screenings; others equaled guaranty.
Rapier's Big Four Horse & Mule Feed, 3; 2 contained screenings; 1 too low in protein.
Rapier's Otene Horse Feed, 2; 1 contained foreign material and too high in fiber.
Rapier's Golden Rod Dairy Feed, 2; ingredients not as guaranteed.
Rapier's Teamster Horse & Mule Feed, 2; equaled guaranty.

Rapier's Jersey Cream Dairy Feed, 2; 1 equaled guaranty; 1 ingredients not as guaranteed.
Rapier's 90% Grain Horse & Mule Feed, 1; too low in protein.
Rapier's Pig Meal, 1; equaled guaranty.
Rapier's Red Wing Horse & Mule Feed, 1; equaled guaranty.
Blue Hen Laying Mash, 2; equaled guaranty.
Cottonseed Meal, 1; too high in fiber.

Richardson Milling Co., Horse Cave, Ky. Inspection sample of Mixed Wheat Feed analyzed, 1; equaled guaranty.

R. D. Riedling, Louisville, Ky. Inspection sample of Chicken Mash analyzed, 1; equaled guaranty.

Ritter-Hennings Co., Louisville, Ky. Inspection sample of Shurpleez Scratch analyzed, 1; too low in protein and ingredients not as guaranteed; misbranded.

Riverside Mills, Adairville, Ky. Inspection samples of Mixed Feed analyzed, 4; 3 too low in protein; all too low in fat.

Roberts Cotton Oil Co., Cairo, Ill. Inspection sample of Diamond R 43% Cottonseed Meal analyzed, 1; equaled guaranty.

Rockport Milling Co., Rockport, Ind. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Roszell Bros., Lexington, Ky. Inspection sample of Roszbro Horse Feed analyzed, 1; equaled guaranty.

Sandefur's Cereal Mill, Owensboro, Ky. Inspection sample of Hominy Feed analyzed, 1; too low in fat.

Schreiber Milling & Grain Co., Minneapolis, Minn. Inspection samples analyzed, 4.
Wheatco Feed, 1; too low in protein; too high in fiber.
Fine Ground Whole Barley, 3; 2 too low in protein; all too high in fiber; 1 oats added.

Schultz-Baujan & Co., Beardstown, Ill. Inspection sample of Sunbeam Pure White Shorts and Screenings analyzed, 1; equaled guaranty.

Scroggins Grain Co., Minneapolis, Minn. Inspection sample of Ground Oats and Screenings analyzed, 1; too high in fiber.

Sebree Roller Mills, Sebree, Ky. Inspection sample of Cream Patent Feed analyzed, 1; equaled guaranty.

Security Mills & Feed Co., Knoxville, Tenn. Inspection samples analyzed, 5.
Security Dairy Feed, 2; equaled guaranty.
Security Scratch Feed, 1; equaled guaranty.
"Big S" Horse Feed, 1; too low in protein.
"Victor" Scratch Feed, 1; equaled guaranty.

Shelton Mills, Chattanooga, Tenn. Inspection sample of "Red Diamond" Fine Feed analyzed, 1; equaled guaranty.

Shepherdsville Roller Mills, Shepherdsville, Ky. Inspection sample of Bullitt Dairy Feed analyzed, 1; too low in protein.

The Sherwin-Williams Co., Cleveland, O. Inspection sample of S. W. C. Linseed Oil Meal analyzed, 1; equaled guaranty.

The Simmons Milling Co., Cincinnati, O. Inspection samples analyzed, 4.
Decko Poultry & Fattening Feed, 2; equaled guaranty.
Simco 24 Dairy Feed, 1; misbranded; very deficient in protein.
Wheat Bran and Screenings, 1; equaled guaranty.

J. Allen Smith & Co., Knoxville, Tenn. Inspection samples of Peerless analyzed, 3; equaled guaranty.

Southern Fuel & Feed Co., Nashville, Tenn. Inspection samples of Rice Bran analyzed, 2; equaled guaranty.

Southern Feed & Grain Co., Louisville, Ky. Inspection samples analyzed, 7.
Sugar Dairy Feed, 3; 1 very deficient in protein; all contained excessive amount of oat hulls.
Eagle Dairy Feed, 2; excessive amount of oat hulls; only small amount of alfalfa meal.
Standard Horse & Mule Feed, 1; equaled guaranty.
Diamond Mixed Wheat Feed and Screenings, 1; equaled guaranty.

Southern Seed Co., Louisville, Ky. Inspection samples analyzed, 3.
Economy Wheat Mixed Feed and Screenings, 1; too high in fiber; excess of weed seeds.
Ideal Horse & Mule Feed, 1; equaled guaranty.
Diamond Dairy Feed, 1; adulterated with oat hulls, screenings and weed seeds; too low in protein; misbranded.

Sparks Milling Co., Alton, Ill. Inspection sample of Try Me Mixed Wheat Feed and Screenings analyzed, 1; equaled guaranty.

Woodford Spears & Sons, Paris, Ky. Inspection samples of Mixed Feed analyzed, 3; 1 contained excessive amount of screenings; 1 too low in protein.

Spencer Kellogg & Son, Buffalo, N. Y. Inspection sample of Kellogg's Pure Old Process Oil Meal analyzed, 1; equaled guaranty.

Standard Roller Mill Co., Cerulean, Ky. Inspection samples analyzed, 2.
Jersey Feed, 1; too high in fiber.
White Wheat Middlings, 1; equaled guaranty.

Star & Crescent Milling Co., Chicago, Ill. Inspection sample of Wheat Middlings analyzed, 1; equaled guaranty.

Star Milling Co., Clinton, Ky. Inspection samples analyzed, 2.
Mixed Feed, 1; equaled guaranty.
Wheat Shorts, 1; equaled guaranty.

The Sugarine Co., Owensboro, Ky. Inspection samples analyzed, 19.
The National Dairy Ration, 3; equaled guaranty.
Universal Dairy Feed, 2; equaled guaranty.

Sugarine Dairy Feed, 2; 1 too low in protein; both contained foreign material.
Ideal Horse & Mule Feed, 3; all much too low in protein; 2 had excess of oat hulls; 1 had added grain screenings.
Sugarine Pig Meal, 1; too high in fiber; contained weed seeds.
Universal Horse & Mule Feed, 1; too low in protein.
Hi-Grain Horse Feed, 1; equaled guaranty.
Record Horse Feed, 1; equaled guaranty.
Record Dairy Feed, 1; equaled guaranty.
Ideal Scratch Feed, 1; too low in protein; ingredients not as guaranteed; misbranded.
Record Scratch Feed, 1; ingredients not as guaranteed; misbranded.
Suco Scratch Feed, 1; ingredients not as guaranteed; misbranded.
Mo-Egg Scratch Feed, 1; added oats and weed seeds.

Sunnyside Milling Co., Evansville, Ind. Inspection samples of Winter Wheat Shorts and Screenings analyzed, 2; 1 too low in protein.

D. B. Sutherland & Sons, Bloomfield, Ky. Inspection samples analyzed, 5.
Sutherland's Feed, 4; 1 contained added corn product; all equaled chemical guaranty.
Sutherland's Hen Feed, 1; too low in protein.

Sutherland Flour Mills Co., Cairo, Ill. Inspection samples analyzed, 4.
Daisy Dairy Feed, 2; 1 too high in fiber and contained weed seeds.
Wheat Middlings and Screenings, 1; equaled guaranty.
Wheat Bran, 1; equaled guaranty.

Swift & Co., Chicago, Ill. Inspection samples analyzed, 3.
Swift's Meat and Bone Scraps, 2; 1 too low in protein.
60% Digester Tankage, 1; equaled guaranty.

Tarkio Molasses Feed Co., Kansas City, Mo. Inspection sample of Tarkio Molasses Feed analyzed, 1; equaled guaranty.

Geo. P. Taylor Co., Somerset, Ky. Inspection sample of Winter Wheat Mixed Feed analyzed, 1; equaled guaranty.

Tell City Flouring Mills, Tell City, Ind. Inspection samples analyzed, 4.
Wheat Middlings and Screenings, 2; adulterated with corn bran.
Hoosier Poultry Feed, 1; contained oats and weed seeds in which were found corn cockle and wild onions.
"A-Mixed Feed," 1; equaled guaranty.

Texas Cake & Linter Co., Dallas, Tex. Inspection samples of "Texoma Brand" 43% Cottonseed Meal analyzed, 4; 3 much too low in protein.

W. W. Thompson & Co., Scottsville, Ky. Inspection sample of Wheat Bran analyzed, 1; equaled guaranty.

Transit Milling Co., Cincinnati. O. Inspection sample of Transit Horse Feed analyzed, 1; had a dead apparance and a musty odor.

Tri-State Vegi Feed Co., Cincinnati, O. Inspection samples of Sugar Jack Dairy Feed analyzed, 3; equaled guaranty.

The Ubiko Milling Co., Cincinnati, O. Inspection samples analyzed, 11.
"Union Grains" Ubiko Biles Ready Dairy Ration, 6; equaled guaranty.
Crusader Horse Feed, 1; equaled guaranty.
Ubiko Buttermilk Egg Mash, 2; equaled guaranty.
Ubiko Egg Mash, 1; equaled guaranty.
Ubiko Chick Feed, 1; equaled guaranty.

United Bi-Products Co., Chicago, Ill. Inspection sample of "Success Brand"' Digester Tankage analyzed, 1; equaled guaranty.

Valier & Spies Milling Co., St. Louis, Mo. Inspection samples analyzed, 3.
Valier's Mixed Wheat Feed and Screenings, 2; equaled guaranty.
Valier's Wheat Middlings and Screenings, 1; too low in fat.

Vanhoose-Adams Co., Ashland, Ky. Inspection samples analyzed, 3.
Red Diamond, 1; contains weed seeds.
Black Diamond Horse Feed, 1; equaled guaranty.
Purity Middlings, 1; too low in protein and contained weed seeds.

The Wallace Milling Co., Huntington, Ind. Inspection sample of Pure Wheat Middlings analyzed, 1; adulterated with finely ground oat hulls; much too low in protein and fat and too high in fiber.

The Washington Milling Co., Washington, C. H., O. Inspection sample of Wheat Bran and Screenings analyzed, 1; too low in protein.

P. J. Weisenberger & Son, Midway, Ky. Inspection sample of Mixed Mill Feed analyzed, 1; equaled guaranty.

A. C. Westervelt & Co., Memphis, Tenn. Inspection sample of 43% Cottonseed Meal analyzed, 1; equaled guaranty.

A. P. White & Co., Cadiz, Ky. Inspection sample of National analyzed, 1; too low in fat.

Wilson & Co., Chicago, Ill. Inspection samples of "Red W Brand" Digester Tankage analyzed, 3; equaled guaranty.

Winchester Roller Mills, Winchester, Ky. Inspection samples analyzed, 7.
Mixed Feed, 3; 2 too low in protein and contained excess of screenings.
Perfection Horse Feed, 3; 1 adulterated with flax plant by-product and screenings.
Perfection Dairy Feed, 1; ingredients not as guaranteed; too high in fiber.

Winer Feed Co., Chattanooga, Tenn. Inspection sample of A-1 Corn Feed Meal analyzed, 1; equaled guaranty.

J. F. Wolcott & Co., S. Carrollton, Ky. Inspection sample of Wolcott's Feed analyzed, 1; too low in protein.

Wood, Stubbs & Co., Louisville, Ky. Inspection samples analyzed, 4.
Special Scratch Feed, 2; contained weed seeds; ingredients not as guaranteed; misbranded.
200-Egg Scratch, 1; ingredients not as guaranteed; misbranded.
Shawnee Pigeon Feed, 1; too low in fat; ingredients not as guaranteed; misbranded.

Woodburn Roller Mills, Woodburn, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Woolcott Flour Mills, Lexington, Ky. Inspection samples analyzed, 5.
Woolcott's Mixed Feed, 2; 1 too low in protein.
Pride of Kentucky Horse Feed, 1; equaled guaranty.
Woolcott's Red Diamond Baby Chick Feed, 1; too low in protein; cheat, inferior wheat and weed seeds present; misbranded.
Woolcott's Green Diamond Horse Feed, 1; too low in protein.

Yopp Seed Co., Paducah, Ky. Inspection samples analyzed, 2.
Yopp's Laying Mash, 1; too high in fiber.
Old Process Linseed Oil Meal, 1; equaled guaranty.

Young & Bishop, Providence, Ky. Inspection sample of Mixed Feed analyzed, 1; equaled guaranty.

Zabel Milling Co., New Albany, Ind. Inspection samples analyzed, 3.
Flour Middlings and Screenings, 1; too low in protein and fat.
Mixed Wheat Feed & Screenings, 2; too low in protein .

Ziliak & Schafer Milling Co., Evansville, Ind. Inspection samples analyzed, 5.
Imperial Dairy Feed, 2; equaled guaranty.
Triangle Scratch Feed, 1; ingredients not as guaranteed; misbranded.
Elite Sugared Shorts, 1; too low in fat; material is bran and not shorts.
Triangle Horse & Mule Feed, 1; equaled guaranty

Kentucky
Agricultural Experiment Station
University of Kentucky

THE RELATION OF SOME CHEMICAL CONSTITUENTS TO THE GRADES OF KENTUCKY TOBACCO.

BULLETIN NO. 258
(Research Bulletin)

Lexington, Ky.
April, 1925

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BULLETIN NO. 258

The Relation of Some Chemical Constituents to the Grades of Kentucky Tobacco

By O. M. SHEDD.*

The tobacco grown as a farm crop in Kentucky is of two kinds, namely, the burley, which is produced chiefly in the bluegrass region of the central area, and the dark types, which are raised extensively in the western section. It should not be understood, however, that only burley tobacco can be grown in central Kentucky and only dark tobacco in western Kentucky, for experience has shown that both can be produced in either section. However, as far as quality is concerned, each kind appears to be best adapted to the soils of that area in which it commonly is grown.

Most of the burley tobacco grown in Kentucky is used in this country, whereas most of the dark tobacco is exported. The demand for the smoker grades in this country has increased recently and, on this account, those strains of burley tobacco which produce a very light-colored leaf, suitable for use in blends for the manufacture of cigarettes and high-grade smoking tobacco, are highly desirable.

As is well known, tobacco has been sold for a long time by grade. Good grading requires a knowledge of quality and of the probable uses by the trade for certain types. A crop that has been graded properly always commands a higher price than a poorly graded one, for the buyer can more easily appraise its

*The author desires to express his thanks to Dr. A. M. Peter, Head of the Department of Chemistry, for helpful criticism in the preparation of the manuscript; also to the County Agents, the Burley Tobacco Growers' Cooperative Association, the Dark Tobacco Growers' Cooperative Association and all other firms and individuals who kindly assisted in the collection of the samples.

value; moreover, he does not incur the expense of regrading. The principal recognized classes of burley tobacco are known as wrappers, fillers and smokers; those of dark tobacco, as leaf, lugs and trash. The nondescript tobacco in a crop should be and generally is separated from the remainder.

In the present investigation an attempt is made to correlate some chemical factors of our tobacco with its quality as ordinarily distinguished by the market grades.

HISTORICAL NOTE

References in the literature pertaining to the chemical analysis of various kinds of tobacco are numerous. The chemical work on burley tobacco and dark varieties similar to those produced in Kentucky is more limited and generally represents the leaves of the entire plant rather than those obtained from certain sections of the stalk which go into the different grades. A few examples of investigations of this kind, carried on in neighboring states as well as here, are of interest in connection with this work.

Carpenter (3)* made a comparison of the percentages of nicotine, nitrate and certain mineral constituents of white burley tobacco grown in Ohio, West Virginia and Kentucky.

Davidson (4) determined the mineral constituents and nicotine of white burley and dark types of Virginia tobacco at different stages of growth and in different parts of the plant.

Graham and Carr (5) compared the content of nicotine, ash and certain extractives in Wisconsin white burley, Kentucky white burley, Kentucky dark tobacco, and improved burley grown in Indiana.

Peter (Robert) (6), analyzed the ashes of 28 samples of cured leaf tobacco grown in different parts of Kentucky, the object being to correlate, if possible, the chemical composition of the ash with that of the soil upon which the crop was grown, and to estimate the amount of mineral plant food removed in the crop. Most of these samples, presumably, were what we call dark tobacco. As this work was done in 1858, about ten years

*Reference is made by number to literature cited, p. 57.

before the appearance of white burley tobacco in Kentucky (2), this was long before the present system of grades was introduced.

The results of the foregoing investigations show that the same kind of tobacco varies in composition according to the soil upon which it is grown.

SIGNIFICANCE OF THE GRADES OF TOBACCO

The lower leaves of the burley tobacco plant, which supply the bulk of the smoker grades, are of light color and weight; the upper leaves, which go into the filler grades, are heavier and darker in color than the lower. The tips may go into either class, depending upon color and other characters. The wrappers are selected from both the smoker and filler grades and are known as cigarette wrapper and twist wrapper, respectively. A better understanding of the different grades can be obtained by referring to the principal ones of the Burley Tobacco Growers Cooperative Association, as defined for the 1921 crop: A (flyings); B (trash); C (lugs); D (bright leaf); E (red leaf); F (heavy tips); FS (smoking tips); CW (cigarette wrapper); and TW (twist wrapper). Each of these grades except the tips and wrappers consists of seven classes, referred to by numerals, of which No. 1 denotes best and No. 7, poorest. Generally speaking, the first two numerals indicate good, the next three medium, and the last two common, of each grade. The samples used in this work for good, medium and common are represented by Nos. 1, 4 and 7, respectively, under the different grades.

Grades A, B and C are smokers, D, either smokers or fillers, depending upon the manufacturers' standard, and E, fillers. Cigarette wrappers are largely obtained from the best C and D grades and twist wrappers from the best D and E grades. It will be noted that the bright leaf, or D grade, divides the smokers and fillers and that it is sometimes used for both.

The grade of wrapper, in burley tobacco, is subdivided into No. 1, good and No. 2, medium, no burley common wrapper being recognized. This is because an exceptional quality of leaf is required for wrappers. On account of its scarcity, this

grade always sells for the highest price. A medium wrapper usually is distinguished from the good by one or more of the following characters: smaller size, darker color, coarser texture, less elasticity, less luster or oily appearance. As differences in appearance between the good and medium of this grade were not as marked as in the other grades used because there are fewer subdivisions in the wrappers, this may account for the smaller differences in some of the results obtained on wrappers.

The relative market value of the grades is to a large extent reflected in the loan values advanced by the Association on the 1921 crop. The loan value in dollars per hundred pounds, on No. 1 of each grade, was as follows: A=16; B=18; C=22; D=20; E=14; F=7; FS=8; CW=26; and TW=20. The sale price was, of course, higher than the loan value but the relations as given above probably held true thru the grades, showing that the smokers sold for more than the fillers.

The dark tobacco is graded differently from the burley but, generally speaking, the leaf, lugs and trash of both occupy the same relative positions on the stalks. The number of leaves that go into each grade, however, is different in the two kinds, on account of the manner in which they are topped and the different purposes for which they are used.

OBJECT AND PLAN OF THE INVESTIGATION

It was thought that a study of the content of certain chemical constituents in the various grades, in order to determine if distinct differences could be found that would distinguish them as clearly as their physical properties, would be of interest.

Burley and dark tobacco from the crops grown in 1920 and 1921 was used in the work. The burley tobacco used consisted of the various strains of white burley produced in the bluegrass region, while the dark tobacco included several varieties, both air-cured and fire-cured, grown in western Kentucky. It was intended to work on only the 1920 crops but as both were abnormal, particularly the burley, due to the presence of wildfire and angular leaf-spot, the work was repeated on the 1921 crops. The latter were more nearly normal altho these diseases were

more or less present but mostly in the common grades. The samples of dark tobacco in both years were freer of disease than the burley.

A study of both kinds of tobacco grown during the two years has, therefore, made possible a comparison of normal versus abnormal leaf and, at the same time, of yearly differences in constituents, particularly of the good grades; for the good samples used in this investigation, even from the 1920 crop, were rarely infected with disease.

The procedure followed in obtaining the samples for this work was to have different expert graders, representing growers, warehouses and manufacturers, select "hands" of good, medium and common of the various grades; consequently, the samples represent the composite judgment of expert graders of each kind of tobacco. This is particularly true concerning the 1921 burley crop, since the writer had the valuable assistance of the Association graders who selected practically all samples.

The samples were prepared for analysis by air-drying the "hands" at room temperature and, after the midrib, commonly known as the stem, had been removed and discarded, the leaf was ground to a fine powder and put into sealed jars. Only a few were sampled at one time and the analyses were made as soon thereafter as possible. Composite samples for the ash analyses were made up of equal weights of all individual samples of each grade, after grinding.

The constituents determined were total nitrogen, nicotine and nitrate nitrogen in the individual samples; also crude ash, silicon, phosphorus, potassium, calcium and magnesium in composite samples representing good and common of each grade.

METHODS OF ANALYSIS

Moisture. A weighed portion of the powdered sample was dried in a slow current of natural gas for 7 hours in an oven surrounded by boiling water (about 98° C.).

Total Nitrogen. Kjeldahl method modified to include nitrate (1, pp. 7-8). Salicylic acid and sodium thiosulfate were

used in the digestion and sodium alizarin sulfonate indicator in the titration.

Nicotine. A method devised by the writer (7) which combines the good features of the Kissling and regular silicotungstic acid methods.

Nitrate Nitrogen. Strowd's Devarda alloy method modified by the writer (8).

Crude Ash. This was determined in the usual manner by ashing the sample at low red heat to constant weight.

Silicon. The silica was obtained in the usual manner from the hydrochloric acid solution of the crude ash by dehydration and subsequent treatment with hydrofluoric acid.

Phosphorus. This was determined volumetrically in an aliquot of the filtrate from the silica determination, by precipitating as ammonium phosphomolybdate, at 40° C., and standing over night at room temperature before filtering. After filtering and washing the precipitate, it was treated with an excess of standard alkali and titrated with standard acid and phenolphthalein indicator (1, p. 18, method III).

Calcium. The filtrate and washings from the ammonium phosphomolybdate were made slightly alkaline with ammonium hydroxid, heated to 40° C. for some time and filtered after standing overnight at room temperature. The precipitate of ferric and aluminum hydroxids thus formed was filtered, washed once or twice, dissolved in hydrochloric acid and reprecipitated in the same manner. The two filtrates from the ferric and aluminum hydroxids, without concentrating, were combined, heated, and hot ammonium oxalate solution added. After standing overnight at room temperature, the calcium oxalate was filtered and the precipitate dissolved in hydrochloric acid and reprecipitated in the same manner but in a smaller volume. The calcium was determined volumetrically by treatment of the calcium oxalate with dilute sulfuric acid, heating, and titrating with standard potassium permanganate solution in the usual manner. (1, p. 17, Method II, modified.)

Magnesium. The combined filtrates from the calcium oxalate were made slightly acid with hydrochloric acid, evaporated

to dryness and ammonium salts eliminated at low heat. Dilute hydrochloric acid was added and the residue of molybdenum trioxid was filtered and washed. The manganese in the concentrated filtrate was eliminated by repeated addition of bromin water and ammonium hydroxid. The residue was filtered and washed and the magnesium determined in the solution gravimetrically as magnesium pyrophosphate. (1, pp. 17, 18, Method II.)

Control determinations were made to estimate the impurities in the reagents and these have been deducted in reporting the results in the tables.

RESULTS OF THE ANALYSES

The findings for total nitrogen, nicotine and nitrate nitrogen, obtained on the individual samples, are given in tables 1 to 12, inclusive. The averages of these findings in each grade and for burley and dark tobacco, for each year, including all grades, are grouped in Tables 13 and 14.

The percentages of mineral constituents in the composite samples representing the good and common of each grade are in Tables 15 and 16. The average percentages of mineral constituents found in all the samples analyzed from the 1920 and 1921 crops, including all grades, are in Table 17.

Each horizontal line in the tables compares samples taken by one grader; therefore the comparisons between good, medium and common samples in any single line are based on the judgment of one man. The selections made by any one grader may appear in several tables, however, or more than once in the same table.

TABLE 1.—Burley Wrapper, Moisture-Free, 1920 Crop.

Number of Sample	Good			Medium		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
61339a, 40a	4.50	3.28	.179	4.21	4.49	.148
61347b	.....	.....	.....	3.70	3.67	.235
61348a, 9a	2.96	3.30	.063	3.28	3.44	.186
61350c	.....	.....	.....	3.83	4.61	.077
61367c	5.27	3.72	.275	.....	.....	.....
61375a, 6a	4.27	4.00	.308	5.34	4.03	.812
61377c	4.12	3.91	.196	.....	.....	.....
61401a	.....	.....	.....	4.08	4.11	.085
61409a	3.41	3.70	.235	.....	.....	.....
61417d	3.85	5.49	.285	.....	.....	.....
61418e	5.33	4.07	.494	.....	.....	.....
Maximum	5.33e	5.49d	.494e	5.34a	4.61c	.812a
Minimum	2.96a	3.28a	.063a	3.28a	3.44a	.077c
Average	4.21	3.93	.254	4.15	4.14	.262

a—Cigarette wrapper.
b—Cigarette wrapper, 1919 crop, omitted from average.
c—Twist wrapper.
d—Light plug wrapper, grown in Illinois.
e—Plug wrapper.

TABLE 2.—Burley Wrapper, Moisture-Free, 1921 Crop.

Number of Sample	Good			Medium		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
80117a, 9a	4.30	3.37	.466	4.38	2.80	.958
80118a, 20a	4.16	3.83	.569	4.22	3.75	.657
80246a, 7a	2.53	2.48	.047	3.48	4.21	.042
80292b, 3b	4.82	5.38	.498	4.18	5.64	.425
80325a, 6a	3.64	3.96	.255	4.06	4.40	.372
80348a	.....	.....	.....	3.32	2.98	.096
80349b	.....	.....	.....	3.99	3.53	.076
80433a	.....	.....	.....	3.34	3.92	.373
Maximum	4.82b	5.38b	.569a	4.38a	5.64b	.958a
Minimum	2.53a	2.48a	.047a	3.32a	2.80a	.042a
Average	3.89	3.80	.367	3.87	3.90	.375

a—Association grade C W (cigarette wrapper).
b—Association grade T W (twist wrapper).

TABLE 3.—Burley Filler, Moisture-Free, 1920 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
61343, 4, 5	4.47	3.91	.293	3.72	4.23	.056	3.84	1.89	.157
61351a, 2a	3.69	4.16	.061	.....	.....	.....	5.02	5.47	.216
16353, 4, 5	6.05	5.08	.417	3.93	3.77	.088	3.97	2.80	.066
61356b, 7b	4.28	2.45	.357	.....	.....	.....	4.59	1.83	.122
61366a	4.28	5.25	.208	.....	.....	.....	.....	.....	.....
61368, 9	5.30	3.50	.456	.....	.....	.....	4.58	3.70	.098
61378, 9	.....	.....	.....	5.57	4.40	.405	4.22	2.94	.200
61405, 6	.....	.....	.....	4.11	3.88	.143	4.28	3.11	.102
61407c	.....	.....	.....	.....	.....	.....	4.84	2.83	.184
61537, 8, 9	4.38	6.18	.120	4.57	3.71	.548	4.11	2.80	.045
61640, 1	4.78	3.86	.735	.....	.....	.....	4.13	4.34	.095
61644, 5	.....	.....	.....	3.10	4.72	.039	3.22	3.38	.009
Maximum	6.05	6.18	.735	5.57	4.72	.548	5.02a	5.47a	.216a
Minimum	3.69a	2.45b	.061a	3.10	3.71	.039	3.22	1.83b	.009
Average	4.88	4.16	.396	4.17	4.12	.213	4.18	2.96	.108

a—1919 crop, omitted from average.
b—Grown in Indiana.
c—Tips.

TABLE 4.—Burley Filler, Moisture-Free, 1921 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
80121, 2, 3	4.60	3.68	.525	4.96	3.13	.251	4.70	3.63	.253
80129, 30, 31	5.76	4.43	.520	5.26	4.24	.614	5.66	2.90	.597
80248a, 9a, 50a	5.64	3.33	.579	5.39	3.51	.320	4.51	2.47	.637
80271a, 2a, 3a	4.42	4.62	.658	4.22	2.81	.231	4.24	2.93	.548
80294a, 5a, 6a	5.33	3.44	.429	5.24	3.00	.239	4.76	3.04	.605
80327a, 8a, 9a	4.95	4.21	.492	4.63	3.18	.365	3.75	1.92	.168
80350a, 1a, 2a	5.33	3.48	.895	4.05	3.70	.277	4.61	3.83	.284
80434b, 5b, 6b	4.06	3.59	.209	4.87	3.52	.613	3.53	2.36	.735
80437b, 8b, 9b	3.62	3.32	.260	3.88	4.25	.197	4.16	2.22	.843
Maximum	5.76	4.62a	.895a	5.39a	4.25b	.614	5.66	3.83a	.843b
Minimum	3.63b	3.32b	.209b	3.88b	2.81a	.197b	3.53b	1.92a	1.68a
Average	4.86	3.79	.507	4.72	3.48	.345	4.44	2.81	.519

a—Association grade E (red leaf).
b—Association grade D (bright leaf).

TABLE 5.—Burley Smoker, Moisture-Free, 1920 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
61341, 2	.....	.....	.....	3.96	3.52	.147	3.11	2.55	.067
61358, 9, 60	2.79	1.50	.024	3.86	1.75	.242	3.16	1.37	.312
61370, 1	3.40	.84	.125	.....	.....	.....	3.17	1.32	.046
61380, 1, 2	3.65	2.50	.438	2.96	2.84	.076	3.44	2.36	.072
61402, 3, 4	3.39	3.16	.070	2.74	1.05	.111	2.66	1.32	.141
61411a	.....	.....	.....	.....	.....	.....	4.36	1.17	.246
61419, 20	2.95b	4.46b	.068b	.....	.....	.....	2.93a	.94a	.087a
61540, 1, 2	3.30	2.68	.356	2.79	2.25	.290	2.51	1.47	.135
61642, 3	3.42	4.26	.089	.....	.....	.....	3.13	2.04	.287
61646, 7, 8	2.80	1.75	.022	2.31	1.23	.031	3.87	1.33	.360
Maximum	3.65	4.46b	.438	3.96	3.52	.290	4.36a	2.55	.360
Minimum	2.79	.84	.022	2.31	1.05	.031	2.51	.94a	.046
Average	3.21	2.64	.149	3.10	2.11	.150	3.23	1.59	.175

a—Badly infected with wildfire and more so than other samples of this grade in this table.
b—Grown in Virginia.

TABLE 6.—Burley Smoker, Moisture-Free, 1921 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
80124, 5, 6	3.50	3.13	.562	3.96	1.90	1.367	3.30	2.48	.365
80132, 3, 4	4.35	4.90	1.121	2.76	1.67	.571	3.99	1.55	.622
80251a, 2a, 3a	2.98	2.82	.054	3.32	2.21	.159	3.00	1.61	.699
80274b, 5b, 6b	2.54	2.08	.043	3.77	1.78	.681	3.28	.95	.867
80297c, 8c, 9c	3.36	3.38	.317	3.83	3.35	.821	3.27	2.13	.545
80330c, 1c, 2c	4.87	4.15	.715	3.66	2.93	.700	3.77	1.99	1.048
80353c, 4c, 5c	4.33	2.82	.624	3.61	2.84	.559	3.34	1.16	.925
Maximum	4.87c	4.90	1.121	3.96	3.35c	1.367	3.99	2.48	1.048c
Minimum	2.54b	2.08b	.043b	2.76	1.67	.159a	3.00a	.95b	.365
Average	3.70	3.33	.491	3.56	2.39	.694	3.42	1.70	.724

a—Association grade B (trash).
b—Association grade A (flyings).
c—Association grade C (lugs).

TABLE 7.—Dark Leaf, Moisture-Free, 1920 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Fire cured—									
61436a, 7a	4.55	7.30	.150	.....	.....	.....	3.27	5.51	.009
61452, 3	4.90	5.29	.163	.....	.....	.....	4.54	5.51	.114
61514, 5	4.77	4.47	.141	.....	.....	.....	4.10	2.59	.132
61521, 2, 3	3.96	6.25	.093	4.12	4.06	.011	4.01	5.72	.066
61553b, 4b, 5b	3.89	7.37	.060	4.26	4.84	.337	3.82	5.60	.110
61602c	3.97	6.12	.020	.....	.....	.....	.....	.....	.....
61630d	.....	.....	.....	.....	.....	.....	3.02	4.18	.045
Air cured—									
61469, 70 -	4.27	7.01	.121	.....	.....	.....	4.83	6.16	.176
61603	3.46	4.93	.026	.....	.....	.....	.....	.....	.....
Maximum	4.90	7.37b	.163	4.26b	4.84b	.337b	4.83	6.16	.176
Minimum	3.46	4.47	.020c	4.12	4.06	.011	3.02d	2.59	.009a
Average	4.22	6.09	.097	4.19	4.45	.174	4.10	5.18	.101

a—Blue Pryor variety.
b—Little Crittenden variety.
c—Used for plug wrapper.
d—1919 crop, omitted from average.

TABLE 8.—Dark Leaf, Moisture-Free, 1921 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Fire cured—									
80090, 1	4.63	4.84	.328	.....	.....	.....	4.60	6.67	.298
80143a, 4a	4.26	6.87	.392	.....	.....	.....	4.43	7.67	.131
80151, 2	4.92	7.15	.311	3.87	5.67	.326	.....	.....	.....
80159, 60	4.07	7.48	.110	.....	.....	.....	3.93	6.31	.153
80220a, 1a	4.54	7.50	.431	4.31	7.02	.207	.....	.....	.....
80382b	4.98	7.78	.250	.....	.....	.....	.....	.....	.....
80383, 4	5.03c	6.99c	.225c	.....	.....	.....	4.24d	5.74d	.187d
Air cured—									
80073e, 4e, 5e	4.74	6.79	.109	4.35	6.01	.211	3.74	5.09	.190
80076f, 7f	4.94	4.92	.441	.....	.....	.....	5.75	4.24	.730
80094	4.26	5.43	.186	.....	.....	.....	.....	.....	.....
80095, 6	4.31	6.45	.108	.....	.....	.....	4.29	5.78	.154
80111a, 2a	4.69	7.15	.356	.....	.....	.....	5.01	6.03	.283
80154, 5, 6	4.77	6.31	.498	4.30	5.24	.206	4.60	5.61	.421
80192, 3	4.21	7.14	.280	.....	.....	.....	3.81	6.23	.278
80234a, 5a	4.38	7.44	.220	4.32	7.22	.175	.....	.....	.....
80236a, 7a	3.70	6.87	.036	.....	.....	.....	3.35	6.00	.044
Maximum	5.03c	7.78b	.498	4.35e	7.22a	.326	5.75f	7.67a	.730f
Minimum	3.70a	4.84	.036a	3.87	5.24	.175a	3.35a	4.24f	.044a
Average	4.53	6.69	.268	4.23	6.23	.225	4.34	5.94	.261

a—Little Crittenden variety.
b—Snuff type.
c—Cigar type.
d—French type.
e—Manufacturing type.
f—Rehandling type.

TABLE 9.—Dark Lugs, Moisture-Free, 1920 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Fire cured—									
61438a, 9a	4.65	5.13	.154	.....	.....	.....	3.84	5.24	.066
61454	4.66	4.66	.224	.....	.....	.....	.....	.....	.....
61456	.....	.....	.....	3.04	4.24	.108	.....	.....	.....
61516, 7	2.78	4.91	.044	.....	.....	.....	3.44	2.30	.045
61556b, 7b	3.86	6.59	.099	.....	.....	.....	4.72	4.26	.390
61604	2.41	3.96	.013	.....	.....	.....	.....	.....	.....
61631c	3.12	5.01	1.04	.....	.....	.....	.....	.....	.....
Air cured—									
61471, 2	3.42	4.44	.320	.....	.....	.....	4.07	6.46	.206
61605	.....	.....	.....	.....	.....	.....	2.88	2.59	.054
Maximum	4.66	6.59b	.320	.....	.....	.....	4.72b	6.46	.390b
Minimum	2.41	3.96	.013	.....	.....	.....	2.88	2.30	.045
Average	3.63	4.95	.142	.....	.....	.....	3.79	4.17	.152

a—Blue Pryor variety.
b—Little Crittenden variety.
c—1919 crop, omitted from average.

TABLE 10.—Dark Lugs, Moisture-Free, 1921 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Fire cured—									
80092, 3	3.06	4.38	.115	.....	.....	.....	3.53	3.58	.385
80145a, 6a	4.24	6.86	.282	.....	.....	.....	4.35	4.94	.275
80153	3.80	5.44	.397	.....	.....	.....	.....	.....	.....
80162, 3	4.03	5.67	.312	.....	.....	.....	4.36	6.10	.360
80222a, 3a	3.43	7.40	.137	3.45	5.87	.114	.....	.....	.....
80385b	.....	.....	.....	4.16	5.43	.176	.....	.....	.....
80386c	.....	.....	.....	3.51	5.35	.240	.....	.....	.....
Air cured—									
80078d, 9d	2.95	4.50	.049	.....	.....	.....	3.05	5.29	.072
80080e	.....	.....	.....	.....	.....	.....	3.46	4.29	.516
80097, 8	3.54	5.01	.157	.....	.....	.....	3.76	2.89	.244
80113a, 4a	4.41	6.37	.427	.....	.....	.....	5.08	5.19	.523
80194, 5	3.57	6.27	.191	.....	.....	.....	4.47	7.83	.311
80238a, 9a	3.29	6.28	.059	.....	.....	.....	2.89	5.85	.049
Maximum	4.41a	7.40a	.427a	4.16b	5.87a	.240c	5.08a	7.83	.523a
Minimum	2.95d	4.38	.049d	3.45a	5.35c	.114a	2.89a	2.89	.049a
Average	3.63	5.82	.213	3.71	5.55	.177	3.88	5.11	.304

a—Little Crittenden variety.
b—Dark type.
c—Bright type.
d—Manufacturing type.
e—Rehandling.

TABLE 11.—Dark Trash, Moisture-Free, 1920 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Fire cured—									
61440a	.....	.....	.....	.....	.....	.....	3.42	4.77	.067
61455	2.83	3.33	.148	.....	.....	.....	.....	.....	.....
61457	.....	.....	.....	2.47	3.19	.043	.....	.....	.....
61518, 9	2.25	3.99	.036	.....	.....	.....	2.45	2.27	.195
61558b, 9b	2.81	3.75	.002	.....	.....	.....	2.07	2.12	.015
61606	.....	.....	.....	.....	.....	.....	2.76	2.83	.028
61632	.....	.....	.....	.....	.....	.....	3.24	3.76	.065
Air cured—									
61473	.....	.....	.....	.....	.....	.....	2.52	2.36	.044
Maximum	2.83	3.99	.148	.....	.....	.....	3.42a	4.77a	.195
Minimum	2.25	3.33	.002b	.....	.....	.....	2.07b	2.12b	.015b
Average	2.63	3.69	.062	.....	.....	.....	2.74	3.02	.069

a—Blue Pryor variety.
b—Little Crittenden variety.

TABLE 12.—Dark Trash, Moisture-Free, 1921 Crop.

Number of Sample	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Fire cured—									
80147a, 8a	3.58	6.66	.404	.....	.....	.....	3.29	3.32	.151
80163, 4	2.83	4.96	.100	.....	.....	.....	3.16	4.95	.401
80224a, 5a	2.87	5.48	.131	3.90	5.65	.185	.....	.....	.....
80387, 8, 9	3.81	3.92	.382	3.70	4.46	.155	2.91	4.64	.156
Air cured—									
80081, 2	2.90b	4.45b	.157b	.....	.....	.....	2.81c	3.73c	.247c
80099, 100	3.85	3.01	.486	.....	.....	.....	3.16	3.12	.329
80115a, 6a	3.73	5.41	.240	.....	.....	.....	3.95	3.79	.099
80196, 7	2.27	4.12	.041	.....	.....	.....	2.70	3.24	.174
Maximum	3.85	6.66a	.486	3.90a	5.65a	.185a	3.95a	4.95	.401
Minimum	2.27	3.01	.041	3.70	4.46	.155	2.70	3.12	.099a
Average	3.23	4.75	.243	3.80	5.06	.170	3.14	3.83	.222

a—Little Crittenden variety.
b—Manufacturing type.
c—Rehandling type.

TABLE 13.—Yearly Average of Constituents in Tobacco Leaf, Moisture-Free, from Tables 1 to 12, Inclusive.

	Good			Medium			Common		
	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent	Total N Per Cent	Nicotine Per Cent	Nitrate N Per Cent
Burley wrapper—									
1920	4.21	3.93	.254	4.15	4.14	.262	.....	.....	.....
1921	3.89	3.80	.367	3.87	3.90	.375	.....	.....	.....
Average*	4.09	3.88	.298	3.98	3.99	.331	.....	.....	.....
Burley filler—									
1920	4.88	4.16	.396	4.17	4.12	.213	4.18	2.96	.108
1921	4.86	3.79	.507	4.72	3.48	.345	4.44	2.81	.519
Average*	4.87	3.94	.465	4.50	3.74	.292	4.30	2.89	.303
Burley smoker—									
1920	3.21	2.64	.149	3.10	2.11	.150	3.23	1.59	.175
1921	3.70	3.33	.491	3.56	2.39	.694	3.42	1.70	.724
Average*	3.44	2.96	.309	3.35	2.26	.443	3.31	1.63	.401
Dark leaf—									
1920	4.22	6.09	.097	4.19	4.45	.174	4.10	5.18	.101
1921	4.53	6.69	.268	4.23	6.23	.225	4.34	5.94	.261
Average*	4.43	6.49	.211	4.22	5.72	.210	4.25	5.67	.204
Dark lugs—									
1920	3.63	4.95	.142	3.04	4.24	.108	3.79	4.17	.152
1921	3.63	5.82	.213	3.71	5.55	.177	3.88	5.11	.304
Average*	3.63	5.49	.186	3.54	5.22	.160	3.85	4.77	.250
Dark trash—									
1920	2.63	3.69	.062	2.47	3.19	.043	2.74	3.02	.069
1921	3.23	4.75	.243	3.80	5.06	.170	3.14	3.83	.222
Average*	3.07	4.46	.193	3.36	4.43	.128	2.96	3.45	.152

*This is the average of the total number of samples of the character indicated that were anlyzed of the crop from both years, not the mean of the yearly averages.

TABLE 14.—Total Nitrogen, Nicotine and Nitrate Nitrogen in Tobacco Leaf, Moisture-Free, 1920 and 1921 Crops.

	No. of Samples	A Total N* Per Cent	Nicotine* Per Cent	B Nicotine N* Per Cent	C Nitrate N* Per Cent	A—(B+C)
Burley—						
1920	59	3.85	3.07	.530	.202	3.118
1921	61	4.12	3.16	.546	.501	3.073
Average**	120	3.99	3.12	.539	.354	3.097
Dark—						
1920	38	3.61	4.63	.800	.108	2.702
1921	71	3.93	5.62	.971	.246	2.713
Average**	109	3.82	5.28	.912	.198	2.710

*Average of all determinations on all grades in Tables 1 to 12 inclusive.
**This is the average of the total number of samples of the character indicated that were analyzed of the crops from both years, not the mean of the yearly averages.

TABLE 15.—Mineral Constituents in Burley Tobacco Leaf, Moisture-Free, 1920 and 1921 Crops.

	Wrapper		Filler		Smoker	
	Good* Per Cent	Medium* Per Cent	Good* Per Cent	Common* Per Cent	Good* Per Cent	Common* Per Cent
1920						
Crude ash	21.32	20.62	20.24	18.76	22.79	25.13
Silicon (Si.)	.40	.28	.42	.54	.55	1.94
Phosphorus (P.)	.33	.36	.35	.34	.41	.44
Potassium (K.)	4.36	4.69	4.60	3.61	4.36	3.14
Calcium (Ca.)	4.53	4.19	4.42	3.94	5.22	5.30
Magnesium (Mg.)	.54	.61	.80	.64	.56	.54
1921						
Crude ash	21.44	21.75	20.52	22.82	22.43	28.82
Silicon (Si.)	.58	.62	.56	1.90	.86	2.56
Phosphorus (P.)	.34	.32	.43	.47	.35	.40
Potassium (K.)	4.27	4.94	4.23	2.54	4.89	3.89
Calcium (Ca.)	2.59	2.84	4.74	3.78	2.77	3.84
Magnesium (Mg.)	.66	.62	.65	.71	.66	.79
Average, ** **1920-1921**						
Crude ash	21.38	21.19	20.38	20.79	22.61	26.98
Silicon (Si.)	.49	.45	.49	1.22	.71	2.25
Phosphorus (P.)	.34	.34	.39	.41	.38	.42
Potassium (K.)	4.32	4.82	4.12	3.08	4.63	3.52
Calcium (Ca.)	3.56	3.52	4.58	3.86	4.00	4.57
Magnesium (Mg.)	.60	.62	.73	.68	.61	.67

*Analysis of a composite of all of this character in Tables 1 to 6, inclusive.

**Mean of both years in above tables.

TABLE 16.—Mineral Constituents in Dark Tobacco Leaf, Moisture-Free, 1920 and 1921 Crops.

	Leaf		Lugs		Trash	
	Good* Per Cent	Common* Per Cent	Good* Per Cent	Common* Per Cent	Good* Per Cent	Common* Per Cent
1920						
Crude ash	17.10	17.69	21.80	20.91	27.93	26.86
Silicon (Si.)	1.24	1.30	2.36	2.52	4.31	3.99
Phosphorus (P.)	.24	.24	.25	.21	.24	.20
Potassium (K.)	2.59	2.69	2.70	2.32	1.84	2.32
Calcium (Ca.)	2.91	3.22	3.62	3.40	3.76	3.72
Magnesium (Mg.)	.93	1.01	.87	.92	1.09	1.00
1921						
Crude ash	18.53	19.10	23.31	24.02	26.05	28.03
Silicon (Si.)	1.37	2.03	3.10	3.75	4.09	4.55
Phosphorus (P.)	.23	.21	.19	.19	.18	.18
Potassium (K.)	3.38	2.98	2.84	2.87	2.86	2.85
Calcium (Ca.)	3.46	3.06	1.16	3.43	1.09	2.03
Magnesium (Mg.)	.95	.99	1.15	1.06	1.20	1.19
Average, ** **1920-1921**						
Crude ash	17.82	18.40	22.56	22.47	26.99	27.45
Silicon (Si.)	1.31	1.67	2.73	3.14	4.20	4.27
Phosphorus (P.)	.24	.23	.22	.20	.21	.19
Potassium (K.)	2.99	2.84	2.77	2.60	2.35	2.59
Calcium (Ca.)	3.19	3.14	2.39	3.42	2.43	2.88
Magnesium (Mg.)	.94	1.00	1.01	.99	1.15	1.10

*Analysis of a composite sample of all of this character in Tables 7 to 12, inclusive.
**Mean of the findings for the two years in above tables.

TABLE 17.—Comparison of Some Mineral Constituents in Burley and Dark Tobacco Leaf, Moisture-Free, 1920 and 1921 Crops.

	Crude Ash* Per Cent	Silicon* Si. Per Cent	Phosphorus* P. Per Cent	Potassium* K. Per Cent	Calcium *Ca Per Cent	Magnesium* Mg. Per Cent
Burley						
1920	21.48	.69	.37	4.03	4.60	.62
1921	22.96	1.18	.39	4.13	3.43	.68
Average	22.22	.93	.38	4.08	4.01	.65
Dark						
1920	22.05	2.62	.23	2.41	3.44	.97
1921	23.17	3.15	.20	2.96	2.37	1.09
Average	22.61	2.88	.21	2.69	2.91	1.03

*Average of all determinations on all grades in Tables 15 and 16.

EFFECT OF LEAF-SPOT DISEASE ON THE CONTENT OF NITROGEN AND NICOTINE IN TOBACCO LEAF

The diseases known as wildfire and angular leaf-spot were prevalent in 1920, particularly in the burley region, but probably to a less extent in the dark tobacco section. This was the first year that wildfire was recognized here. It was the opinion of competent observers that the 1920 crop of burley was one of the worst in quality ever produced in this locality.

In addition to the samples previously described, the writer collected a large number of "hands" of burley tobacco from the 1920 crop for use in some experiments carried on with Prof. A. J. Olney, of this Station, on the preparation of a reliable tobacco solution for spraying (9). These "hands" consisted of very common leaf which was infected with leaf-spot disease, very poorly graded, and otherwise damaged. This kind of tobacco sold for from fifty cents to two dollars per hundredweight, which, of course, was below the cost of production; but this probably is the only kind of leaf that can be used economically in a spray solution. This tobacco was known on the market as very common trash and, even if it had been properly graded, its quality and value would have been below that of the samples included under common in Tables 3 to 6, inclusive, on account of its more diseased condition. A "hand" often contained a mixture of inferior smoker, filler and tips. This trash should not be confused with the Association grade B-7 (common trash) which is composed of only one kind of leaf.

The determinations made were total nitrogen and nicotine, and it was observed that while the nicotine content was generally small, the corresponding nitrogen content was not always low. This is shown in Tables 18 and 19.

In Table 18 the percentages of nitrogen and nicotine in this burley trash are compared with the percentages of the same constituents found in the common grades of fillers and smokers given in Tables 3 to 6, inclusive. It will be seen that the nitrogen content of the burley trash lies between that of the fillers and smokers, whereas its nicotine content, tho lowest, is practically the same as that of the smokers.

As the samples of burley trash were mixed grades containing filler, smoker and tip leaves, all more or less damaged and diseased, it would be expected that their average nitrogen and nicotine content would fall between those of the other two grades. As a matter of fact, the nitrogen content is intermediate but the nicotine content is smaller than in the other two. This may be explained by the effect of disease on the nicotine content, as shown in Table 19.

There was a considerable amount of burley tobacco in the 1920 crop which cured with a green color. The "hands" were, in numerous instances composed of large leaves of uniform size and relatively free from disease, but on account of their green color they could not be graded; consequently they were known as trash, or green tobacco, and sold for a very low price. It was demonstrated, however, that much of this tobacco, when properly bulked for a sufficient time or put thru the drying process, would assume a normal color and could then be graded properly. For this reason, therefore, such tobacco could not be classed along with the diseased trash samples mentioned above. Two samples of this green tobacco were found to contain 4.60 per cent and 4.84 per cent total nitrogen and 2.21 per cent and 2.69 per cent nicotine.

A comparison of the common dark samples is given in Table 18. The considerations that dark trash is a distinct grade composed of leaves obtained from a different part of the stalk from this burley trash, and that it was not affected with as much disease as the burley tobacco, afford an explanation why the relation shown among the findings for the burley does not hold true for the dark tobacco.

Some of this burley trash was separated into two lots, one of which was appreciably and the other badly infected with leaf-spot disease; otherwise their appearance was the same. Comparisons were made also with samples of similar leaf in one of which the midrib was present and in the other it had been removed. These results are given in Table 19.

TABLE 18.—Average Total Nitrogen and Nicotine in Common Grades of Tobacco, Moisture-Free, 1920 and 1921 Crops.

Grade	Number of Samples	Nitrogen Per Cent	Nicotine Per Cent
Common burley fillers	19	4.30	2.89
Common burley smokers	17	3.31	1.63
Common burley trash*	8	3.74	1.61
Common dark leaf	17	4.25	5.67
Common dark lugs	14	3.85	4.77
Common dark trash	13	2.96	3.45

*Each sample of burley common trash consisted of a "hand" containing very common filler, smoker and tip leaves of the 1920 crop, that were either diseased or damaged and sold for a very low price. This trash should not be confused with the Association grade, B-7 (common trash) given in the preceding tables.

TABLE 19.—Total Nitrogen and Nicotine in Burley Common Trash, Moisture-Free, Infected with Leaf Spot Disease, 1920 Crop.*

Appreciably Infected			Badly infected.		
Number of Sample	Nitrogen Per Cent	Nicotine Per Cent	Number of Sample	Nitrogen Per Cent	Nicotine Per Cent
Leaf including midrib or stem.					
61476	4.77	1.33	61481	4.52	1.04
61477	2.42	1.00	61482	3.57	.94
61478	2.63	.95	61483	2.81	.92
61479	3.87	3.17	61484	3.15	.75
61480	2.45	.75	61485	3.65	1.06
			61486	4.25	1.01
			61487	4.44	1.40
			61488	3.46	.99
			61489	4.61	1.16
			61490	3.56	1.01
Average (5 samples)	3.23	1.44	Average (10 samples)	3.80	1.03
Leaf, not including midrib or stem.					
61476 to 80 inc.	3.71a	2.03a	61481 to 90 inc.	4.42b	1.35b
61408	4.60	2.21	61346	5.60	2.96
61410	4.84	2.69	61421	1.96	.29
			61422	3.20	1.33
			61423	4.13	2.23
			61424	3.72	2.78
			61425	3.23	.95
			61426	4.14	.75
			61427	3.96	1.58
Average (7 samples)	4.00	2.15	Average (18 samples)	4.12	1.47

*Each sample of common trash consisted of a "hand" containing very common filler, smoker and tip leaves that were either diseased or damaged and sold for a very low price. This trash should not be confused with the Association grade B-7 (common trash) given in the preceding tables.

a—Composite of 5 samples, Nos. 61476 to 80, inclusive, not including midrib or stem.

b—Composite of 10 samples, Nos. 61481 to 90, inclusive, not including midrib or stem.

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DISCUSSION OF RESULTS AND CONCLUSIONS

The averages of all individual determinations of nitrogen, nicotine and nitrate made on the burley and dark tobacco of both years, as given in Table 13, show the following relations between the different grades:

Burley Wrapper. Good has slightly more nitrogen than medium but somewhat less nicotine and nitrate. The differences are small.

Burley Filler. Good has the most nitrogen, nicotine and nitrate. Medium has more nitrogen and nicotine than common but about the same nitrate.

Burley Smoker. Good has more nitrogen and nicotine but less nitrate than the other grades. Medium has about the same nitrogen, more nicotine and slightly more nitrate than common. The differences in nitrogen are not as large, however, as in some other grades.

Dark Leaf. Good has more nitrogen and nicotine than the other grades, but about the same nitrate. Medium contains about the same nitrogen, nicotine and nitrate as the common.

Dark Lugs. Good contains somewhat more nitrogen and nitrate than medium but has less than common. It has the most nicotine. Medium contains less nitrogen and nitrate but more nicotine than common.

Dark Trash. Good contains less nitrogen than medium but more than common. It has about the same nicotine as medium but more than common; also more nitrate than the others. Medium has more nitrogen and nicotine but slightly less nitrate than common.

Referring to the burley in the same table, it will be found that the fillers usually contain the most nitrogen and nicotine and the smokers the least. The nitrate is more variable but the smokers compare favorably with the other grades regarding this constituent; in fact, the medium and common carry some of the largest amounts.

The same table also shows that the dark leaf usually carries the most nitrogen, nicotine and nitrate and the trash generally the least of these constituents.

Table 14 shows that, comparing all grades of each kind of tobacco of each year, the tobacco grown in 1921, both burley and dark, contains more of all three constituents than that grown in 1920. Again, on comparing the burley and dark samples, it is apparent that the burley tobacco carries more nitrogen and nitrate than the dark tobacco, but less nicotine than the latter, in both years. The combined burley samples contain 4.5 per cent more nitrogen and 78.8 per cent more nitrate but 40.9 per cent less nicotine than the combined dark.

The same table shows, also, in the case of the burley, that if the sum of the nitrogen in nicotine and nitrate be taken from the total nitrogen the remainder is about the same for each year, for each kind of tobacco, but the amount is less in the dark tobacco than in the burley.

The averages of the mineral constituents in the different grades of each kind of tobacco for the two years, as given in Tables 15 and 16, show the following relations:

Burley Wrapper. Good has slightly more ash but considerably less potassium than the medium.

Burley Filler. Good has less ash and silicon but more potassium and calcium than the common.

Burley Smoker. Good has less ash, silicon and calcium but more potassium than the common.

Dark Leaf. Good has less ash and silicon but more potassium than the common.

Dark Lugs. Good has less silicon and calcium but more potassium than the common.

Dark Trash. Good has less ash, potassium and calcium than the common.

The findings suggest that the good tobacco usually has a larger percentage of potassium than the common of the same class, but further work on individual samples is necessary to establish this point. The writer is now making the necessary analyses to test this question more fully.

The percentages of constituents not mentioned in any of the foregoing comparisons between good and common are about the same in both.

If the mean of the averages for good and common of each burley grade, calculated from the two-year average given in Table 15, is used as a basis of comparison, it will be found that the wrappers have the least silicon and calcium but the most potassium; the fillers, the least ash and potassium; and the smokers the most ash, silicon and calcium. The phosphorus and magnesium are more nearly constant than the remaining constituents. The same comparison of the dark grades in Table 16 shows the leaf to have the least ash and silicon but the most potassium and calcium, while the trash has the most ash and silicon but the least potassium and calcium. The phosphorus and magnesium are again nearly constant.

Table 17 shows that the 1921 samples of burley have more ash and silicon but less calcium than the 1920 crop. The other constituents are nearly equal. The 1921 samples of dark tobacco have more ash, silicon and potassium, but less calcium than those of 1920, while the other constituents show little variation.

The same table also shows that the 1920 samples of burley have less ash, silicon and magnesium but more phosphorus, potassium and calcium than the dark samples of the same year. The same relations hold true concerning the 1921 samples. The combined burley samples have 1.7 per cent less ash, 67.7 per cent less silicon and 36.9 per cent less magnesium, but 81.0 per cent more phosphorus, 51.7 per cent more potassium and 37.8 per cent more calcium than the combined dark.

Referring to the burley averages in Table 18, it will be seen that the trash has the least nicotine but not the lowest nitrogen content. As this trash was composed of mixed filler, smoker and tip leaves which were more or less diseased, it would be expected that the amounts of these two constituents present in it would be intermediate between the amounts of the same constituents found in the other two grades, were it not for the fact that disease evidently has affected the nicotine content but not the nitrogen content of these samples, as shown in Table 19.

The averages for dark tobacco, in the same table, show that the trash contains the least nicotine and nitrogen. The fact that the dark trash is composed of leaves obtained from a different

portion of the stalk from that from which the burley trash comes, and were freer from disease, may account for this.

Table 19 shows that the presence of the stem in the leaf lowers the nitrogen and nicotine content. It also shows that the leaf, with or without the stem, that was badly infected with leaf-spot disease has less nicotine but more nitrogen than that only partly infected. As a further comparison in order to demonstrate this, it might be mentioned that the averages of all other burley samples grown in the same year, 1920, given in Table 14, show 3.85 per cent nitrogen and 3.07 per cent nicotine. They were, with few possible exceptions, of higher quality and freer of disease than the trash. The averages in Table 19 for partly infected leaf are 4.00 per cent nitrogen and 2.15 per cent nicotine, while those for badly infected leaf are 4.12 per cent nitrogen and 1.47 per cent nicotine. This indicates that either the diseased leaf had a part of its nitrogen in combinations which were detrimental or the deficiency of nicotine vitiated its quality.

SUMMARY

1. This investigation is a comparative study of the total content of nitrogen, nicotine, nitrate nitrogen, crude ash, silicon, phosphorus, potassium, calcium and magnesium found in the different grades of tobacco represented by 145 samples of burley and 109 samples of dark tobacco grown in Kentucky in 1920 and 1921. The mineral constituents were determined on composite samples but the other determinations were made on the individual samples.

2. The burley crop of 1920 was abnormal, being infected to an unusual degree with leaf-spot diseases. The dark tobacco of that year employed in this investigation, was less diseased than the burley. Both burley and dark tobacco samples taken from the 1921 crops were more nearly normal, as they were freer of disease. This affords a comparison of abnormal versus normal leaf, as well as variations in different years.

3. The good division of any grade usually contained a larger percentage of nicotine than the common. The nitrogen

and nitrate were more variable but in the majority of instances, the good carried larger percentages of these constituents than the common.

4. A comparison of the burley grades shows that the fillers usually contain the largest percentages of nitrogen and nicotine and the smokers, the smallest. In the dark tobacco the leaf usually has the largest percentage of nitrogen, nicotine and nitrate, and the trash the smallest.

5. The burley tobacco of 1921 contained larger percentages of all constituents determined, except calcium, than that of 1920. The dark tobacco of 1921 also carried larger percentages of all except calcium and phosphorus, than that of 1920. The proportions of phosphorus and magnesium, altho different in the two kinds of tobacco, showed the least variation in the same crop, in the two years.

6. The burley tobacco of each year contained larger percentages of nitrogen and nitrate but a smaller percentage of nicotine than the dark tobacco. The combined burley samples showed 4.5 per cent more nitrogen and 78.8 per cent more nitrate nitrogen, but 40.9 per cent less nicotine than the dark.

7. The ranges for the nitrogen constituents determined in the dry burley were 1.96 to 6.05 per cent total nitrogen, 0.29 to 6.18 per cent nicotine, and 0.009 to 1.37 per cent nitrate nitrogen. For the dry dark tobacco they were 2.07 to 5.75 per cent total nitrogen, 2.12 to 7.83 per cent nicotine, and 0.002 to .73 per cent nitrate nitrogen.

8. The proportions of the ash constituents, other than phosphorus and magnesium, differed considerably in the good and common grades. The good, apparently, had the most potassium, but further work on individual samples is necessary to establish this point.

9. The averages obtained for burley tobacco apparently show that the wrappers have the smallest percentages of silicon and calcium but the largest potassium; the fillers, the smallest percentages of ash and potassium, and the smokers the largest percentages of ash, silicon and calcium. The averages for dark tobacco show that the leaf has the smallest percentages of ash

and silicon but the largest of potassium and calcium, while the trash has the largest percentages of ash and silicon but the smallest of potassium and calcium.

10. The burley tobacco of each year contained smaller percentages of ash, silicon and magnesium, but larger percentages of phosphorus, potassium and calcium than the dark tobacco of the corresponding year. The averages of the analyses of burley tobacco representing the two years show 1.7 per cent less ash, 67.7 per cent less silicon and 36.9 per cent less magnesium, but 81.0 per cent more phosphorus, 51.7 per cent more potassium and 37.8 per cent more calcium than the corresponding averages for the dark tobacco.

11. Burley leaf which was badly infected with leaf-spot disease contained a considerably smaller percentage of nicotine but a larger percentage of nitrogen than that which was less diseased. This indicates that such tobacco either had part of its nitrogen in combinations which were detrimental or the deficiency of nicotine vitiated its quality.

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Kentucky
Agricultural Experiment Station

University of Kentucky

FARMING WITH BLUEGRASS

BULLETIN NO. 259

Lexington, Ky.

July, 1925.

(59)

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This bulletin is a joint contribution from
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BULLETIN NO. 259

Farming with Bluegrass

By J. B. HUTSON and E. L. LANGSFORD

INTRODUCTION

The Kentucky bluegrass area proper, known as the Bluegrass Region of Kentucky, is composed of about fifteen counties in central Kentucky of which Fayette, Woodford, Clark, Bourbon and Jessamine are the most prominent. In this bluegrass area the extent to which it is desirable to utilize the land for bluegrass and the most effective utilization of this bluegrass are important considerations.

In central Kentucky bluegrass is a crop which yields fairly definite returns. Bluegrass pasture, alone or with feeds, will maintain live stock and put on gains. Much of the bluegrass yields returns in the form of seed. In 1923, the direct returns were determined for 2,770 acres of bluegrass in central Kentucky.[1]

These returns were measured in pounds of gain put on beef cattle and bushels of bluegrass seed. The quantity returns were reduced to values by applying the price at which the beef cattle were bought and sold[2] and the prices at which bluegrass seed

[1] The Department of Farm Economics of the Agricultural Experiment Station of the University of Kentucky and the Bureau of Agricultural Economics of the U. S. Department of Agriculture undertook in the spring of 1923 to encourage and assist farmers with bluegrass areas in central Kentucky in keeping accurate records as to the returns from their land in bluegrass. Fifteen farmers in cooperation with these agencies kept accurate records as to the returns from lands in bluegrass in 1923. The area in bluegrass on these farms ranged from 47 to 528 acres, the total of the fifteen being 2,770 acres. These bluegrass areas are located in the central bluegrass section in Fayette, Woodford, Clark and Bourbon counties.

[2] When cattle were put on or taken off bluegrass without being bought or sold the values were determined on the basis of the prices at which similar cattle were being transferred in the localities. In all cases the weights were accurately determined when the cattle were put on and taken off bluegrass.

was sold and deducting the expenses incident to handling the beef cattle and harvesting the bluegrass seed.

The gains put on beef cattle ranged from 7 to 182 pounds per acre, the average being 57.3 pounds per acre. The bluegrass seed yield ranged from 3.6 bushels to 12.5 bushels per acre, the average being 6.5 bushels per acre. The value of these gains in 1923 ranged from $3.61 to $17.45 per acre, the average being $12.01 per acre. This average was about 6 per cent on the estimated market value of the land.

The main factors affecting these variations were the prices at which the beef cattle were bought and sold, the time the cattle were turned on and taken off bluegrass and the yield of bluegrass seed.

In 1923 the gains and value of gains put on beef cattle appear to have been slightly less than normal. The yield of bluegrass seed appears to have been slightly above normal. The price of bluegrass seed appears to have been about normal. A careful consideration of these data along with 1923 season and prices and normal seasons and prices is indicative, within reasonable limits, of what may be expected from land in central Kentucky in bluegrass handled in this way.

Bluegrass is most profitable when grown in a rotation with other crops. The best quality of Burley tobacco usually is grown after bluegrass. In most cases the most economical method of seeding the bluegrass is with clover in small grain. A long rotation system with tobacco or corn one or two years, small grain one year, clover one year and bluegrass from 6 to 8 years has many advantages for the central Kentucky farmer.

Part I.

Returns from Bluegrass

COMMON SYSTEMS OF CROP ROTATION IN CENTRAL KENTUCKY

A considerable part of the land in central Kentucky is held in comparatively large tracts. For example, about 40 per cent of the farm land in Fayette, Bourbon, Clark, Woodford and Jessamine counties is held in tracts of 260 acres or larger and about 20 per cent in tracts of 500 acres or larger. A common rotation on these large farms is bluegrass from six to eight years, white burley tobacco or corn one or two years, small grain one year, and clover one or two years. The bluegrass usually is sown in the small grain with clover. A small acreage of the clover usually is cut for hay and the remainder pastured. During the second year the clover disappears and then the land is left in bluegrass from five to eight years.

When the bluegrass is turned under the more fertile areas are planted in burley tobacco for one or two years and then in small grain. The less fertile areas are planted in corn for one or two years and then in small grain. The small grain may be either cut, threshed and marketed, or pastured, depending upon the yield and price outlook and the need for pasturage in the early spring. The need for corn on these large farms is relatively small and often some of this is purchased. Considerable corn is shipped into the bluegrass area. Thus on these large farms we usually have from five to ten per cent of the acreage in burley tobacco, a slightly larger acreage in corn, from eight to fifteen per cent in small grain, from ten to twenty per cent in clover, most of which is pastured, and the remainder in bluegrass.

On the smaller farms generally a shorter crop rotation is followed. A common rotation for these farms is corn or tobacco one year, small grain one year, clover and timothy two years. Often a small part of the farm is left for bluegrass which is

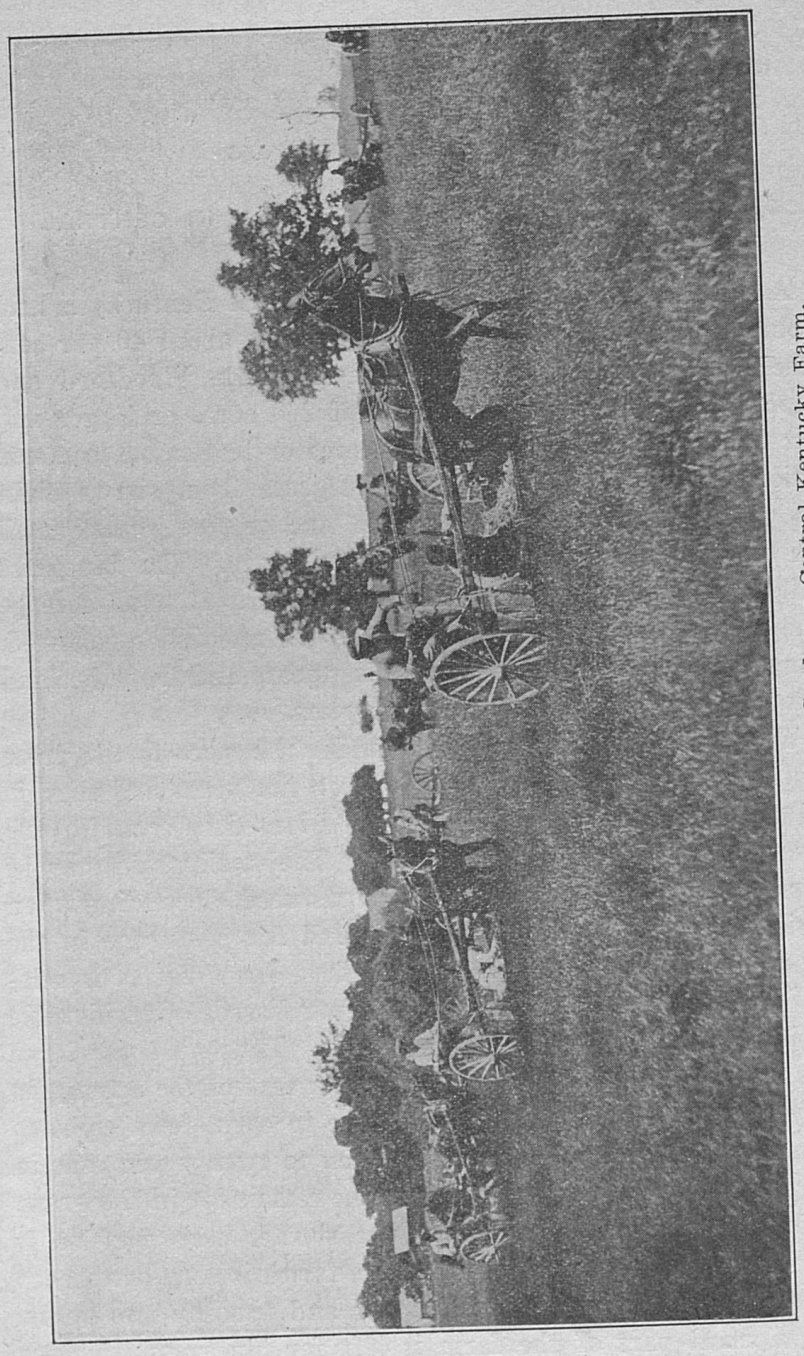

Fig. 1.—Stripping Bluegrass Seed on a Central Kentucky Farm.

handled in the same manner as in the longer rotation previously mentioned.

Within recent years many of these smaller farms, with the shorter rotations, have experienced considerable difficulty in growing burley tobacco of the best quality. It is believed that bluegrass in some way causes a better quality of tobacco.

COMMON PRACTICES IN HANDLING BLUEGRASS PASTURES

Bluegrass makes some growth in practically every month of the year. In early spring and late fall its growth usually is luxuriant. In central Kentucky it usually has made considerable growth before April 1, and affords good pasturage until December 1. It is utilized for seed and pasturage or for pasturage alone. Either the pasturage or the seed may be made the main consideration, depending chiefly upon the season, the quantity of bluegrass seed, the price outlook and the quantity and kinds of weeds in the bluegrass. (See Fig. 1.)

If seed is made the chief consideration the bluegrass is not pastured or is pastured lightly before stripping. The stripping season usually starts from May 25 to June 10 and lasts five to ten days. The seed may be sold standing in the field, hired stript, or stript on the share basis. If stript on the share basis, from two-fifths to one-half is given for all labor and expenses incident to stripping, curing and marketing. The bluegrass may be pastured quite heavily from the stripping season until the dry, hot season of summer (usually beginning about July 1 to 15), then lightly until about the middle of September and then heavily until the middle or latter part of December. During years with an open winter bluegrass affords some pasturage thruout the winter. If handled in this way bluegrass may be expected during most years to return from five to fifteen bushels of seed per acre in addition to the pasturage.

If pasturage is the chief consideration, bluegrass usually is pastured heavily from April or early May until the hot summer season, following which it is pastured as already indicated for the remainder of the season. Good bluegrass pastured fairly heavily before stripping usually returns from three to eight

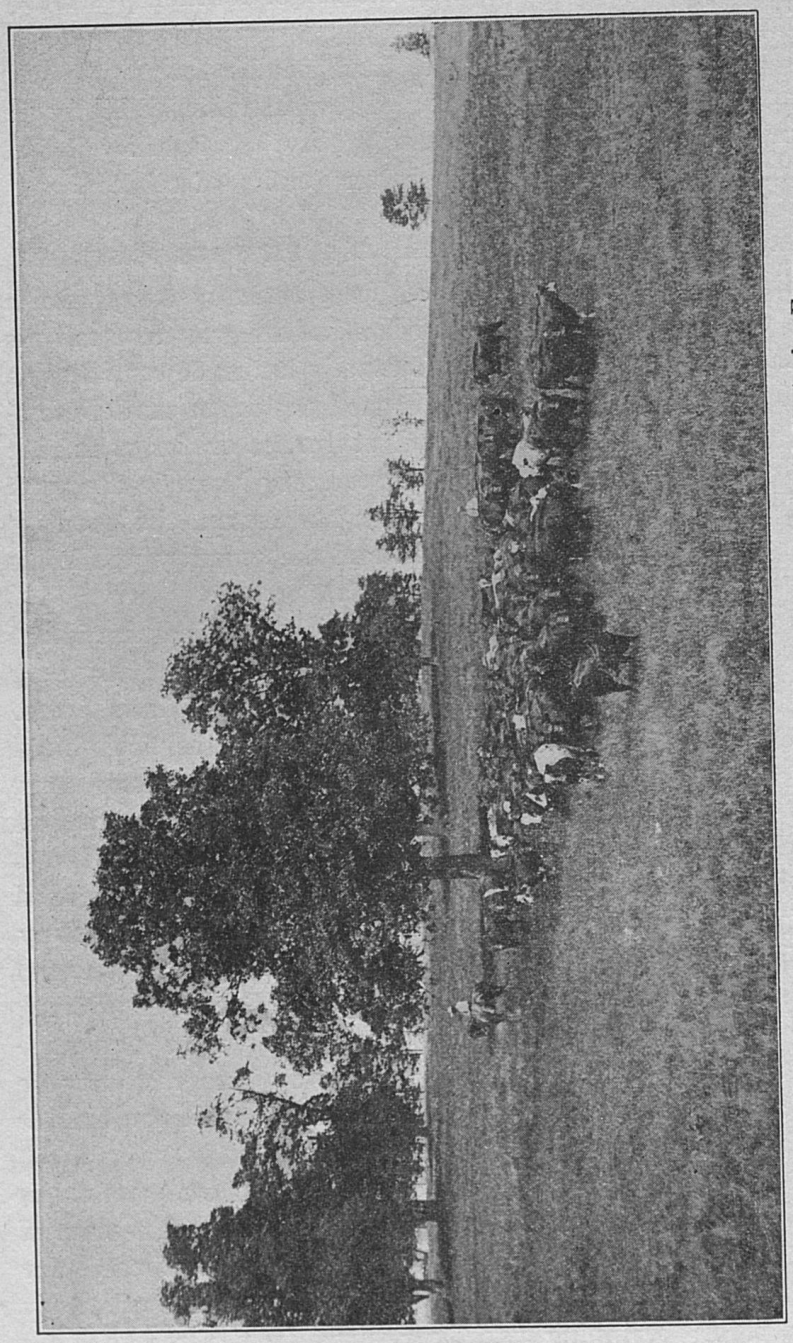

Fig. 2.—Bluegrass Pastured by Beef Cattle on a Central Kentucky Farm.

bushels of seed per acre in addition to the pasturage. If handled in either way the number of live stock on it is reduced at times during the year or else other pasture is utilized.

Usually the bluegrass seed crop is harvested on a considerable scale in only four or five of the central bluegrass counties. As a rule the other counties utilize the bluegrass almost entirely for pasturage.

The principal kinds of live stock utilizing bluegrass pasture in this area are breeding horses, including thoroughbred and standardbred horses, sheep, dairy cattle and beef cattle. In this study beef cattle were selected because the returns from beef cattle are more easily determined than are those from most other classes of live stock.

COMMON PRACTICES IN HANDLING BEEF CATTLE ON FARMS WITH BLUEGRASS

In central Kentucky beef cattle to be pastured on bluegrass usually are brought to the farms in September or October. Usually long yearlings or short two-year-olds weighing from 800 to 1,000 pounds and classed as "good feeders" are shipped into the area from Tennessee or the St. Louis market during these months. Some are bought locally. They may be purchased directly by the farmer or thru local stock dealers.

These cattle are put on bluegrass as soon as bought and are allowed to remain without other feed until the middle or latter part of December. From late December until about March 1 they are fed a maintenance ration of stover and other roughage with a little corn. Beginning about March 1 they are fed rather heavily on corn on a limited pasture area or silage and corn in the barn until put on pasture from April 20 to June 1. This spring feeding is called by cattle men "warming up."

Sometimes the cattle go directly to bluegrass after this warming up process and sometimes they go first to young rye or clover and then to bluegrass, this depending upon the season, the relative availability of feed and young rye or clover, other live stock on hand, the bluegrass seed outlook and the previous experience of the individual cattle man. In recent years there is

a tendency to feed slightly more heavily and later in the spring than formerly. These cattle, bought in September and October, usually are sold from July 1 to September 1 of the following year as "grass fat" cattle, ranging in weight from 1,200 to 1,450 pounds and classed on market as "good steers." Most of these cattle are sold directly or thru local dealers to the eastern markets.

RETURNS FROM BEEF CATTLE AND BLUEGRASS SEED

The net returns from bluegrass seed, beef cattle and other sources are shown in Table 1. These returns are presented on the per acre basis for each of the 15 bluegrass areas from which data were obtained.

TABLE I.—The Returns from Beef Cattle and Bluegrass Seed
(Acre Basis)

1	2	3	4	5	6	7	8	9	10	11
Farm No.	Estimated Value of Land	Total Pasture Days Per Acre	Total Cattle Gains, Lbs.	Net Value of Total Cattle Gains	Returns Other Sources	Bushels Seed Per Acre	Net Returns Bluegrass Seed	Total Net Returns	Opportunity Rental	Per Cent Return on Estimated Value of Land
14	$200	103	61.0	$14.06	$0.60	7.5	$6.58	$20.90	$10.00	10.4
9	200	92	62.0	3.32	.....	12.5	14.47	17.45	10.00	8.7
5	200	105	51.0	7.80	.....	8.2	9.20	16.66	10.00	8.3
6	200	12	9.3	3.13	.....	11.0	12.60	15.39	10.00	7.7
8	200	42	58.0	7.63	.....	6.5	6.84	14.13	10.00	7.1
11	200	82	61.6	2.33	.84	9.4	10.75	13.58	10.00	6.8
4	200	52	56.9	9.25	.....	4.5	4.03	12.94	10.00	6.5
2	200	80	87.0	7.00	.....	6.8	6.17	12.83	10.00	6.4
3	185	59	7.0	—.15	.....	9.2	11.59	11.10	8.00	6.0
7	200	32	9.3	2.80	.....	7.5	8.40	10.86	10.00	5.4
1	200	58	38.1	4.75	1.87	5.4	3.02	9.29	10.00	4.6
12	175	121	182.0	5.62	.....	3.6	3.46	8.73	8.00	5.0
13	175	80	160.0	4.50	.....	4.2	2.14	6.30	8.00	3.5
15	140	52	21.2	4.48	1.75	.....	.....	5.89	6.00	4.2
10	190	108	40.1	3.85	.....	.....	.....	3.51	9.00	1.8
Ave.	$191	62	57.3	$5.53	$0.03	6.5	$6.45	$12.01	$9.26	6.3

3. "Total Pasture Days Per Acre" includes the pasture days for all beef cattle and other live stock. This represents the number of days of pasturage furnished by each acre to a mature animal during the season.

4. "Total Cattle Gains" represents the difference in the weights of all cattle when turned on bluegrass and the weights when turned off bluegrass divided by the number of acres in the area.

5. "Net Value of Total Cattle Gains" represents the difference between the purchase or estimated value of all cattle when turned on bluegrass, plus the expenses incident to caring for the cattle (in some cases this included a small amount of feed), and the sales or estimated value when

turned off bluegrass, divided by the number of acres in the area. Actual sales or opportunity sales prices were taken.

6. "Returns Other Sources" represents actual returns received when some of the areas were rented out for other live stock, or opportunity returns when utilized by live stock from which weights and prices on and off the bluegrass could not be obtained.

8. "Net Returns Bluegrass Seed" represents the sale price of the seed, less the cost of harvesting and marketing, divided by the number of acres in the area.

9. These bluegrass areas are listed in the order of the total net returns per acre, beginning with the highest. The "Total Net Returns" per acre were computed by adding the net value of the cattle gains, returns from other livestock and the net returns from bluegrass seed (columns 5, 6 and 8) and deducting the charges for the fences and upkeep of the bluegrass area. This fence and upkeep charge was $0.34 per acre in 1923.

10. "Opportunity Rental" is the figure at which similar bluegrass in the locality rented in 1923.

11. "The Per Cent on the Estimated Value of Land" is the percentage the total net return (column 9) is of the estimated value of the land (column 2).

As stated above, beef cattle usually are turned on bluegrass in April, May or June and sold in July or August. In 1923 cattle were handled in this way on nine of the fifteen farms. On the other six farms the cattle were turned on bluegrass in April and May and sold in September, October and November. On most of the farms that sold the cattle in July or August another drove was bought in September or October and kept on bluegrass in the late fall and early winter. In most instances the cattle on bluegrass in the late fall and early winter were on the same areas as the cattle on bluegrass in the spring. Cattle on bluegrass from spring to fall utilized practically all the pasturage for the spring, summer and fall seasons on the areas to which they had access.

The gains put on beef cattle ranged from 7 to 182 pounds per acre for the season, the average being 57.3 pounds per acre. The areas from which smaller gains were obtained were not pastured before the seed was stript and, in most cases, were pastured with large, half-fat cattle that were sold in July and August. The bluegrass seed was made the chief consideration on these farms.

The areas showing the larger gains were pastured heavily from early in the spring until late in the fall. The same cattle were held on these areas thruout the entire grazing season and, in most cases, these cattle were unusually thin when turned on bluegrass in the spring.

With the prices prevailing in 1923 the total net value of the gains on beef cattle ranged from $2.33 to $14.06 per acre, the average being $5.53 per acre. There does not appear to be a constant relation between pounds of gain and value of gain. Some farmers get small gains in pounds and large returns in dollars because they give more attention to buying on low markets and selling on high markets than they do to providing cattle to utilize bluegrass as it is available. The farmer, in attempting to secure the largest possible returns from a given pasture area, must take into account the condition of his cattle and the market situation on the one hand and the utilization of the bluegrass on the other.

The bluegrass seed was stript from thirteen of these fifteen bluegrass areas, the acreage stript being 2,595 of the total 2,770 acres. The yield on the acreage stript ranged from 3.6 to 12.5 bushels per acre, the average yield, including all the bluegrass acreage on which records were kept, being 6.5 bushels per acre. The average net returns from bluegrass seed were $6.45 per acre.

The total net returns from all sources ranged from $3.61 to $20.90 per acre, the average net returns being $12.01 per acre. The areas that showed the highest net returns per acre were areas upon which the bluegrass was handled in such a way as to get good returns from seed as well as to utilize the pasturage. In general those that received the highest net returns per acre pastured lightly before stripping.

The following notes suggest some of the reasons for the variations from farm to farm in 1923. The notes are arranged in the same order as the data in Table 1. That is, the notes for the farms with the highest "net returns per acre" are placed first.

Farm No. 14. Pastured heavily before stripping. Stript on shares, gave two-fifths instead of one-half for stripping. Good grade cattle. Fair gains. Sold in August for October delivery. Well sold. Only one drove.

Farm No. 9. Pastured lightly before stripping. Exceptional pasture. Good yield of seed. Cattle held until December. Fair gains. Only one drove.

Farm No. 5. Pastured lightly before stripping. Good yield of seed. Good grade cattle. Fair gains. Sold in August. Two droves of feeders after first cattle came off. Small gains on last two droves.

Farm No. 6. Not pastured before stripping. Cattle large and half fat. Sold in August. Small gains. Well sold. Second drove cattle fed on pasture but no gains allowed for grass.

Farm No. 8. Pastured lightly before stripping. Fair returns from seed. Good gains on cattle. Second drove of cattle September to December. Small gains.

Farm No. 11. Pastured lightly before stripping. Good returns from seed. Cattle bought high. Second drove of cattle made small gains.

Farm No. 4. Pastured lightly before stripping. Cattle held until October. Fair gains. Sold in August for October delivery. Second drove of cattle fed on pasture but no gains allowed for grass.

Farm No. 2. Pastured lightly before stripping. Medium grade cattle. Fat cattle graded out and sold in August. Others graded out and sold in October. Some held until December. All considered one drove. Good gains.

Farm No. 3. Not pastured before stripping. Stript seed cheaply. Cattle sold in August. Small gains. No gains from second drove of cattle.

Farm No. 7. Not pastured before stripping. Good yield. Cattle large, and half fat. Sold in August. Small gains. Well sold. No gains from second drove of cattle

Farm No. 1. Pastured heavily before stripping. Stript on shares. First cattle sold in July. No gains from second drove of cattle. Part of pasture rented for other stock.

Farm No. 12. Pastured heavily before stripping. Cattle thin. On pasture from May until December. Exceptional gains. Only one drove of cattle.

Farm No. 13. Pastured heavily before stripping. Seed stript on shares. Cattle thin when put on bluegrass. Fat cattle graded out and sold in August. Some held until December. All considered one drove.

Farm No. 15. No seed stript. Cattle on from May 1 to July 14. Good gains. Well sold. Only one drove. Pastured with other live stock.

Farm No. 10. No seed stript. Pastured heavily. First cattle sold in July. Then heifers on for one month. Fair gains on heifers. Feeders on from October to December. No gains.

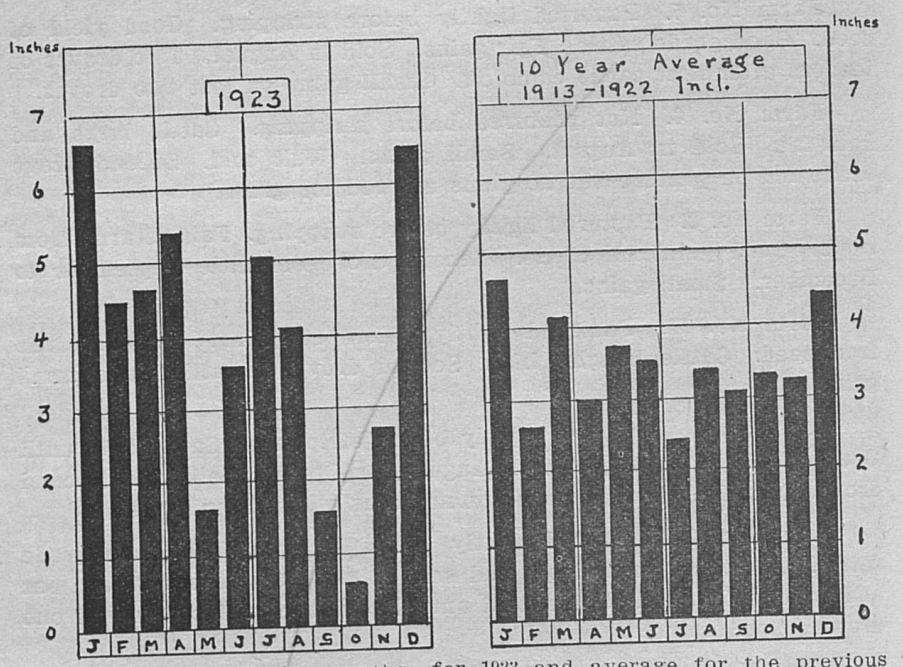

Fig. 3.—Rainfall, by months, for 1923 and average for the previous ten-year period.

THE SEASON OF 1923 AS RELATED TO NORMAL[3] SEASONS

Before data of this kind can be used in making plans and anticipating returns the extent to which they represent normal returns must be considered. In this case the seasonal variations of 1923 from normal seasons and the relation of gains and prices of beef cattle and yields and prices of bluegrass seed in 1923 to normal yields, gains and prices are considered.

The monthly distribution of rainfall for 1923 and the average for the previous ten-year period are shown in Figure 3. Considering only the growing season it appears that the rainfall was unusually heavy in 1923 during March, April, July and August and unusually light during May, September and October. (See Fig. 3.)

The monthly mean temperature for 1923 and the average for the previous ten-year period are shown in Fig. 4. It was slightly colder than usual during February, March, April and

[3] The word "normal" as used in this bulletin implies the long-time average.

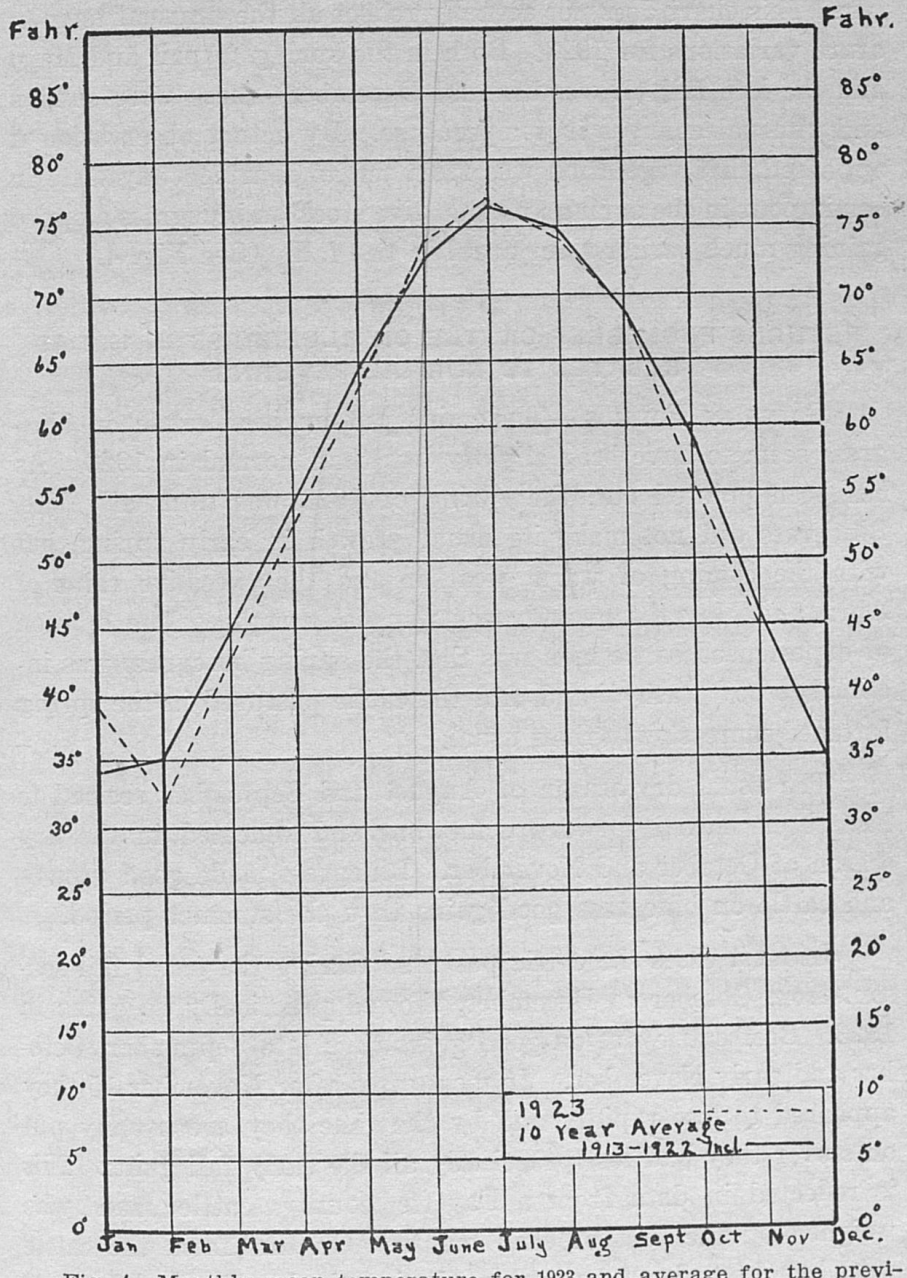

Fig. 4.—Monthly mean temperature for 1923 and average for the previous ten-year period.

May and slightly warmer than usual during January and December. This chart does not actually reflect all the unusual temperature variations for 1923. Both in the spring (April and May) and the late fall (November and December) there were sudden and unusual changes in temperature. By actual observation it appeared that vegetation was from ten to fourteen days late in coming out in the spring and that live stock on bluegrass stopped gaining much earlier than usual in the fall. (See Fig. 4.)

RETURNS FROM BEEF CATTLE ON BLUEGRASS IN 1923 AS RELATED TO NORMAL RETURNS

Gains in Pounds.—The gains put on beef cattle on bluegrass seem to have been slightly less than normal in 1923. As has been pointed out, the spring of 1923 was unusually late. Bluegrass did not make its usual growth in early spring, but with the coming of warm weather and the excessive rains of April and May the growth was unusually rapid. The opinion of experienced cattle men was that the spring bluegrass was inclined to be "washy" and that the cattle pastured in the spring fattened more slowly than usual.

The usual dry season of August and September seemed to have been moved forward somewhat and reflected in the dry season of October and November. Bluegrass made good growth and cattle on bluegrass good gains thru the summer period.

In most cases the cattle pastured during the usual fall season, from October to December, showed practically no gains in 1923. Beef cattle put on good gains thru late September, October and early November. In most cases after November 15 they appeared to lose rapidly and by the time they are usually put on stover they had lost practically all the early fall gains. This is reflected in data from a Fayette county cattle man who weighed on the first of each month. On this farm the cattle were bought and put on pasture during the last days of September. The monthly weights were as follows:

October 1. Cattle on bluegrass. Total weight.....62,880 lbs.
November 1. Cattle on bluegrass (1 died). Total weight....66,280 lbs.
December 1. Cattle on bluegrass. Total weight.....66,240 lbs.
January 1. Cattle on bluegrass. Total weight .....63,440 lbs.

Some cattle men attributed these late fall losses to the unusual and sudden changes in temperature in late November and December which seemed to throw the cattle "off feed." Others suggested that the late fall bluegrass lacked substance. All agreed that the cattle on bluegrass in the fall did not put on and retain normal gains.

Taking into consideration these impressions in connection with the data available it appears that the gains put on by beef cattle on bluegrass in 1923 were slightly below normal for May, June and July, considerably above normal for August and September, possibly about normal for October, and considerably below normal for November and December. The feeling on the part of most cattle men was that the total gains for the year were slightly below normal.

Prices of Beef Cattle.—Data on prices indicate that the spread in prices between feeders and fat steers was slightly less than normal in 1923. The 1923 prices and the previous three-year average prices on the St. Louis market[4] are shown in Table II. The spread between good feeders and good fat steers was less in 1923 than the average for the three previous years. Other data not tabulated indicate that the average spread from 1920 to 1922 is about the same as the spread from 1915 to 1919.

The decline in price for good fat steers came earlier in 1923 than usual. It also appears that the lower fattening qualities of bluegrass in the spring of 1923 caused many of the cattle to be held later than usual. Combining the gain in pounds and price considerations it appears that beef cattle on bluegrass in 1923 put on slightly smaller gains than usual and that any changes

[4] St. Louis prices are used because more feeder cattle coming to central Kentucky pass thru the St. Louis market than thru any other large market. While the fat cattle usually go to the eastern markets the St. Louis prices suggest the spread between feeders and fat cattle.

in the time for marketing occasioned by these smaller gains resulted in less favorable prices. It appears that the cattle fattened on bluegrass in 1923 netted slightly smaller returns than

TABLE II.—Prices for 1923 and Previous Three-Year Average Prices for "Good Feeders" and "Good Fat Steers."

Date	St. Louis Market, 1923		St. Louis Market, 3-Year Average (1920-21-22).	
	Good Feeders (750 lbs. to 1,000 lbs.)	Good Fat Steers (1,200 lbs. and Over)	Good Feeders (750 lbs. to 1,000 lbs.)	Good Fat Steers (1,200 lbs. and Over)
May 15	$7.47	$9.74	$7.41	$9.84
Aug. 15	6.50	11.00	7.19	11.50
Sept. 15	6.50	11.10	7.12	11.45
Oct. 15	6.00	10.70	6.87	11.57
Dec. 15	5.88	10.46	6.38	9.75

Spread between good feeders, May 15, St. Louis market, and good fat steers, August 15, for 1923, $3.53; for three-year average, $4.09.

Spread between good feeders, May 15, and good fat steers, October 15, for 1923, $3.23; for three-year average, $4.16.

Spread between good feeders, September 15, and food feeders, December 15, for 1923, $0.62, decline in price; three-year average, $0.74, decline in price.

Price data from "Weather Crops and Markets," U. S. D. A.

usual. These conclusions are in line with the general feeling of live stock men in the area that beef cattle was one of the least profitable classes of live stock utilizing bluegrass in 1923.

RETURNS FROM BLUEGRASS SEED IN 1923 AS RELATED TO NORMAL RETURNS.

Yield of Bluegrass Seed.—The season of 1923 seemed favorable for bluegrass seed production. A relatively large acreage of bluegrass seed was harvested, with yields per acre equal to or possibly slightly above a long-time average. The total bluegrass seed production in Kentucky in 1923 was considerably above a long-time average. However, the yields for

the areas upon which records were kept were slightly less than seven bushels per acre while the consensus of opinion of bluegrass men seems to be that from seven to eight bushels per acre is a normal yield. It is possible that the areas upon which records were kept were pastured more heavily than is usual, considering the entire area from which seed is stript. Then it is possible that the generally accepted average yield is slightly above the yields actually obtained from the present bluegrass, considering the poor along with the good bluegrass seasons. Considering the total production data along with impressions gained from men in the field it appears that the yields of bluegrass seed on the areas from which data were obtained were slightly above normal in 1923.

Prices of Bluegrass Seed.—The prices received by Kentucky growers for bluegrass seed, by years, from 1910 to 1923, are shown in Table III.[5]

TABLE III.—Prices Received by Growers for Kentucky Bluegrass Seed from 1910 to 1923.

Date	Prices for Cured Seed Per Bu.
1910	$1.25—$1.60
1911	1.65— 1.75
1912	.55— .70
1913	.60
1914	.45
1915	.60
1916	.70
1917	1.40— 1.65
1918	1.50
1919	1.50— 1.75
1920	1.75— 1.85
1921	2.15— 2.25
1922	1.25— 1.50
Approximate 13-year average	$1.24
1923 average	1.30

These data indicate that the bluegrass seed prices were about normal in 1923. Then, with the yields slightly above normal,

[5] Prices for the years 1910 to 1922 were taken from Bulletin 247, Kentucky Experiment Station. Prices for 1923 were taken from the farms from which these bluegrass records were obtained.

it appears that the net returns per acre for bluegrass seed were slightly above normal in 1923. This conclusion is in line with the feeling of bluegrass men generally, that 1923 was a profitable year for bluegrass seed.

Summing up these considerations it appears that in 1923 the returns from beef cattle were slightly below normal and the returns from bluegrass seed slightly above normal. While it does not appear that the season and price conditions were unusually favorable for bluegrass areas pastured by beef cattle in 1923, it is possible that the men who cooperated on this project are above the average in ability to handle bluegrass areas profitably. Possibly the bluegrass areas on which records were kept were slightly better than the average in central Kentucky. However, no effort was made to select the better bluegrass areas or the unusually successful farmers as cooperators. In any event these data seem to indicate that bluegrass is a good crop for a good farmer.

Part II.

Bluegrass in a Profitable Farming System in Central Kentucky

The organization of a 586-acre bluegrass farm as it has been operated during 1922, 1923 and 1924 and a proposed organization of a 400-acre farm are shown in the following pages. The returns shown for the 586-acre farm are those actually obtained with the prices of these years.

A 586-ACRE BLUEGRASS FARM

Resources Available.—This farm consists of 586 acres of good bluegrass land. There are barns for 33 to 40 acres of tobacco, 3 tenant houses, stock barn and silo and machine shed. The investment in buildings other than the residence is between $7,000 and $8,000. The investment in machinery is between $2,000 and $2,500.

This farmer usually keeps from 5 to 8 head of work stock, about 120 ewes and 5 bucks, 10 brood sows and 2 dairy cows. He usually buys each fall from 75 to 100 pigs weighing from 100 to 125 pounds and about 100 head of small cattle weighing from 450 to 600 pounds.

The market value of this land is about $175 per acre without buildings. The total investment, including a $15,000 residence, is about $135,000.

The work on this farm is done by the operator, 2 regular hired men, 3 tobacco tenants and extra labor in stripping bluegrass seed, baling straw, cutting and husking corn and filling the silo.

The beef cattle handled on the 586-acre farm were lighter than those usually handled in central Kentucky. They were lighter than those suggested for the 400-acre organization shown later. In recent years light, well bred cattle appear to have made considerably larger returns for the pasturage used than

heavy cattle. It is possible that taking one year with another most central Kentucky farmers will find light, well bred cattle making larger returns than heavy cattle. On the other hand prices may favor one for a series of years and then the other for a time.

EXPENSES AND RECEIPTS.—The expenses and receipts for this farm for 1922, 1923 and 1924 are shown in Table IV.

TABLE IV.—Expenses and Receipts of a 586-Acre Bluegrass Farm for 1922, 1923 and 1924.

	1922	1923	1924
RECEIPTS			
Live-stock sales	$14,783.96	$15,426.43	$10,899.44
Crop sales	11,839.52	10,000.67	8,929.65
Miscellaneous sales	823.00	59.00	183.50
Increase live stock on hand	.....	1,224.00	123.00
Increase feed and supplies on hand	.....	782.00	.....
Increase other resources on hand	.....	1,025.00	558.50
Total	$27,446.48	$28,517.10	$20,694.09
EXPENSES			
Live stock bought	$8,424.40	$11,668.49	$5,850.30
Feed bought	499.00	769.00	848.13
Other live stock expense	148.00	285.00	165.08
Labor	1,294.00	1,505.00	1,448.47
Seed	523.00	427.00	324.96
Other crop expenses	646.00	322.00	66.47
Building and fence repairs	25.00	697.00	168.25
Miscellaneous expenses	1,173.00	516.00	1,263.86
Taxes and insurance	1,748.00	1,608.00	1,554.65
Decrease live stock on hand	701.00	.....	.....
Decrease feed and supplies on hand	381.00	.....	616.38
Decrease other resources on hand	356.00	.....	.....
Total	$15,918.40	$17,797.49	$12,306.55
Excess receipts over expenses	$11,528.08	$10,719.61	$8,387.54

Details of Organization.—The production of crops and live stock on this farm and the disposition of them are shown in Table V.

TABLE V-A—Crops Grown.

	1922			1923			1924		
	Acres	Yield Per Acre	Production	Acres	Yield Per Acre	Production	Acres	Yield Per Acre	Production
Corn	47	39.1 Bu.	1,840 Bu.	44	53.2 Bu.	2,340 Bu.	48.0	40.2 Bu.	1,928 Bu.
Wheat	126	14.6 Bu.	1,835 Bu.	64	21.4 Bu.	1,368 Bu.	64.0	19.0 Bu.	1,219 Bu.
Hay	38	1.5 T.	57 T.	38	1.7 T.	64 T.	38.0	1.2 T.	46 T.
Tobacco (tenant's)	32	1411.1 Lbs.	45,154 Lbs.	34	1,293.9 Lbs.	43,994 Lbs.	26.6	1,220.2 Lbs.	32,456 Lbs.
Tobacco (operator's)	....	.....	.....	....	.....	.....	3.8	1,186.8 Lbs.	4,510 Lbs.
Barley	13	14.6 Bu.	190 Bu.	....	.....	.....	.....	.....	.....
Oats	20	Failed	.....	....	.....	.....	.....	.....	.....
Sorghum silage	....	.....	.....	9	22.2 T.	200 T.	9.0	13.3 T.	120 T.
Corn silage	14	13.6 T.	190 T.	....	.....	.....	.....	.....	.....
Bluegrass	223*	6.9 Bu.	1,528 Bu.	194*	8.1 Bu.	1,575 Bu.	212.0‡	8.0 Bu.	**1,700 Bu.
Orchard grass	36*	10.3 Bu.	370 Bu.	68†	.....	Pastured	160.0	.....	Pastured
Clover pasture	....	.....	.....	108	.....	Pastured	.....	.....	.....
To tenants	14	.....	.....	8	.....	.....	14.0	.....	.....
Yard and lawn	6	.....	.....	6	.....	.....	6.0	.....	.....
Waste (roads, lots, etc.)	17	.....	.....	13	.....	.....	4.6	.....	.....

*Stript for seed and pastured.
†Pastured only.
‡Only 200 acres stript.
**This is on green seed basis; seed was sold before curing.

TABLE V-B.—Disposition of Crops, 1922.

	Total Production	Amount Fed	Amount Sold	Amount Bought	Decrease on Hand	Increase on Hand
Wheat	1,835 Bu.	85 Bu. (Seed)	1,750 Bu.	.....	.....	.....
Straw	108 T.	14 T.	88 T.	.....	.....	6 T.
Mixed hay	57 T.	19.5 T.	39.5 T.	2 T.	.....	.....
Oat hay	.....	8 T.	.....	.....	8 T.	.....
Tobacco (Tenant's)	45,154 Lbs.*	.....	45,154 Lbs.*	.....	.....	.....
Corn	1,720 Bu.†	2,141 Bu.	.....	325 Bu.	96 Bu.	.....
Barley	190 Bu.	190 Bu.	.....	.....	.....	.....
B. G. seed	1,528 Bu.	.....	1,528 Bu.	.....	.....	.....
Corn silage	190 T.	125 T.				65 T.

Disposition of Crops, 1923

	Total Production	Amount Fed	Amount Sold	Amount Bought	Decrease on Hand	Increase on Hand
Wheat	1,368 Bu.	90 Bu. (Seed)	1,278 Bu.	.....	.....	.....
Straw	37 T.	13.5 T.	21.5 Bu.	.....	.....	2 T.
Mixed hay	64 T.	10.5 T.	81 T.	.....	27.5 T.	.....
Tobacco T.	43,994 Lbs.*	.....	43,994 Lbs.*	.....	.....	.....
Corn	2,340 Bu.†	1,815 Bu.	.....	875 Bu.	.....	1,400 Bu.
B. G. seed	1,575 Bu.	.....	1,575 Bu.	.....	.....	.....
Corn or sorghum silage	200 T.	190 T.				10 T.

*Total tobacco production includes tenant's part.
†Does not include tenant's part.

Corn or sorghum silage.....	200 T.	100 T.				

*Total tobacco production includes tenant's part.
†Does not include tenant's part.

Disposition of Crops, 1924

	Total Production	Amount Fed	Amount Sold	Amount Bought	Decrease on Hand	Increase on Hand
Wheat	1,219 Bu.	96 Bu. Sown	1,123 Bu.	.....	.....	.....
Straw	53.6	15 T.	46.6 T.	.....	8 T.	.....
Hay	46 T.	18 T.	50 T.	7.18 T.	14.82	.....
Tobacco	4,510 Lbs.	.....	4,510 Lbs.	.....	.....	.....
Tobacco (Tenant's)	32,456 Lbs.*	.....	32,456 Lbs.*	.....	.....	.....
B. G. seed	1,700 Bu.	.....	1,700 Bu.	.....	.....	.....
Corn (cut and shock)	1,370 Bu.	6 Bu. Seed 1,907 Bu.	.....	293 Bu.	250 Bu.	.....
Corn hogged	558 Bu.	558 Bu.	.....	.....	.....	.....
Sorghum silage	120	200			80	

*Total tobacco production includes tenant's part.

TABLE V-C.—Crop Sales.

	1922		1923		1924	
	Amount	Value	Amount	Value	Amount	Value
Tobacco	----------	----------	----------	----------	4,510 Lbs.	$936.20
Tobacco (Tenant's)	22,577 Lbs.*	$6,819.75	21,997 Lbs.*	$5,461.88	32,456 Lbs.*	3,571.06
Wheat	1,750 Bu.	2,012.65	1,278 Bu.	1,347.41	1,123 Bu.	1,419.81
Hay	39.5 T.	574.47	81 T.	1,108.67	50 T.	875.65
B. G. seed	1,528 Bu.	1,528.00	1,575 Bu.	1,829.06	1,700 Bu.	1,518.12
Straw	88 T.	531.38	21.5 T.	172.00	46.6 T.	608.81
Misc. crop receipts	370 Bu.†	373.27	----------	81.65‡	----------	----------
Total		$11,839.52		$10,000.67		$8,929.65

*Tenant's tobacco, includes operator's part only.
†Orchard grass seed.
‡Received for pasture rented out.

TABLE V-D.—Feed Consumed, 1922.

			Corn	C. S.	Mill	Mixed	Oat	Stock
Horses	4	Bu.	1,000	1,000	1,000	1,000	1,000	1,000
		Lbs.	4,000	4,000	4,000	4,000	4,000	4,000
		Value	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00
Mules	4	Bu.	1,000	1,000	1,000	1,000	1,000	1,000
		Lbs.	4,000	4,000	4,000	4,000	4,000	4,000
		Value	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00
Cattle	4	Bu.	1,000	1,000	1,000	1,000	1,000	1,000
		Lbs.	4,000	4,000	4,000	4,000	4,000	4,000
		Value	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00
Hogs	4	Bu.	1,000	1,000	1,000	1,000	1,000	1,000
		Lbs.	4,000	4,000	4,000	4,000	4,000	4,000
		Value	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00
Sheep	4	Bu.	1,000	1,000	1,000	1,000	1,000	1,000
		Lbs.	4,000	4,000	4,000	4,000	4,000	4,000
		Value	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00
Poultry	4	Bu.	1,000	1,000	1,000	1,000	1,000	1,000
		Lbs.	4,000	4,000	4,000	4,000	4,000	4,000
		Value	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00	$1,000.00
Total		Bu.	7,000	7,000	7,000	7,000	7,000	7,000
		Lbs.	28,000	28,000	28,000	28,000	28,000	28,000
		Value	$7,000.00	$7,000.00	$7,000.00	$7,000.00	$7,000.00	$7,000.00

TABLE V-D.—Feed Consumed, 1922.

	Corn Bu.	Barley Bu	Corn Silage Tons	C. S. Meal Tons	Mill Feed Tons	Mixed Hay Tons	Oat Hay Tons	Straw Tons
Beef cattle	.....	.....	125	2*	.....	.....	.....	9.75
Hogs	1,711	190	.....	.....	1*	.....	.....	.5
Work stock	417	.....	.....	.....	.....	11.8	7.25	2.25
Other horses	8	.....	.....	.....	.....	2.15	.75	1.5
Dairy cows	5	.....	.....	.....	.....	3.25	.....	.....
Sheep	.....	.....	.....	.....	.....	2.26	.....	.....
Total	2,141	190	125	2*	1*	19.46	8.00	14.00

*Bought

Feed Consumed, 1923

	Corn Bu.	Oats Bu.	Corn Silage Tons	C. S. Meal Tons	Mill Feed Tons	Hay Tons	Straw Tons	Stover Shocks
Beef cattle	250	.....	188	3*	.....	.....	11.0	100
Hogs	1,295	.....	.....	.....	1	.....	.2	.....
Work stock	237	50*	.....	.....	.....	7.25	1.6	.....
Other horses	11	.....	.....	.....	.....	.75	.2	.....
Dairy cows	12	.....	2	.....	.....	1.5	.5	.....
Sheep	.....	.....	.....	.....	.....	1.0	.....	.....
Poultry	10	.....	.....	.....	.....	.....	.....	.....
Total	1,815	50*	190	3*	1	10.5	13.5	100

*Bought

Feed Consumed, 1924

	Corn	Corn Hogged	Sorghum Silage	C. S. Meal	Mill Feed	Sheaf Oats	Mixed Hay	Straw	Stover
	Bu.	Bu.	Tons	Tons	Lbs.	Tons	Tons	Tons	Shocks
Beef cattle	756	.....	196	6	.....	.....	.....	11.5	360
Hogs	861	558	.....	.....	2,800	.....	.....	.....	.....
Sheep	.....	.....	2	.....	.....	.....	1	1.0	.....
Dairy cattle	10	.....	2	.....	.....	1	14.5	2.5	.....
Work stock	232	.....	.....	.....	.....	.....	2.5	.....	.....
Other horses	18	.....	.....	.....	.....	.....	.....	.....	.....
Poultry	30	.....	.....	.....	.....	.....	.....	.....	.....
Total	1,907	558	200	6	2,800	1	18.0	15.0	360

TABLE V-E.—Live Stock Sales and Purchases, 1922

Kind of Stock	Sales			Purchases		
	No.	Lbs.	Value	No.	Lbs.	Value
Dairy cows	.....	.....	.....	1	.....	$80.00
Beef cattle	117	77,975	$5,401.85	142	78,534	5,350.60
Ewes	14	1,400	98.00	.....	.....	.....
Lambs	184	13,845	1,926.40	.....	.....	.....
Wool	.....	1,108	531.96	.....	.....	.....
Hogs	252	43,241	4,230.75	66	7,930	713.80
Work stock	10	.....	1,690.00	10	.....	1,870.00
Other horses	5	.....	905.00	4	.....	410.00
Total	.....	.....	$14,783.96	.....	.....	$8,424.40

Increase in live stock on hand from January 1, 1922, to January 1, 1923; beef cattle, 25 head, 14,441 pounds, value $1,050; dairy cattle, 1 cow, value $80.00.

Decrease in live stock on hand from January 1, 1922, to January 1, 1923; work stock, 1 mule, value $50 (1 mule died); other horses, 1 horse, value $100; hogs, 101 pigs, weight 12,625 pounds, value $1,236; sheep, 45 ewes, value $390 (17 ewes died).

Used in home, 3 hogs, weight 900 pounds, value $90.

Live Stock Sales and Purchases, 1923

Kind of Stock	Sales			Purchases		
	No.	Lbs.	Value	No.	Lbs.	Value
Beef cattle	*118	111,779	$7,024.63	165	116,584	$6,675.44
Ewes	223	.....	2,156.00	259	.....	2,576.00
Lambs	150	10,200	1,177.42	.....	.....	.....
Wool	.....	950	521.60	.....	.....	.....
Hogs	250	42,128	2,978.53	149	21,201	1,272.05
Work stock	6	.....	1,218.25	5	.....	910.00
Other horses	3	.....	350.00	2	.....	235.00
Total	.....	.....	$15,426.43	.....	.....	$11,668.49

* Includes 10 veal calves.

Increase in live stock on hand January 1, 1923, to January 1, 1924; beef cattle, 57 head, 29,350 pounds, value $2,134.00.

Decrease in live stock on hand January 1, 1923, to January 1, 1924; work stock, 1 mule, value $150; other horses, 1 horse, value $100; hogs, 2,700 pounds, value $390; sheep, 20 head, increase with decrease in value of $250 (16 ewes died).

Used in home, 8 hogs, weight 2,000 pounds, value $140.

Live Stock Sales and Purchases, 1924

Kind of Stock	Sales			Purchases		
	No.	Lbs.	Value	No.	Lbs.	Value
Beef cattle	121	86,222	$5,541.27	70	46,375	$2,768.95
Old sheep	103	.....	938.00	151	.....	1,598.00
Lambs	75	5,165	670.15	.....	.....	.....
Wool	.....	600	300.00	.....	.....	.....
Hogs	200	30,310	2,439.62	93	9,879	748.35
Work stock	6	.....	1,010.40	6	.....	735.00
Other horses	.....	.....	.....	.....	.....	.....
Total	.....	.....	$10,899.44	.....	.....	$5,850.30

Increase in live stock on hand January 1, 1924, to January 1, 1925; sheep, 49 head, value $1,615.00.

Decrease in live stock on hand January 1, 1924, to January 1, 1925; beef cattle, 18,100 pounds, value $1,285.00; hogs, 1,150 pounds; decrease value $2.00; work stock decrease value, $220.00.

Used in home, hogs, 1,150 pounds, value $135.00.

TABLE V-F.—Live Stock Production.

Kind of Stock	1922		1923		1924	
	Lbs.	Value	Lbs.	Value	Lbs.	Value
Beef cattle	13,882	$1,101.25	24,545	$2,483.19	21,747	$1,487.32
Hogs	23,586	2,370.95	20,227	1,456.48	20,431	1,824.27
Lambs	13,845	1,926.40	10,200	1,177.42	5,165	670.15
Wool	1,108	531.96	950	521.60	600	300.00

SUGGESTED ORGANIZATION FOR A 400-ACRE BLUEGRASS FARM

A suggested organization for a 400-acre blugerass farm is shown in Table VI. The cropping system suggested provides for 30 acres of bluegrass sod to be plowed each year and 30 acres seeded each year. The land would be cultivated two years, seeded to small grain, clover and bluegrass. Enough clover would be cut to provide feed and the remainder pastured. This system would permit the bluegrass to remain from 7 to 8 years.

TABLE VI.—Suggested Organization for a 400-Acre Farm with Bluegrass as One of the Principal Crops.

Crops	Acres	Yield	Total Operator's Production
Operator's tobacco	10	1,200 Lbs.	12,000 Lbs.
Tenant's tobacco (grown for one-half)	10	1,200 Lbs.	6,000 Lbs.
Operator's corn	30	48 Bu.	1,440 Bu.
Tenant's corn (grown for one-half)	10	48 Bu.	240 Bu.
Small grain (pastured)	30		
Small grain (cover crop)	30*		
Rotation pasture (clover)	20		
Hay	10	1.5 T.	15 T.
Land to tenant and hired man	12		
Waste (land around house, lots, etc.)	10		
Non-tillable pasture	30		
Bluegrass, tillable	228	6 Bu.†	1,368 Bu.
Total	400		

*Acreage in cover crop not included in total.
†Six bushels per acre is considered relatively small yield, yet possibly only 175 to 200 acres could be stript annually.

Live Stock		Probable Production
	10 Ewes	1,000 Lbs.
60 Ewes	80 Lambs	6,000 Lbs.
3 Bucks	Wool	480 Lbs.
50 Steers (gain)*		15,000 Lbs.
5 Brood sows (35 pigs) @ 190		6,650 Lbs.
2 Dairy cows		Milk for home consumption
4 Work stock (operator's)		
Poultry.		

*Fifty 1,000-lb. steers bought in fall sold following summer or early fall weighing 1,300 lbs.

TABLE VII.—Approximate Feed Requirements for Live Stock.

Kind of Stock	Corn	Hay	Mixed Feed, Bran, Oats, etc.	C. S. M.	Tankage	Stover
Sheep and lambs..	20 Bu.	5 Tons	2,000 Lbs.	None	None	None
Hogs	400 Bu.	None	None	None	1,000 Lbs.	None
Steers	1,000 Bu.	None	None	6,000 Lbs.	None	All
Work stock	220 Bu.	7 Tons	None	None	None	None
Dairy cows	40 Bu.	3 Tons	1,000 Lbs.	None	None	None
Total	1,680 Bu.	15 Tons	3,000 Lbs.	6,000 Lbs.	1,000 Lbs.	

Disposition of Crops

Crops	Total Production	Amount Required For Feed	Salable Surplus
Tobacco*	18,000 Lbs.	None	18,000 Lbs.
Corn*	1,680 Bu.	1,680	None
Hay	15 Tons	15 Tons	None
B. G. seed	1,368	60 Bu. (Seed)	1,308

*This is the production of 15 acres of tobacco and 35 acres of corn, the tenant's part not being included.

The organization suggested provides for one hired man and one tobacco tenant. It is assumed that the tobacco tenant will grow 10 acres of tobacco and 10 acres of corn, furnishing the labor, teams and tools for these crops, for which he would get one-half of each. The yields suggested here are above average yields for central Kentucky, yet the cropping system proposed is one that would keep up fertility so that good yields could be obtained.

Many farmers with 400 acres plan to grow more than 20 acres of tobacco. If the tobacco acreage is increased the corn acreage must be decreased or a change made in the cropping system. If the first alternative is chosen corn must be bought or the live stock reduced. If the live stock is reduced the pasture will not be fully utilized. For most years possibly it would be desirable to buy the corn and fully utilize the pasture.

If the cropping system is changed so that the corn will be produced on the farm, more than 30 acres of bluegrass sod must be plowed each year or some of the land cropped with cultivated crops three consecutive years instead of two as suggested in the proposed organization. Of these alternatives possibly it would be desirable in most cases to use a second cover crop and cultivate some of the land the third year. The probable acreages of the different crops with 10 acres of tobacco substituted for 10 acres of corn and with 10 acres of tobacco and 5 acres of corn added are shown in Table VIII. The acreages of the crops suggested in the organization first proposed are shown again for comparison.

*This is the production of 15 acres of tobacco and 35 acres of corn, the tenant's part [illegible]

TABLE VIII.—Probable Acreage of Bluegrass and Other Crops with Different Acreages of Tobacco.

	Plan No. 1 20 Acres Tobacco	Plan No. 2 30 Acres Tobacco	Plan No. 3 30 Acres Tobacco
Tenant's tobacco	10	20	20
Operator's tobacco	10	10	10
Tenant's corn	10	20	20
Operator's corn	30	10	25
Small grain (pastured)	30	30	30
Small grain (cover crop)	30	30	45
Hay (clover)	10	10	10
Rotation pasture (clover)	20	20	20
Land to hired labor (house, lot, garden, etc.)	6	6	6
Land to tenant (house, lot, graden, etc.)	6	12	12
Non-tillable pasture	30	30	30
Waste (roads, building sites, etc.)	10	10	10
Total	172	178	193
Bluegrass, tillable	228	222	207
Total in farm	400	400	400
Available pasture	308	302	287

Plan No. 2 assumes that the farmer would buy the corn displaced by the increase in the tobacco acreage. Plan No. 3 assumes that 15 acres of the land would be seeded to a cover crop after the second cultivated crop had been harvested, and would be planted in corn the following year. Plans 2 and 3 both suggest that the added 10 acres of tobacco be grown by a tenant who would want 10 acres of corn along with the 10 acres of tobacco. A method of calculating the probable changes in the net income with plans 2 and 3 is shown in Table IX.

TABLE IX.—Probable Changes in Net Income by Using Plan 2 or Plan 3 Instead of Plan. 1.

	Plan No. 2*		Plan No. 3†	
Increase in receipts over Plan 1				
5,000 lbs. of tobbacco @ 18c	$900		$900	
Decrease in expenses over Plan 1				
Labor, seeding and stripping B. G.	3		20	
		$903		$920
Decrease in receipts over Plan 1				
Bluegrass seed	$60		$252	
Gains in steers‡	37		111	
Increase expenses over Plan 1				
Added corn bought	450			
Int., taxes, depreciation, upkeep on added tobacco barn, tenant house, etc.	300		300	
Increase seed costs			23	
		$847		$686
Differences		$56**		$234**

*This change is the substitution of 10 acres of tenant tobacco for 10 acres operator's corn.

†This change is the addition of 10 acres tobacco and 5 acres corn, thus increasing cultivated crops 15 acres.

‡With plan 2, 6 acres less pasture would be available and possibly one less steer should be kept or else the gain from pasture slightly reduced. With plan No. 3, 19 acres less pasture would be available and possibly about 3 fewer steers should be kept or else the gains from pasture proportionately reduced.

**Probable increase over plan No. 1.

In calculating the income from plan No. 1 it is assumed that the 20 acres of tobacco would yield 1,200 pounds per acre and a price of 20c per pound is suggested. With plans 2 and 3 it is assumed that the added 10 acres of tobacco would yield 1,000 pounds per acre and 18c per pound is suggested. By breaking 30 acres of bluegrass sod each year and planting only 20 acres of tobacco, the most desirable 20 acres could be selected for tobacco. However, by planting 30 acres of tobacco, all of the sod land would be planted in tobacco or some of the land planted in

tobacco the second year. With either practice it is not expected that the yield and quality of the added 10 acres would be equal to the yield and quality of the first 20 acres.

Plan No. 1 provides for 5% of the total farm area in tobacco when practically all the farm is tillable. With the yields and prices used in these calculations obviously the opportunities are not favorable for increasing the net income to any considerable extent by increasing the tobacco very much above 5% of the total farm area in a system in which bluegrass is made one of the principal crops. As the tobacco is increased above the 5% or 20 acres for a 400-acre farm corn must be bought or the land cropped more heavily. With tobacco at 20c per pound and corn at 90c per bushel the growing of tobacco for the purchase of corn is doubtful economy in the central bluegrass area. If a cropping system with a larger acreage of cultivated crop is followed eventually the crop yields will be reduced.

Sometimes a farmer feels that 40 acres is the most profitable acreage of tobacco for a 400-acre bluegrass farm. If he has a farm with a large acreage of old bluegrass the temptation to plant a large acreage in tobacco is often great. However, a greatly increased acreage of tobacco for one or two years usually will require added barns or added expense in hauling tobacco. A greatly increased acreage of tobacco for one or two years will mean less desirable land for tobacco in later years. The incentive must be great and the price outlook exceedingly favorable to overcome these added handicaps.

On the other hand it is possible that for many seasons 10 acres of tobacco would be the desirable acreage on a 400-acre farm. With an outlook for tobacco prices at around 15 cents per pound and yields around 1,000 pounds per acre it might be good practice to grow only 10 acres of tobacco instead of 20 acres on a farm of this size.

Possibly the decision between 20 and 30 acres of tobacco on a 400-acre farm can be made only after considering the present acreage of bluegrass, the tobacco price outlook for the following year and the kind of tobacco tenant obtainable. With a large part of the land in old sod, with a favorable outlook for tobacco

prices, and a good tenant, 30 acres of tobacco would likely be more profitable than 20 acres. However, with recent yields and prices it is doubtful if this practice would be profitable for any considerable period.

It is possible for a given year that on 400-acre farms in a given neighborhood one farmer would decide to grow 10 acres of tobacco, another 20 acres of tobacco and another 30 acres of tobacco and all be making the best decisions possible, in view of the variations in conditions on individual farms. The most desirable cropping system for one farmer and one farm is not necessarily the most desirable for another farmer or another farm. Yet all have much in common if considered for a period of years.

Many 400-acre farms in central Kentucky grow all the tobacco on the tenant-share basis. Especially is this true with the farms larger than 400 acres. With the tenant growing all the tobacco and an equal acreage in corn the operator's corn problem assumes a different aspect. With the tenant's corn going off the farm or to his individual stock the operator more often will find it to his advantage to buy corn.

The yields and production secured on the 586-acre farm for these years were higher for most products than those used in the proposed plan for the 400-acre organization. The prices of 1922, 1923 and 1924 were not considered unusually favorable for the staple products grown in central Kentucky.

It is intended that the proposed 400-acre organization suggest a desirable long-time combination of crops and live stock to plan for. The 586-acre organization suggests modifications that may better fit the resources and abilities of an individual farmer and the conditions at a particular time.

In this plan of organization staple enterprises which have proved to be well adapted to this region have been suggested. Some specialty live stock enterprises such as thoroughbred horses or retail dairying would in some cases give considerably higher net returns. However, an increase in the production of these specialities would affect prices more than a similar increase in the products suggested, also specialty enterprises are much

more dependent upon the special aptitudes and qualifications of the individual farm operator; hence their adoption would not be practical for any considerable part of the farmers of the section.

In planning a system of farming for central Kentucky it should be remembered that one of the individual farmer's most difficult problems is to find the most desirable combination of crops and live stock at a given time. Both bluegrass and tobacco usually are profitable crops, if handled properly, but they are most profitable only when grown with other crops, in the proper ratio. A long-time plan is desirable, but with any plan, modifications may be necessary from year to year. It is hoped that this bulletin will be suggestive in shaping the long-time plan and in reaching conclusions as to yearly modifications.

Kentucky

Agricultural Experiment Station

University of Kentucky

SOURCES OF ANIMAL PROTEIN FOR LAYING HENS

I. Varying percentages of meat scrap in the mash.

II. A comparison of sour skim-milk, condensed and dried buttermilk with meat scrap.

III. Grain supplements for skim-milk.

BULLETIN NO. 260.

Lexington, Ky., August, 1925

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SUMMARY

Part I

1. Meat scrap in the laying mash in any proportion from 5% to 20% is profitable for the production of eggs.
2. A mash containing 20% meat scrap will yield more eggs and more profit than one containing only 5%, 10% or 15% meat scrap.
3. Altho increasing the proportion of meat scrap in the mash increases the feed cost per hen, it also increases the egg yield, thereby decreasing the cost per dozen eggs.

Part II

1. A mash consisting of equal parts by weight of bran, shorts, ground oats and corn meal had no apparent effect in increasing egg production or profits.
2. One gallon of skim-milk had the same value for egg production as one pound of meat scrap.
3. When all the animal protein is supplied from skim-milk or condensed buttermilk, there is no advantage in feeding a dry mash containing ground grains and wheat by-products.
4. When breeding hens receive whole grain and run on a well sodded lot (green food) there is little difference in the hatchability of fertile eggs, whether meat scrap or skim-milk is the source of protein.
5. Both dried buttermilk and condensed buttermilk are efficient commercial sources of animal protein and are desirable for use when skim-milk or buttermilk is not available on the farm.

Part III

1. Shelled yellow corn and skim-milk (no mash) produce very satisfactory egg yields.
2. Wheat is a very desirable addition to the grain mixture if not too high in price.
3. Oats of a low quality (light oats less than 30 lbs. per bushel) increase the fiber in the grain ration and add little to its feed value.
4. It is not necessary to feed a dry mash to secure high egg yields and satisfactory profits if skim-milk is available as a source of protein.
5. Granulated buttermilk may be used to supplement the grain mixture (no mash fed) with very good egg yields, as is indicated by one year's results.
6. Maximum egg yields and greatest returns over feed cost were obtained (one year's data) when a mash containing 10% meat scrap was fed in addition to skim-milk to supplement the grain ration.

BULLETIN NO. 260.

Sources of Animal Protein for Laying Hens

By J. HOLMES MARTIN*

It is a well established fact that maximum egg yields cannot be secured when only the common grains and their by-products are used in the ration. That some source of protein in the form of a protein concentrate is necessary has been shown in previous experiments at this and other Experiment Stations. Tankage, meat scrap, skim-milk, buttermilk and the commercial forms of milk are the most readily available sources of animal protein for egg production.

Since protein concentrates are, with relation to grain prices, always high in price per pound, the question arising in the mind of the poultryman is to what extent can he afford to supplement his poultry ration with these concentrates. The question also arises as to which concentrate to use from among those readily available. It was to aid in answering these problems that the following series of experiments was run.

METHODS USED

All pens in these experiments consisted of March and early April hatched pullets, except in Pens 1A and 3A of Part II B. In this case yearling hens were used because results relative to the hatchability of the eggs were desired. All pens were housed in shed-roof houses of equal size and the same design, except Pens 1A and 3A of Part II B which were in similar half-monitor houses. All pens had the run of lots of equal size and well set in bluegrass sod. Grit and oyster shell were available in all

*The author is indebted to C. L. Morgan, graduate student, for his assistance in computing tables and determining the nutritive ratios.

pens at all times. Where mash was fed it was always available in a self-feeder. Each pen receiving skim-milk had it available at all times in a large open pan. Such pens received no drinking water. Fresh water was always available for the pens receiving no skim-milk. All pens received grain morning and evening in the straw litter.

Accurate trap-nest records were kept. By means of these records the eggs laid by any hens dying before the expiration of the first 10 months of the experimental year could be excluded from the average.* In other words the egg yields include only those laid by hens living thru the first 10 months of the experiment, or on to its conclusion. In computing average feed consumption, proper adjustment was made for the feed consumed by hens which died. Hens failing to lay as many as 10 eggs in any one month of their year were treated as abnormal individuals and their records excluded from the egg averages.**

In computing the nutritive ratios the figures for digestible nutrients given in Henry and Morrison's "Feed and Feeding" were used. Kaupp's digestive coefficient for meat scrap was used in computing its digestible nutrients. The chemical analysis of the meat scrap used was 50.7% crude protein.

Feed and Egg Prices: The prices of feeds used in the experiment are as follows:

TABLE 1.—PRICES OF THE FEEDS USED.

Corn	$0.84 per bu.
Oats	.52 per bu.
Wheat	1.20 per bu.
Shipstuff	29.00 per ton
Bran	28.00 per ton
Shorts	30.00 per ton
Ground oats	1.62 per cwt.
Corn meal	1.50 per cwt.
Meat scrap	80.00 per ton
Tankage	70.00 per ton
Granulated buttermilk	8.00 per cwt.
Condensed buttermilk	4.00 per cwt.
Skim-milk	.50 per cwt.

*The mortality in all pens was relatively low, averaging only 2 birds per pen (10 per cent) during the year for the Wyandottes.

**There were only five or six such individuals and their external characters indicated some internal oviduct trouble.

Egg prices used in computing tables were based on average retail prices of eggs in Lexington during the experiment. They are as follows:

TABLE 2.—PRICES OF EGGS.

November and December	60c per dozen
January	50c per dozen
February	48c per dozen
March thru August	30c per dozen
September	36c per dozen
October	42c per dozen

Part I.

VARYING PERCENTAGES OF MEAT SCRAP IN THE MASH

To determine the best proportion of meat scrap in the mash for laying hens a series of experiments in which four pens of birds were fed five, ten, fifteen and twenty per cent meat scrap in the mash was begun in November, 1918, and conducted for three successive years. The dates of the tests were as follows:

Series 1. November 1, 1918, to October 31, 1919.
Series 2. November 1, 1919, to October 31, 1920.
Series 3. November 1, 1920, to October 31, 1921.

Birds. The birds used in this experiment were White Wyandotte pullets hatched from the Kentucky Experiment Station flock. During the first test 15 birds per pen were used, while in the second and third tests 20 birds per pen were used.

Rations. The grain mixture for all pens was the same thruout the experiment and consisted of corn 70 parts and oats 30 parts. The mash fed the various pens was as follows:

TABLE 3.—COMPOSITION OF THE MASH.

	Pen No. 1	Pen No. 2	Pen No. 3	Pen No. 4
Shipstuff*	47.50 lbs.	45.00 lbs.	42.50 lbs.	40.00 lbs.
Corn meal	23.75 lbs.	22.50 lbs.	21.25 lbs.	20.00 lbs.
Ground oats	23.75 lbs.	22.50 lbs.	21.25 lbs.	20.00 lbs.
Meat scrap	5.00 lbs.	10.00 lbs.	15.00 lbs.	20.00 lbs.

*Essentially equal parts bran and shorts, but not separated at the mill.

In addition to the grain and mash, grit and oyster shell were available in hoppers for the birds at all times. Fresh drinking water was always available.

Results. The yearly egg production, both for the individual years and for the entire period, showed an increase in production with each increase in the amount of meat scrap in the mash. In winter production the results were not so uniform, but on the average, with the exception of the 15 per cent meat scrap pen, the greater amount of meat scrap produced the greater number of winter eggs. The following table shows the winter and yearly egg production per bird for each of the three tests:

TABLE 4.—EGG PRODUCTION PER HEN.

Mash	1918-1919		1919-1920		1920-1921		Ave. 3 Yrs.	
	Winter	Year	Winter	Year	Winter	Year	Winter	Year
5% meat scrap	25.0	118.1	20.5	116.9	18.8	93.3	21.2	108.7
10% meat scrap	29.7	141.6	27.1	129.1	28.4	110.3	28.3	125.5
15% meat scrap	33.6	148.7	26.6	138.3	25.3	116.6	27.9	133.3
20% meat scrap	37.4	157.8	24.7	142.1	31.1	137.0	30.8	145.5

It is interesting to note that the smallest differences in production were found between the 10 per cent meat scrap and the 15 per cent meat scrap pens. Between the 5 per cent meat scrap and the 20 per cent meat scrap pens the differences in winter and yearly production were quite marked.

The pens receiving 10 per cent, 15 per cent and 20 per cent meat scrap in the mash consumed more feed than did the 5 per cent meat scrap pen. The 20 per cent meat scrap pen consumed the greatest amount of grain in proportion to mash, while the 5 per cent meat scrap pen consumed the smallest amount of grain to mash. The 20 per cent meat scrap pen consumed slightly less feed than either the 10 per cent or the 15 per cent meat scrap pens. The nutritive ratio of the rations varied inversely in proportion to the amount of meat scrap in the mash. The following table shows the amounts of feed consumed:

TABLE 5—FEED CONSUMED PER HEN IN POUNDS, AND NUTRITIVE RATIO.

Mash	1918-1919			1919-1920			1920-1921			Ave 3 Yrs.		
	Grain	Mash	N. R.	Grain	Mash	N. R.	Grain	Mash	N. R.	Grain	Mash	N. R.
5% meat scrap	46.9	34.7	1:6.6	48.6	46.1	1:5.3	43.9	25.6	1:6.8	46.4	35.7	1:6.2
10% meat scrap	46.5	34.4	1:6.0	49.4	41.2	1:5.9	54.8	32.1	1:6.3	50.5	36.1	1:6.1
15% meat scrap	47.4	40.2	1:5.3	50.4	49.1	1:5.1	51.5	28.9	1:5.9	50.0	39.7	1:5.5
20% meat scrap	48.8	34.9	1:5.2	50.4	39.1	1:5.0	56.8	26.9	1:5.9	52.2	33.7	1:5.3

In comparing the costs and profits the 20 per cent meat scrap pen showed the greatest feed cost per bird but the least cost per dozen eggs and the greatest profit over feed cost (see Fig. 1). The 5 per cent meat scrap pen was fed at the lowest

Value of Eggs, Feed Cost, and Returns Over Feed Per Hen
When Varying Percentages of Meat Scrap are Fed
In The Mash

(White Wyandottes)

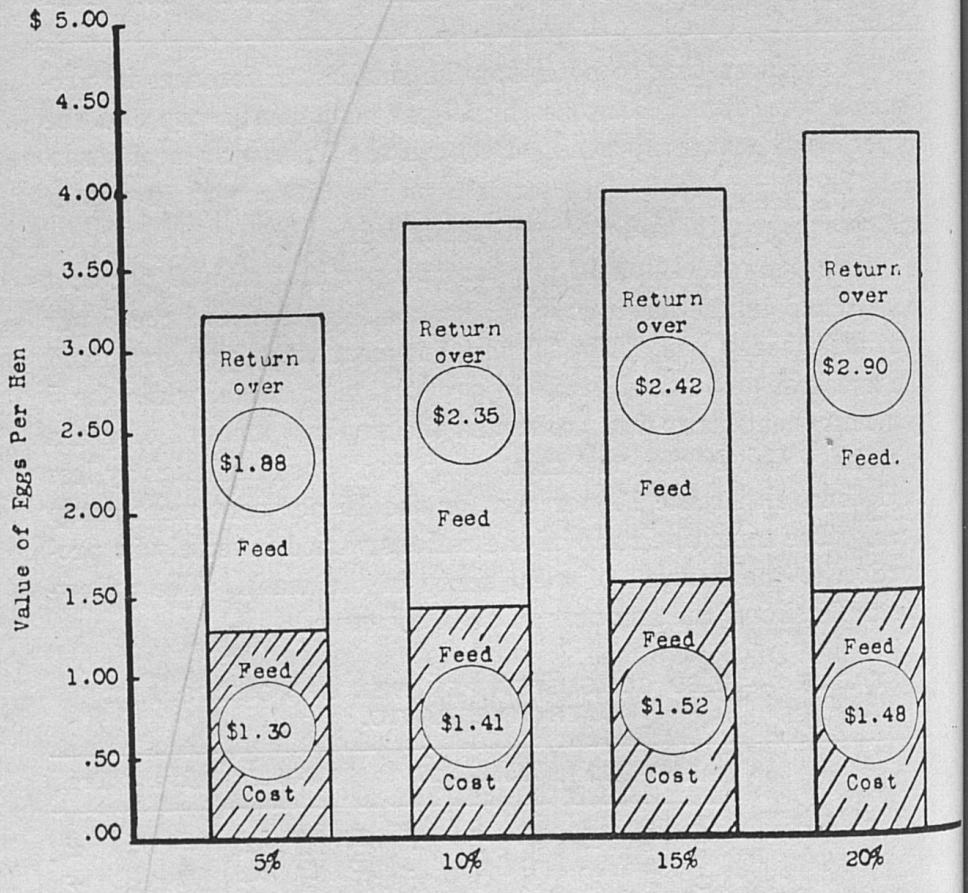

Fig. 1 Percentage of Meat Scrap in Mash.

cost per bird, but the cost per dozen eggs was the greatest and the profits over feed cost the least. The 10 per cent meat scrap and the 15 per cent meat scrap pens, in cost of feed, cost per

dozen eggs and profits over feed cost stood between the 5 per cent meat scrap and the 20 per cent meat scrap pens. In cost per dozen eggs there was scarcely any difference between the 10 per cent and 15 per cent pens but the 15 per cent pen showed the greater profit. The following table shows costs and profits:

TABLE 6.—COSTS AND PROFITS.

Mash	Cost of Feed Per Hen	No. Dozen Eggs	Cost of Eggs Per Doz.	Value of Eggs Per Hen	Profit Over Feed Cost
5% meat scrap	$1.30	9.06	14.3c	$3.18	$1.88
10% meat scrap	1.41	10.45	13.5c	3.76	2.35
15% meat scrap	1.52	11.10	13.6c	3.94	2.42
20% meat scrap	1.48	12.12	12.2c	4.38	2.90

From the standpoint of maintaining the weight of the birds all of the rations were satisfactory. In every trial except one the birds were heavier at the close of the test than at the beginning. The average of the weights thruout the experiment indicated good condition at all times. The following table shows the weights of the birds at the beginning of the test, at the close and an average of all weights taken during the test:

TABLE 7.—AVERAGE WEIGHTS OF HENS, POUNDS.

Mash	1918-1919			1919-1920			1920-1921		
	Begin	End	Ave.(4)	Begin	End	Ave.(5)	Begin	End	Ave.(4)
5% meat scrap....	4.2	4.5	4.5	3.1	4.1	3.9	4.4	4.5	4.5
10% meat scrap....	4.2	4.8	4.6	3.3	4.2	4.3	4.8	4.6	4.7
15% meat scrap....	4.2	4.9	4.7	3.4	4.2	4.3	4.2	4.4	4.5
20% meat scrap....	4.5	5.0	4.8	3.5	4.4	4.4	4.3	4.6	4.6

(5) Average of 5 weights. (4) Average of 4 weights.

Conclusion. Twenty per cent meat scrap in the mash produced both the greatest number of winter eggs and the greatest number of eggs yearly.

The number of eggs produced each year was in direct proportion to the amount of meat scrap in the mash.

As the percentage of meat scrap in the mash increases the cost of feeding a hen for one year tends to increase.

As the percentage of meat scrap in the mash is increased the gross return per hen increases.

The larger the percentage of meat scrap in the mash the greater the profit per hen over feed costs (up to 20%).

TABLE 8.—SUMMARY OF RESULTS.

Grain Plus	Eggs Per Hen		Feed Per Hen		Cost of Feed Per Hen	Cost of Eggs Per Dozen	Gross Return Per Hen	Profit Per Hen Over Feed
	Winter	Year	Grain	Mash				
Mash 5% meat scrap	21.2	108.7	46.4	35.7	$1.30	14.3c	$3.18	$1.88
Mash 10% meat scrap	28.3	125.5	50.5	36.1	1.41	13.5c	3.76	2.35
Mash 15% meat scrap	27.9	133.3	50.0	39.7	1.52	13.6c	3.94	2.42
Mash 20% meat scrap	30.8	145.5	52.2	33.7	1.48	12.2c	4.38	2.90

Part II A

A COMPARISON OF SOUR SKIM-MILK, CONDENSED AND DRIED BUTTERMILK WITH MEAT SCRAP.

Method of Experimentation. To compare the value of sour skim-milk and condensed buttermilk with meat scrap as supplements to a basic mash and to compare the same forms of milk as supplements to grain with no mash a series of tests was begun November 1, 1920, and continued for three years. On November 1, 1921 another pen was added to the test, in which dried buttermilk was used as a supplement to the basic mash. The dates of the tests were as follows:

Series 1. November 1, 1920, to October 31, 1921.
Series 2. November 1, 1921, to October 31, 1922.
Series 3. November 1, 1922, to October 31, 1923.

Stock. The birds used were White Wyandottes of the same breeding as used in Part I. Twenty birds were used in each pen.

Rations. The grain mixture for all pens thruout the experiment consisted of corn 70 parts and oats 30 parts. The various pens received in addition to grain the following mash and milk supplements:

TABLE 9.—FEEDS USED.

Feed	Pen 1	Pen 2	Pen 3	Pen 4	Pen 5	Pen 6
Bran	5 lbs.	5 lbs.	No	5 lbs.	No	5 lbs.
Shorts	5 lbs.	5 lbs.		5 lbs.		5 lbs.
Corn meal	5 lbs.	5 lbs.	Mash	5 lbs.	Mash	5 lbs.
Ground oats	5 lbs.	5 lbs.		5 lbs.		5 lbs.
Meat scrap	5 lbs.					
Dried buttermilk						8 lbs.
Skim-milk		Ad lib.	Ad lib.			
Condensed* buttermilk				1 lb. daily for 16-20 birds	1 lb. daily for 16-20 birds	

*Commonly sold as semi-solid buttermilk.

In addition to the rations stated above, grit and oyster shell were available for the birds, in hoppers, at all times. Fresh drinking water was continually before all birds except those receiving skim-milk in which pens no water was given. In the various mashes used equal amounts of protein were supplied by the protein concentrates. In the skim-milk and condensed buttermilk pens there was no opportunity for controlling the amount of protein the birds received.

Feeding. Mash, where used, was kept in hoppers before the birds at all times. Skim-milk, where used, was supplied *ad libitum* and no water was given. Condensed milk was fed at the rate of one pound daily to 16 to 20 hens, in the paste form, just as it came from the barrel. The grain was fed in the straw litter twice daily.

Results. A comparison of Pens 2 and 3 shows that the addition of the basic mash to a ration of grain and sour skim-milk had no apparent effect in increasing either winter or yearly egg production. In two out of three years the pen which did not receive the basic mash laid more winter eggs than the pen receiving the mash. On the basis of a three year average the pen receiving the basic mash produced 3.3 more winter eggs per hen, but 5.4 fewer eggs per pen for the year. It is evident then that the basic mash which was composed of equal parts of bran, shorts, ground oats and corn meal was of no apparent value in increasing winter or yearly egg production. A similar comparison of Pens 4 and 5 shows that the basic mash, when used to supplement a ration of grain and condensed buttermilk did not result in an increase in egg production. As a matter of fact the pen which did not receive basic mash produced on the average for the three years 2.4 more winter eggs per hen. On the basis of two full years the pen which did not receive the basic mash averaged 5.2 more eggs. Again it is quite evident that the addition of the basic mash to the ration of grain and condensed buttermilk was of no apparent value in increasing either winter or yearly egg production. The pen receiving the mash containing the dried buttermilk (on the basis of two years results) gave the largest number of eggs during both the winter and year. The

Per cent Egg Production

pen receiving a basic mash to which meat scrap was added stood last among the six pens in winter egg production (see Figs. 2 and 3). This is probably accounted for by the fact that the addition of milk to the ration of the pullets on November 1st tended to stimulate them into higher winter egg production. Altho the

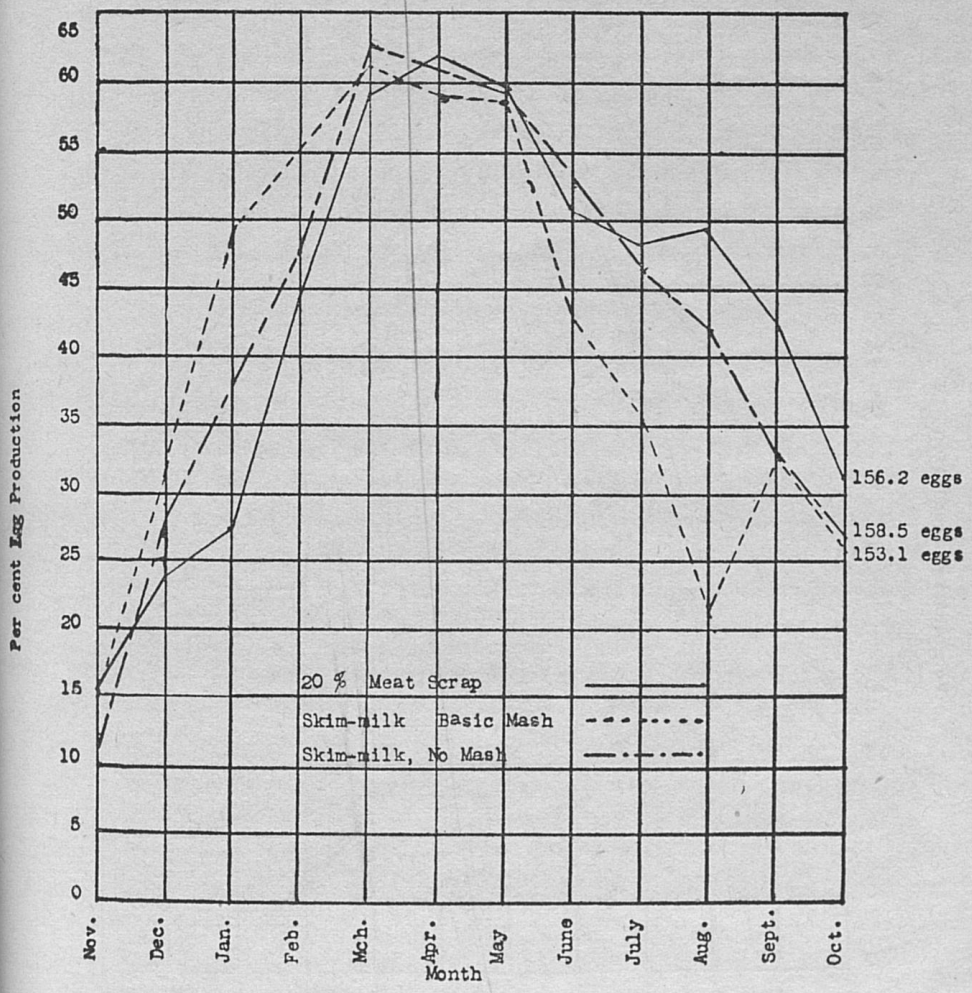

Fig. 2 Distribution of Egg Production in Skim-milk & Meat Scrap Pens.

meat scrap pen stood last on the basis of winter egg production, it stood fourth on the basis of yearly egg production, laying enough eggs during the spring and summer to surpass the skim-milk-mash pen (Pen 2) and the condensed buttermilk-mash pen (Pen 4). The following table shows the production per pen, both for the winter and for the year.

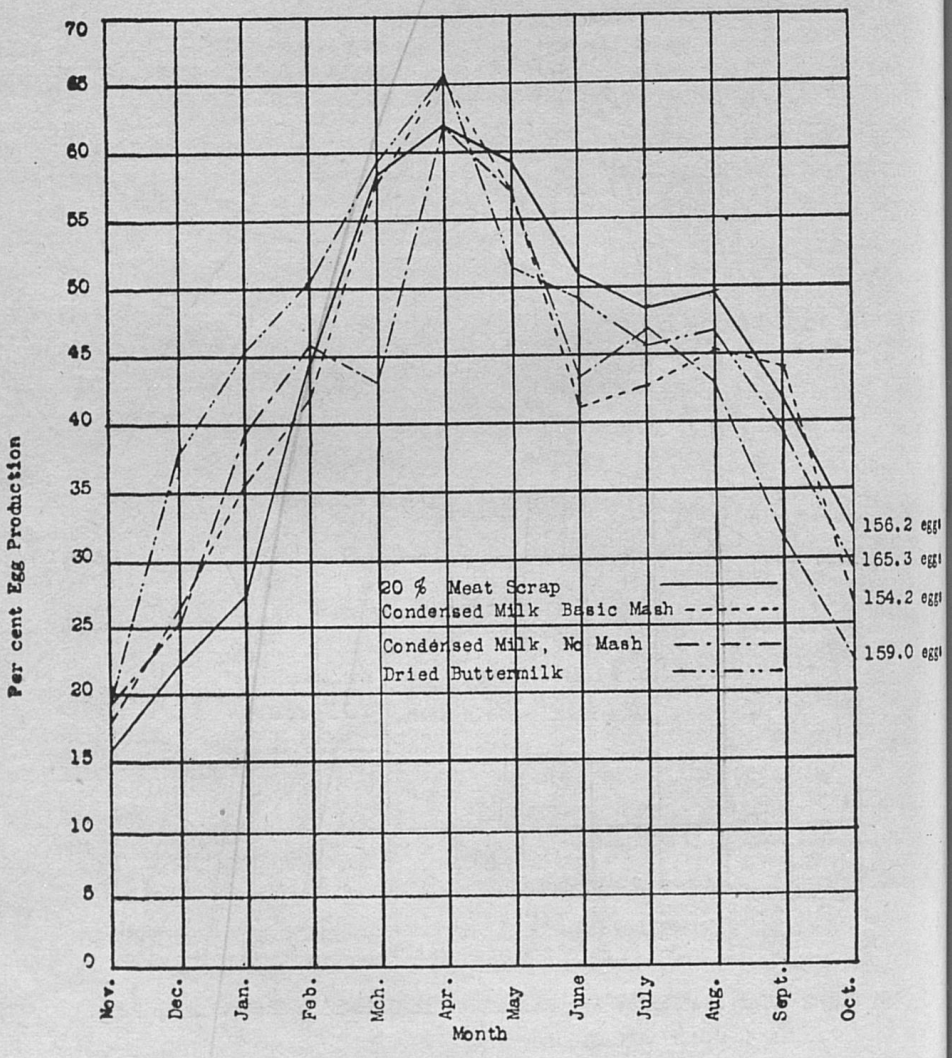

Fig. 3 Distribution of Egg Production in Condensed & Dried Buttermilk Pens.

TABLE 10.—EGG PRODUCTION PER HEN.

Pen	1920-21		1921-22		1922-23		Average	
	Winter	Year	Winter	Year	Winter	Year	Winter	Year
1	31.1	137.0	27.5	150.6	40.0	178.3	32.7	156.2
2	43.7	135.1	38.0	160.8	48.7	163.1	43.6	153.1
3	47.4	157.0	44.7	158.7	30.5	159.7	40.3	158.5
4	33.8	144.8	30.6	101.4*	45.0	163.3	36.4	154.2†
5	40.4	154.0	27.6	87.7*	48.6	164.0	38.8	159.4†
6			48.4	179.0	41.1	149.0	†45.3	165.3†

*8 months production. Due to an infestation of intestinal worms these pens were discontinued after 10 months.
†Two years average.

When skim milk and condensed milk are calculated on the basis of their milk solids and the feed consumption of the various pens compared, it will be noted that the pen receiving condensed buttermilk and no mash (Pen 5) consumed the smallest amount of feed per year and the pen receiving condensed butter-

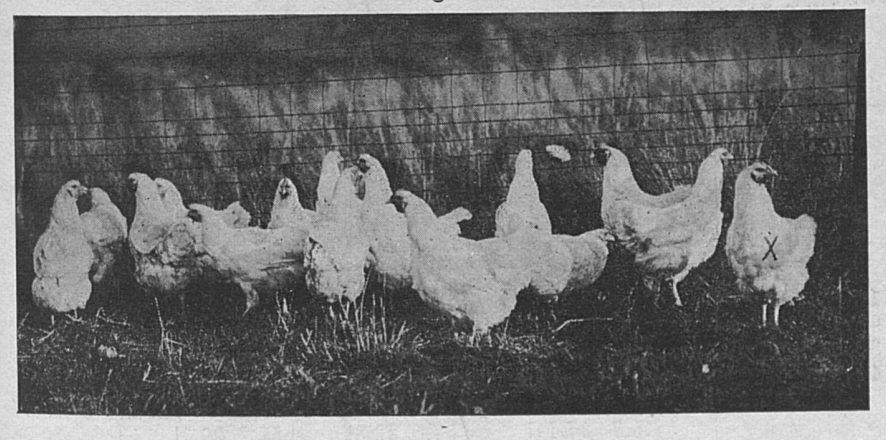

Fig. 4. Pen 5 (1921-1922) which averaged 154 eggs per hen. The bird marked X laid 242 eggs. This picture was taken immediately after the 12 months test.

milk mash (Pen 4) the largest amount of feed. A comparison of pens 2 and 3 shows that when no mash was fed the total feed consumed was 4.3 pounds less. A comparison of pens 4 and 5 likewise shows that when no mash was fed the total feed consumed

was 1.9 pounds less. In other words in both cases the addition of the basic mash increased the total feed consumption, when milk is calculated on the basis of its solids. That this same point was true with yearling hens is brought out in Table 18 of Part II B. The pens receiving skim-milk—no mash (Pen 3) and condensed buttermilk—no mash (Pen 5) consumed practically the

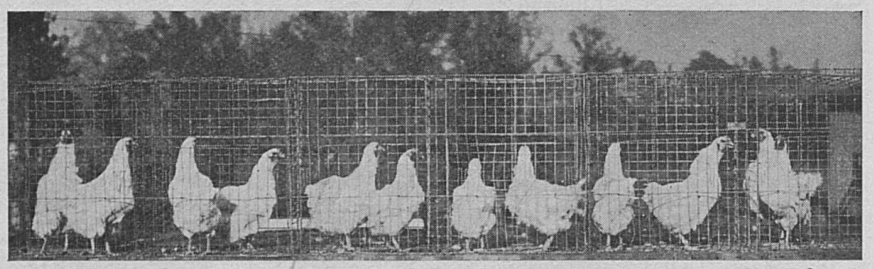

Fig. 5. Twelve hens from Pen 3A after 2 years on grain and skim-milk (no mash). The birds are arranged from left to right according to their total production for two years, the lowest producers on the left and the highest on the right.

same amount of grain. The following table shows the amounts of feed consumed by the various pens:

TABLE 11.—FEED CONSUMPTION PER HEN, POUNDS.

Pen	1920-21			1921-22			1922-23			Average			Total Feeds with Milk Solids†
	Grain	Mash	Milk	Grain	Mash	Milk	Grain	Mash	Milk	Grain	Mash	Milk	
1	56.8	26.9		48.1	34.4		44.7	32.7		49.9	31.0		80.9
2	47.0	18.9	73.4	53.3	14.4	98.9	46.4	25.1	89.0	48.9	19.5	87.1	77.1
3	60.0		92.6	63.8		94.4	68.4		75.4	64.1		87.5	72.8
4	51.5	17.8	24.1	46.1*	28.5*	17.6*	58.7	21.9	31.8	52.1	22.7	24.5	81.8
5	59.9		20.1	63.2*		14.7*	67.8		32.2	63.6		22.3	69.9
6				45.9	35.4		57.5	22.8		51.2	29.1		80.2

*Calculated for the year on the basis of consumption during 10 months of the test.

†Milk solids in skim-milk, taken from Feeds and Feeding.—Henry & Morrison. Solids in condensed milk, taken from U. S. D. A. Bulletin 1052.

The nutritive ratios of the feed consumed by the various pens are given in the table below. Those of the pens receiving

skim-milk and condensed buttermilk with no mash are the widest. Since these pens are relatively high in egg production it would indicate that milk protein was more available for egg production than the other proteins of the rations.

TABLE 12.—NUTRITIVE RATIOS OF FEED CONSUMED.

Pen	1920-21	1921-22	1922-23	Average
1	1:5.7	1:5.04	1:4.8	1:5.18
2	1:5.88	1:5.58	1:5.5	1:5.65
3	1:5.84	1:6.01	1:6.3	1:6.05
4	1:5.9	1:6.1	1:5.5	1:5.8
5	1:6.5	1:7.1	1:5.8	1:6.5
6		1:5.6	1:5.5	1:5.55

In considering the yearly feed costs per hen in the various pens the lowest feed cost was in the meat scrap-mash pen (Pen 1) closely followed by the skim-milk—no mash pen (Pen 3). The profits per hen over feed costs ranked in practically the opposite order from the costs of feed per hen (see Fig. 7.) From a comparison of Pens 1 and 3, when a value of 50 cents per hundred pounds (4.3 cents per gal.) is given to skim-milk, eggs are produced as cheaply as on a meat scrap ration with meat scrap at $4.00 per hundred pounds. Thus it would be fair to give skim-milk a value per gallon equal to the cost of one pound of meat scrap, for the feeding of laying hens.

TABLE 13.—COSTS AND RETURNS PER HEN.

Pen	Cost of Feed Per Hen	Cost of Eggs Per Dozen	Value of Eggs Per Hen	Returns Over Feed Cost Per Hen
1	$1.39	10.5c	$4.82	$3.43
2	1.49	12.0c	4.78	3.29
3	1.42	10.3c	4.84	3.42
4	2.13	17.1c	4.74 (2)	2.61
5	1.87	14.0c	4.94 (2)	3.07
6	1.78	13.0c	5.15 (2)	3.37

(2) 2 years' data only.

From a study of the weights of the birds all rations were satisfactory. All the birds were in good condition (note Fig. 4) thruout the experiment with the exception of Pens 4 and 5 for 1922-23, as already noted. The following table shows the weights of the birds at the beginning and the end of the tests and the average weights during the tests:

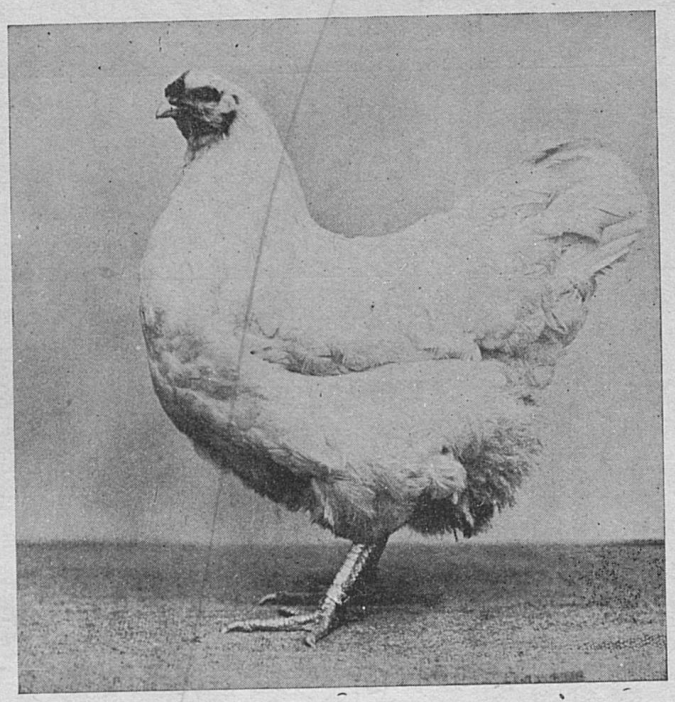

Fig. 6. A 200-egg White Wyandotte from Pen 3. This bird laid 173 eggs as a yearling on the same ration in Pen 3A.

TABLE 14.—WEIGHTS PER HEN, POUNDS.

Pen	1920-1			1921-22			1922-23		
	Begin	End	Ave.	Begin	End	Ave.	Begin	End	Ave.
1	4.3	4.7	4.8 (4)	3.5	4.6	4.6 (4)	4.5	5.0	4.9 (3)
2	4.5	4.6	4.7 (4)	3.8	5.3	4.8 (4)	3.9	4.7	4.4 (3)
3	4.2	4.3	4.7 (4)	3.3	4.7	4.6 (4)	4.4	5.0	4.8 (3)
4	3.6	4.5	4.6 (4)	4.5	.....	4.8 (2)	4.1	4.4	4.7 (3)
5	3.9	4.6	4.6 (4)	4.1	.....	4.5 (2)	3.9	4.3	4.3 (3)
6	.....	.....	.....	3.9	4.9	4.8 (3)	4.1	5.0	4.7 (3)

(2) 2 weights. (3) 3 weights. (4) 4 weights.

Value of Eggs, Feed Cost, and Return Over Feed Per Hen When Various Forms of Milk are Used to Supplement Grain With and Without Basic Mash.

(White Wyandottes)

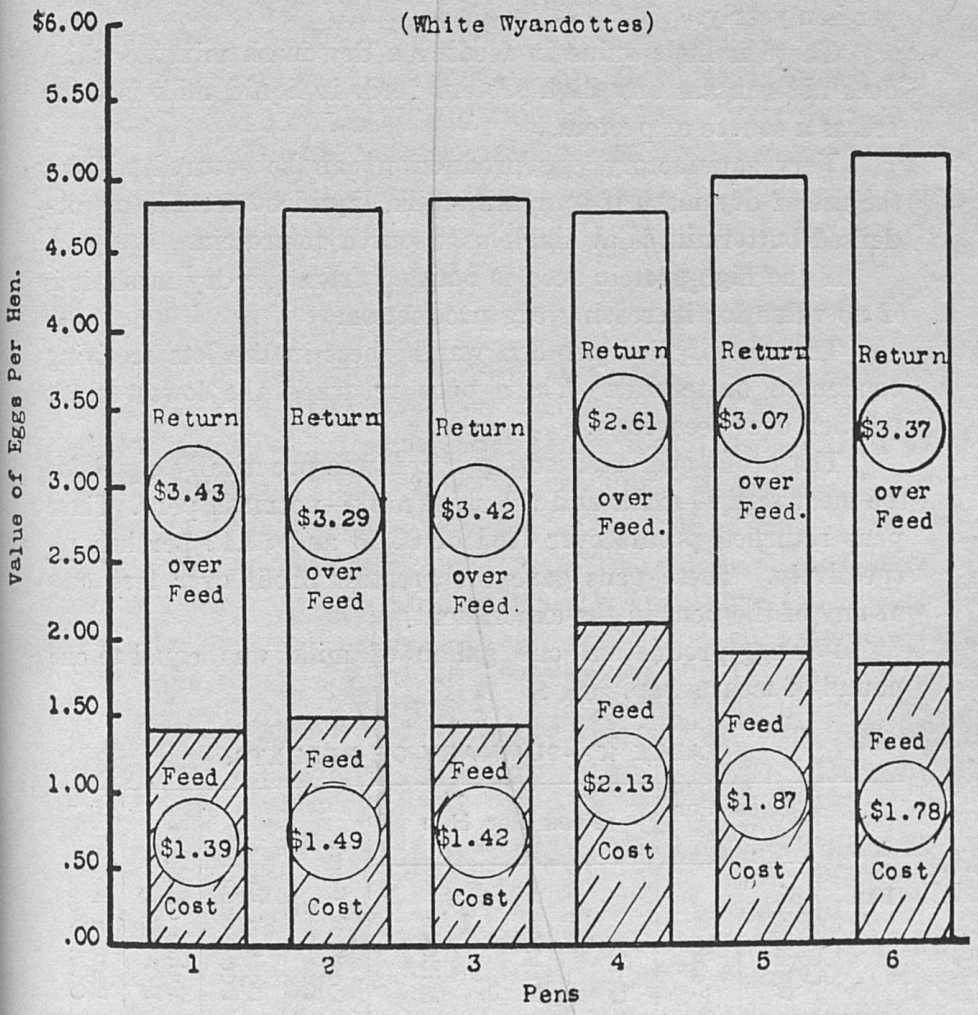

Fig. 7 Forms of Milk for Egg Production.

Pen 1 Grain + Basic Mash + Meat Scrap 20%.
" 2 Grain + Basic Mash + Skim-Milk ad libitum
" 3 Grain + Skim-Milk ad libitum
" 4 Grain + Basic Mash + Condensed Buttermilk
" 5 Grain + Condensed Buttermilk
" 6 Grain + Basic Mash + Dried Buttermilk.

Conclusions. All the rations fed were satisfactory for egg production.

The pen receiving basic mash with dried buttermilk gave the highest production on two years average, producing 165.3 eggs per hen yearly.

There is little value in feeding a dry mash mixture which does not contain any high-protein feed, if liquid milk is being fed as a source of protein.

Very satisfactory egg production can be secured without the use of dry mash if sour skim-milk, liquid buttermilk or condensed buttermilk is available as a source of protein.

If the high-protein feed is omitted from the dry mash, it is of no value for increasing egg production.

The cost of feed per hen was highest in the lots receiving condensed buttermilk. These pens returned the lowest profit per hen over feed costs.

The profit over feed cost per hen was practically equal for the meat scrap—mash and the skim milk—no mash pens. These pens returned profits over feed of $3.43 and $3.42 per hen respectively. These pens gave the greatest profit over feed cost of any of the pens in the experiment.

For egg production one gallon of milk was equal to one pound of meat scrap.

TABLE 15.—SUMMARY OF RESULTS.

Pen	Eggs Per Hen		Feed Per Hen			Cost of Feed Per Hen	Cost of Eggs Per Dozen	Value of Eggs Per Hen	Return Per Hen Over Feed
	Winter	Year	Grain	Mash	Milk				
1	32.7	156.2	49.9	31	.....	$1.39	10.5c	$4.82	$3.43
2	43.6	153.1	48.9	19.5	10.1 gal.	1.49	12.0c	4.78	3.29
3	40.3	158.5	64.1	.....	10.2 gal.	1.42	10.3c	4.84	3.42
4	36.4	154.2*	52.1	22.7	24.5 lbs.	2.13	17.1c	4.74*	2.61
5	38.8	159.0*	63.6	.....	22.3 lbs.	1.87	14.0c	4.94*	3.07
6	45.3*	165.3	51.2	29.1	.....	1.78	13.0c	5.15*	3.37

*Two years' average.

Part II B

HATCHABILITY AND EGG PRODUCTION OF YEARLINGS, WITH AND WITHOUT DRY MASH.

Method of Experimentation. In order to compare the rations used in Pens 1 and 3 of Part II A, 12 breeders from each pen were saved over from the previous year's experiments and continued on the same ration the second year. The dates of the tests of yearling hens were as follows:

Series 1. November 1, 1921, to October 31, 1922.
Series 2. November 1, 1922, to October 31, 1923.

Stock. The birds in Series 1 above were some of those in Series 1 of Part II A. Likewise the birds in Series 2 above were some of those in Series 2 of Part II A. Each pen consisted of the 12 highest record yearling hens remaining in the pens at the close of the pullet year. A White Wyandotte cockerel was kept in each pen thruout the experimental year. These males were alternated during the breeding season, when eggs were being saved for hatching, in order to eliminate any possible influence of the individual males.

Rations. The rations fed were identical with those received by the pens during their pullet year. Pen 1A received the same ration that it had received as Pen 1 the first year and Pen 3A received the same ration that it had received as Pen 3 the first year (see Table 9).

Results: In both winter and yearly egg production the yearlings agreed quite closely with the pullets. Altho the yearling production was, of course, not up to that of the pullet year, nevertheless, the same proportion held true in most cases. Table 16 shows that the yearlings receiving skim-milk held up slightly better in winter egg production, altho not laying quite as well during the entire year as those receiving the mash containing meat scrap.

TABLE 16.—EGG PRODUCTION PER HEN (YEARLINGS).

Pen	1921-22		1922-23		Average	
	Winter	Year	Winter	Year	Winter	Year
1A Mash with meat scrap	22.3	122	25.8	127	24	125
3A Skim-milk only	30.8	120	26	117.3	28	119

Since all the birds kept thru the second year were trap-nested, both as pullets and as yearlings, their egg production for each year may be compared. Table 17 shows that the pullets receiving skim-milk (no mash), altho laying better as pullets, showed a more decided drop than those receiving the meat scrap mash. A comparison of the total number of eggs laid by the birds kept thruout the entire two years, brings out that altho the birds on skim-milk showed more of a drop, they layed a larger number of eggs during the two years than the birds receiving the mash containing meat scrap (see Figs. 5 and 6).

TABLE 17.—COMPARISON OF PULLET AND YEARLING RECORDS

Pen	1921-22		1922-23		Total 2 Years	
	Pullet Year*	Second Year	Pullet Year*	Second Year	1921-22	1922-23
1A Mash	136	122	155.8	127	258	282.8
3A Skim-milk	156.7	120	166	117.3	276.7	283.3

*Actual trap nest records of hens saved over for second year.

The feed consumption for the yearling hens was slightly greater per hen on the average than for the same birds as pullets (compare tables 18 and 11). It is interesting to note, however, that the yearlings consumed an average of 67.4 pounds of skim-milk each, whereas the same pens, as pullets, averaged to consume 93.5 pounds each. The yearlings receiving dry mash averaged to consume 32.9 pounds each, whereas, the same pens as pullets averaged to consume 30.7 pounds each, which shows a slight increase in mash consumption in the yearling year.

TABLE 18.—FEED CONSUMPTION PER HEN.

Pen	1921-22			1922-23			Average		
	Grain Lbs.	Mash Lbs.	Milk Lbs.	Grain Lbs.	Mash Lbs.	Milk Lbs.	Grain Lbs.	Mash Lbs.	Milk
1A Mash	53.3	31.5	.....	56.3	34.4	.....	54.8	32.9	.....
3A Milk	70.6	.....	64.1	73.8	.....	70.8	72.2	.....	67.3

A comparison of the nutritive ratios of Pens 1A and 3A shows that the yearling hens receiving skim-milk (no mash) in each instance received a wider nutritive ratio than those receiving the mash containing meat scrap. Since the former pen produced more eggs, while at the same time receiving a smaller proportion of protein, the point previously made, namely, that milk protein is more available and digestible than meat scrap protein, is again borne out. A comparison of tables 12 and 19 shows relatively little difference between the nutritive ratios for the pullets and yearlings receiving the mash containing meat scrap (Pens 1 and 1A). However, it should be noted that the yearlings receiving the skim-milk (no mash) received a much wider nutritive ratio each year than the same pens did as pullets. This is, of course, due to the fact that they consumed less milk as yearlings and ate more grain the second year. A study of the weights of the yearlings in both pens shows that they remained in good condition thruout the experiment, the birds in the mash pen, however, attained about one-half pound greater maximum weight during the spring of the year than those in the milk pen.

TABLE 19.—NUTRITIVE RATIOS AND BODY WEIGHTS.

Pen	N. R. of Feed Consumed			Average Weights Pounds		
	1921-22	1922-23	Average	Start	Mid-Year	End
1A Mash ..	1:5.33	1:5.2	1:5.27	3.85	5.7	5.2
3A Milk ..	1:6.74	1:6.8	1:6.77	4.55	5.25	5.2

A comparison of the hatchability of the fertile eggs from Pens 1A and 3A shows that there is relatively little difference, if any, between the hatchability of eggs of yearling hens in the two pens. The eggs from each pen were set at the same time and in the same incubator. That more eggs were set from one pen than from the other is because one pen was laying better than the other during the hatching season. Before any eggs were selected for hatching the birds had been receiving the ration under consideration for the previous 16 months, that is, from November first of their pullet year until March first of their yearling year. Table 20 shows no significance in the distribution of embryo mortality before or after the 18th day. The term "dead germs" is used to designate those eggs in which the embryo started development, but died prior to the 18th day. The term "dead in shell" designates those eggs in which the embryo lived beyond the 18th day, but failed to hatch.

TABLE 20.—HATCHABILITY OF FERTILE EGGS.

	Fertile Eggs		Dead Germs		Dead in Shell		Chicks	
	Mash-Pen	Milk-Pen	Mash-Pen	Milk-Pen	Mash-Pen	Milk-Pen	Mash-Pen	Milk-Pen
1922	127	226	20	37	31	60	76	129
1923	125	93	19	15	37	27	69	51
Total	252	319	39	52	68	87	145	180

A percentage comparison of the hatchability of fertile eggs shows that eggs from the mash-fed pen hatched slightly better each year than those from the milk fed pen. However, the difference is so little in favor of the first pen, especially on a two-year average (1.1 per cent) that it may safely be stated that the eggs hatched equally well from one pen as from the other. From the percentages in Table 21 it may be concluded that continuous feeding of a ration of grain and skim-milk (no mash) has no

effect, either harmful or beneficial, on the hatchability of fertile eggs, as compared with the pens receiving grain and a mash containing 20 per cent meat scrap.

TABLE 21.—HATCHABLILITY OF FERTILE EGGS

	Mash Pen	Milk Pen
1922	59.8%	57.1%
1923	55.2%	54.8%
Two years	57.5%	56.4%

Conclusions: Yearling hens on a ration consisting of grain and skim-milk (no mash) produced more winter eggs, but slightly fewer eggs during the entire year, than the hens receiving a mash containing 20 per cent meat scrap.

Yearling hens receiving grain and skim-milk showed more of a drop from their pullet to yearling production than the birds receiving the mash containing meat scrap. However, the former produced more eggs as pullets and during the two years.

When sour skim-milk was fed in place of a dry mash, no apparent effect was noticed on the hatchability of fertile eggs.

Part III.

GRAIN SUPPLEMENTS FOR SKIM-MILK.

Method of Experimentation. To compare the value of corn alone, corn and oats, corn and wheat, and corn oats and wheat as grain mixtures for laying hens, when supplemented with skim-milk, a series of tests was begun November 1, 1922. These tests have been conducted for two years,* which dates are as follows:

Series 1. November 1, 1922, to October 31, 1923.
Series 2. November 1, 1923, to October 31, 1924.

During the second year two more pens were added in which corn and wheat were fed as the grain, with granulated buttermilk** as the supplement, in one pen, and a 10 per cent tankage mash plus skim-milk as the supplement, in the other pen.

Stock. The birds used in these tests were Barred Plymouth Rocks hatched from the flocks at the poultry farm of the Experiment Station. Twenty pullets were used in each pen.

Rations. The rations for the various pens were as follows:

TABLE 22.—FEEDS USED.

Pens	Grain	Supplement
14	Corn alone (shelled)	Sour skim-milk
15	Corn 70%, Oats 30%	Sour skim-milk
16	Corn 70%, Wheat 30%	Sour skim-milk
17	Corn 60%, Oats 20%, Wheat 20%	Sour skim-milk
18	Corn 70%, Wheat 30%	Granulated buttermilk
19	Corn 70%, Wheat 30%	Mash: Bran 40%, Shorts 40%, Corn meal 10%, Tankage 10%; Skim-milk.

Grit and oyster shell were kept before all pens at all times. Drinking-water was furnished to the pen receiving granulated buttermilk (Pen 18).

*The third year of the series is now under way.

**The granulated buttermilk used was obtained from the Collis Products Co., Clinton, Iowa. It is of the same composition as the powdered buttermilk but of a granular form, the granules being slightly smaller than wheat grains.

Feeding. Sour skim-milk was fed *ad libitum* in all lots where it was used. No water was given to the pens receiving skim-milk. Granulated buttermilk was fed at the rate of one pound daily to 20 hens. The mash in Pen 19 was hopper fed and kept before the birds at all times.

Results. In egg production the pens receiving wheat in the grain ration produced the largest number of eggs during both the winter and the year. The highest producing pen (both for the winter and year) receiving skim-milk alone as a supplement was the one receiving corn and wheat for grain (Pen 16). A comparison of Pen 15, which received oats in addition to the shelled corn, with Pen 14, which received only the shelled corn, shows that in winter egg production the pen receiving shelled corn and oats outlayed the other pen in both cases. However, a comparison of the yearly egg production shows that the corn pen laid better the first year than the pen receiving corn and oats, whereas the second year the corn and oats pen outlayed the pen receiving only shelled corn. Better results were secured with oats the second year because the oats used were of a better grade (heavier) than those used the first year. A comparison of pens 16 and 17 shows that the addition of oats to a grain mixture of corn and wheat resulted the first year in a decrease of winter egg production, again probably due to the poor quality of oats. The second year there was practically no difference between these two pens during either the winter or yearly egg production, again bearing out the point that when oats of a good quality were used better results were secured. On the basis of one year's results, a grain ration of corn and wheat supplemented with granulated buttermilk gave the greatest winter production but did not equal in yearly production the other pens receiving wheat in the grain mixture. One year's data showed that a grain mixture of corn and wheat when supplemented with a 10 per cent tankage mash and skim-milk gave the greatest yearly production and good winter production. The following table shows the winter and yearly production per hen:

TABLE 23.—EGG PRODUCTION PER HEN.

Pen	1922-23		1923-24		Average	
	Winter	Year	Winter	Year	Winter	Year
14	60.6	183.1	29.5*	143.3	50	159
15	63.7	165.2	50.7	161.1	56	164
16	76.5	180.9	54.5	168.0	66	178
17	66.5	185.3	54.1	166.7	61	175
18	.....	.....	67.6	167.8	68	168
19	.....	.....	58.7	196.7	59	197

*An epidemic of pox in this pen cut down the November and December production.

In feed consumption, comparing the four pens receiving skim-milk alone as a supplement, the pens receiving wheat as a part of the grain, required less total pounds of feed, when computing the skim-milk as reduced to the basis of milk solids. Oats added to corn as the grain ration increased the total pounds of feed consumed, no doubt due to the higher fiber content of oats. Pen 19 (one year's data) receiving corn and wheat in the grain ration with a 10 per cent tankage mash plus skim-milk required the same number of pounds of feed as the corn-oats-skim-milk pen. The granulated buttermilk pen (one year's data) consumed practically the same amount of feed (milk calculated as solids) as the pen receiving skim-milk, when the same grain ration was fed. The following table shows the feed consumed by the various pens:

TABLE 24.—FEED CONSUMED PER HEN.

Pen	1922-23			1923-24			Average			Total Feeds Including Milk Solids, Lbs.
	Grain, Lbs.	Mash	Milk, Gal.	Grain, Lbs.	Mash	Milk, Gal.	Grain, Lbs.	Mash	Milk, Gal.	
14	70.3	.....	12.8	71.6	.....	14.6	71.0	.....	14	79.9
15	75.4	.....	13.1	74.2	.....	18.3	75.0	.....	16	85.2
16	73.0	.....	13.9	66.7	.....	14.4	70.0	.....	14	78.9
17	72.6	.....	12.3	62.8	.....	17.0	68.0	.....	15	77.5
18	.....	.....	.....	64.2	.....	14.9	64.0	.....	*15	77.9
19	.....	.....	.....	59.2	16.2	16.1	59.0	.....	16	85.2

*Lbs. of granulated buttermilk.

From a study of feed consumed, it is noted that the nutritive ratios of the pens receiving skim-milk alone were practically

the same. The granulated buttermilk pen (pen 18) showed the widest nutritive ratio, while the 10 per cent tankage mash-skim-milk pen (pen 19) had the narrowest nutritive ratio. The following table shows the nutritive ratios calculated on the basis of the feed consumed:

TABLE 25.—NUTRITIVE RATIOS.

Pens	1922-23	1923-24	Average
14	1:6.5	1:5.4	1:5.9
15	1:5.9	1:5.2	1:5.5
16	1:6.1	1:5.7	1:5.9
17	1:5.9	1:5.1	1:5.5
18	.....	1:6.2	1:6.2
19	.....	1:3.6	1:3.6

The feed costs per hen showed that for the four pens receiving skim-milk as the only supplement, the rations containing oats were the most expensive to feed. These same pens also returned the smallest profit per hen over feed cost. The greatest profit per hen over feed costs (see Fig. 9) was from the pen fed corn and wheat as the grain ration. This pen also ranked second in low cost of feeding a hen for one year. The greatest profit was obtained from Pen 19 (one year's data) using a 10 per cent tankage mash and skim-milk to supplement a grain ration of corn and wheat. The pen receiving granulated buttermilk (one year's data) as a supplement to corn and wheat showed the greatest feed cost and the smallest profit over feed cost per hen. The following table shows the value of eggs per hen, cost of feeds per hen, cost per dozen eggs and return or profit over feed cost per hen:

TABLE 26.—COSTS AND RETURNS PER HEN.

Pen	Cost of Feed	Cost of Eggs Per Doz.	Value of Eggs	Profit Over Feed
14	$1.67	12.2c	$5.27	$3.60
15	1.83	13.4c	5.36	3.53
16	1.76	12.6c	5.79	4.03
17	2.14	11.9c	5.72	3.58
18	2.18	16.1c	5.64	3.46
19	1.94	11.2c	6.24	4.30

The weights of the birds show that all rations were quite satisfactory. In all pens the birds gained in weight thruout the experiment (see Fig. 8). The following table shows the weights at the beginning and at the end and the average of weights during the test:

TABLE 27.—WEIGHT OF HENS, POUNDS.

Pen	1922-23			1923-24		
	Begin	End	Ave. (3)	Begin	End	Ave. (3)
14	4.9	5.9	5.5	4.9	6.3	5.7
15	4.8	5.8	5.6	4.8	6.5	5.8
16	5.0	5.7	5.7	4.3	5.6	5.2
17	4.6	5.7	5.3	4.4	5.6	5.3
18				4.9	6.1	5.7
19				4.6	5.7	5.4

(3) Average of 3 weights.

Conclusions. Corn alone with skim-milk was a satisfactory ration for egg production.

Wheat in rations for laying hens reduced the amount of feed consumed (calculating milk on the basis of its solids) and returned a profit over feed cost, in comparable pens, equal to or greater than that of pens receiving no wheat.

Oats in the grain ration for laying hens increased feed costs and reduced the profits over feed cost per hen. This was strikingly brought out in the case of oats of low quality.

Granulated buttermilk (one year's data) increased the cost of feeding a hen per year and did not show as much profit over feed cost as skim-milk.

A 10 per cent tankage mash plus skim-milk (one year's data) furnished the most profitable supplement for a grain mixture of corn and wheat.

A balanced ration is not necessarily a complicated ration, since very satisfactory egg yields can be secured from a ration consisting of shelled corn, sour skim-milk and oyster shell.

Plymouth Rocks receiving only shelled corn for grain and no mash, but with sour skim-milk always available continue in production thruout most of the year and do not tend to get overfat.

A ration containing in addition to the grain mixture, a mash (10% tankage) and all the milk that the flock will consume, will give maximum results.



Fig. 8. Thirteen hens from Pen 14 which were saved over as breeders. This picture was taken the week after they had completed the year's record on corn and skim-milk. The entire pen averaged 183 eggs per hen.

TABLE 28.—SUMMARY OF RESULTS.

Pen	Eggs Per Hen		Feed Per Hen			Cost of Feed Per Hen	Cost of Eggs Per Dozen	Value of Eggs Per Hen	Profits Per Hen Over Feed
	Winter	Year	Grain	Mash	Milk				
14	50	165	71.0	.....	14 gal.	$1.67	12.2c	$5.27	$3.60
15	56	166	75.0	.....	16 gal.	1.83	13.4c	5.36	3.53
16	66	177	70.0	.....	14 gal.	1.76	12.6c	5.79	4.03
17	61	175	68.6	.....	15 gal.	2.14	11.9c	5.72	3.58
18	68(1)	168(1)	64.0	.....	15 gal.	2.18	16.1c	5.64	3.46
19	59(1)	197(1)	59.0	16	16 gal.	1.94	11.2c	6.24	4.30

(1) One year of results.

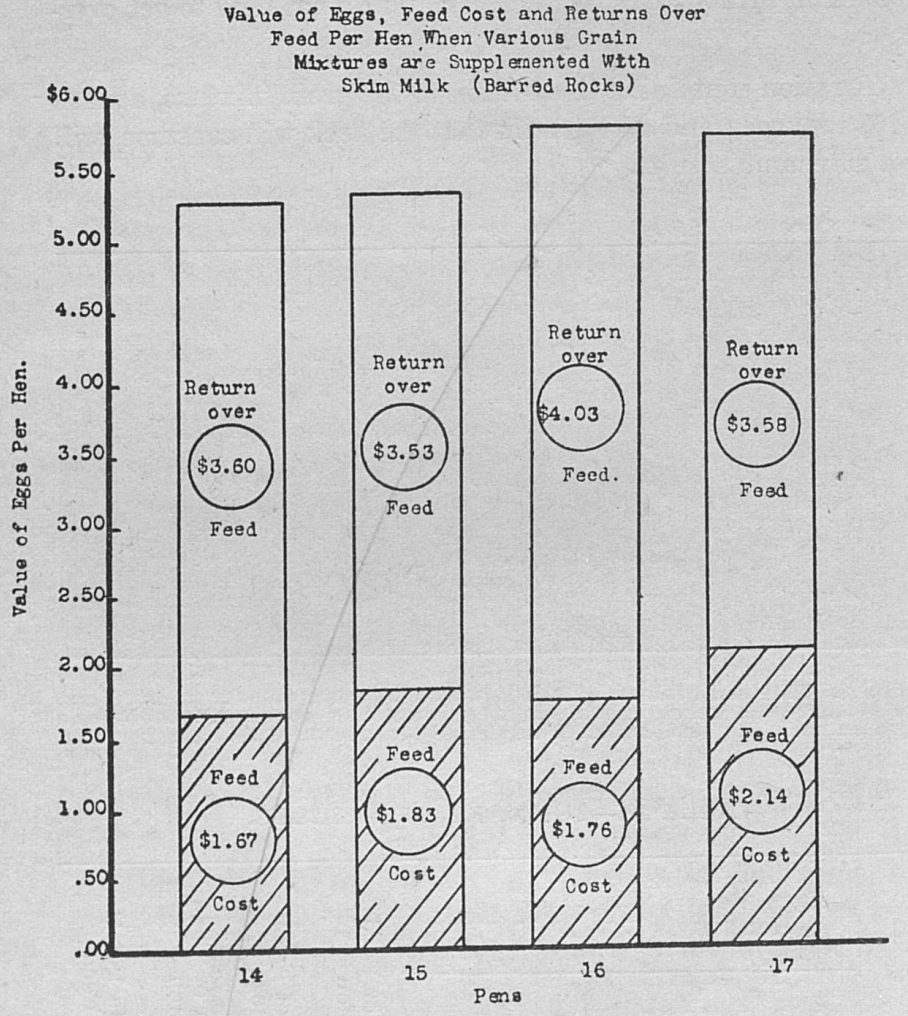

Fig. 9 Grain Mixtures for Egg Production.

Pen 14 Grain + Corn Alone + Skim-Milk Ad Libitum
Pen 15 Grain + Corn 70% Oats 30% + Skim-Milk Ad Libitum
Pen 16 Grain + Corn 70% Wheat 30% + Skim-Milk Ad Libitum
Pen 17 Grain + Corn 60% Oats 20% Wheat 20% + Skim-Milk Ad Libitum

Kentucky

Agricultural Experiment Station

University of Kentucky

An Economic Study of 270 Farms in Union and Henderson Counties

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BULLETIN NO. 261



Lexington, Ky.

November, 1925

(133)

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J. R. Smyth, Acting in chg., Poultry
J. W. Nutter, Dairyman
Amanda Harms, Asst. Path. Bact.
Harold Barber, Head Herdsman
W. W. Dimock, Head, Vet. Science
Philip Edwards, Asst. Bacteriologist
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A. M. Peter, Head
S. D. Averitt, Chemist
O. M. Shedd, Chemist
G. D. Buckner, Chemist
J. S. McHargue, Chemist
W. D. Iler, Asst. Chemist
D. J. Healy, Bact.

CREAMERY LICENSE SECTION

J. D. Foster, Inspector in charge.

ENTOMOLOGY AND BOTANY

H. Garman, Head
Mary L. Didlake, Asst. Entomologist
H. H. Jewett, Research Asst. Entgst.
Carrie Lee Hathaway, Seed Analyst
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FARM ECONOMICS

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O. B. Jesness, Chief, Sec. Markets
Dana G. Card, Asst. Marketing
W. G. Finn, Farm Management
Thomas Baird, Farm Management
E. C. Johnson, Asst. in Marketing
J. W. Jones, Asst. in Marketing. In co-op. with U. S. Dept. of Agr.
**Z. L. Galloway

FEED CONTROL

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H. D. Spears, Chemist
W. G. Terrell, Inspector
Fred Fitschen, Inspector

FERTILIZER CONTROL

H. E. Curtis, Head
Harry Allen, Chemist
Lelah Gault, Asst. Chemist
Robert Mathews, Inspector

HOME ECONOMICS

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HORTICULTURE

C. W. Mathews, Head
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C. S. Waltman, Asst.

PUBLIC SERVICE LABORATORY

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A. L. Meader, Asst. Chemist
James H. Martin, Asst. Chemist
E. K. Borman, Asst. Bacteriologist

ROBINSON SUBSTATION
(Quicksand, Ky.)

R. W. Jones, Superintendent
C. H. Burrage, Forester
Lula Hale, Field worker

WESTERN KENTUCKY SUBSTATION
(Princeton, Ky.)

S. J. Lowry, Superintendent

SUMMARY.

This report presents the results of a study of 270 farms which was made in the summer of 1924. These farms were located in Union County and the adjoining section of Western Henderson County. The period covered was the farm year of 1923 and the study included an analysis of the capital investment, crop acreage, and live stock, farm receipts, expenses and net income of each operator. The survey method was used in the study and the records were gotten by men who were technically trained in agriculture and accounting and who had a thoro practical knowledge of farming.

The chief purpose of the study was to find out the most important factors which determined the profitableness of farming in this section and to make this information available to farmers in the large area of which the region is typical, so that they may use the data for checking and modifying their farm business organizations to secure more profitable results.

A significant point brought out by the investigation is the great difference in the net earnings of farmers operating in this territory. The net earnings of the 270 farmers averaged $465, while those of the best twelve farmers averaged $3,058.

The net earnings included the value of garden products, dairy products, and poultry products, meat, meal, wood and other perquisites furnished by the farm for family use. The average value of these perquisites was $332 per farm.

The average capital investment per farm, including the dwelling house, was $17,270. Excluding the dwelling house, the capital investment was $15,234.

The average farm receipts were $2,995 per farm. This figure included the cropper's share of the tobacco and other crops raised on shares. The average expenses were $1,616 per farm. This included the value of the cropper's share of crops charged as cropper labor, and also depreciation on buildings and machinery, decrease in inventories of feeds and supplies, and unpaid family labor.

The factors which exerted the greatest influence on farm profits were:

1. Efficient labor utilization as measured by total labor accomplished per man.
2. Control of expenses and low cost of production as measured by the ratio of expenses per $100 receipts.
3. Volume of sales per 100 acres.
4. Good crop yields.
5. Good returns from live stock, as measured by returns from live stock per dollar's worth of feed fed.

BULLETIN NO. 261

An Economic Study of 270 Farms in Union and Henderson Counties

W. D. NICHOLLS*

CONDITIONS IN THE REGION STUDIED.

Union County and Western Henderson County occupy one of the best agricultural areas in Western Kentucky. The area is located in the western coal measures and lies about midway between the Green and Cumberland Rivers. It is bordered on the north and west by the Ohio River which, with its tributary streams, drains the territory.

This is one of the oldest settled regions in Western Kentucky, the first permanent settlement having been made about 1805. Most of the earliest settlers came from Virginia and North Carolina. Originally the land was occupied by dense forests and the first settlers located on the uplands and ridges. The lowlands and bottoms were occupied by swamps and bogs. Stock raising early became an important industry, hogs and cattle being the most profitable of all the live stock. By the year 1850 wheat had become an important farm crop in the region.

Besides the agricultural interests of the region there are extensive coal mines which employ large numbers of laborers. Because of the influence of the mines on wages they are a disturbing element in the farm labor situation.

The principal towns of the immediate territory studied are Morganfield, with a population of 2,725, Sturgis, with a population of 1,467, and Uniontown, with a population of 1,356. Henderson, a city of 11,452 population, is located twenty-four

*Acknowledgment is due Mr. L. C. Brewer, county agricultural agent of Union County, for valuable assistance and co-operation in securing the field data upon which this report is based; to Messrs. R. H. Lickert and N. C. Shiver for work done in securing the records, and to Mr. H. R. Brown for efficient work in securing the field records and tabulating the data.

miles northeast of the territory and Evansville, thirty-six miles northeast. The latter city furnishes the chief market for live stock and grain, while Henderson is the principal market for tobacco. The Evansville and Hopkinsville branch of the Illinois Central Railroad traverses the region. There are but a few miles of hard surfaced roads in the region studied but plans have been perfected to add very considerably to the mileage of improved roads.

The U. S. Bureau of Soils names the Miami Silt Loam, the Waverly Silt Loam, and the Yazoo Clay as the three most extensive soil types of the region.

About two-thirds of the entire area is occupied by the Miami Silt Loam which is known locally as "the uplands". This soil varies from almost level in some places to hilly in other places. It is six to twelve inches in depth and is well drained, but its texture is such as to cause it to wash badly on the steep slopes. Wheat, corn, grass, and tobacco are largely grown on this type of soil and give good yields. In normal seasons corn produces about 35 bushels per acre and in good seasons 50 bushels per acre, the normal yield of wheat is 18 to 20 bushels per acre and of tobacco 1,100 to 1,200 pounds. Orchard fruits also do well on this soil.

The Waverly Silt Loam, or "black bottom soil" occupies about 11 per cent of the region, mainly in the level country southward from the Pond Fork Creek and the eastern section along the broad bottom lands of Highland and Casey Creeks. This soil is a highly fertile black silt loam twelve to fifteen inches in depth and is underlaid by a black clay loam subsoil. Much of it requires underdrainage. Practically all crops grown in the region do well on this type of soil. Corn averages 60 bushels per acre, wheat 20 bushels and tobacco 1,300 pounds. Grass also grows well on it.

The Yazoo Clay occupies about 10½ per cent of the area and is mostly bottom land stretching along the Ohio River. Because of the liability of this to overflow it is planted almost exclusively to corn, a normal yield of which is about 45 bushels per acre and 60 to 75 bushels in favorable seasons.

NET EARNINGS OF FARM OPERATORS.

The net earnings of each of the 270 farm operators were determined. This figure indicates the net return obtained by each operator for his labor and management during the year and is regarded as an index of his efficiency as a farmer. A summary of investments, receipts, expenses and net earnings of all the operators is shown in Table 1. The table also shows a comparison of these factors on the average farm and the twelve most profitable farms. The latter had a 50.6 per cent greater capital investment, 122.5 per cent greater farm receipts and 37.9 per cent greater farm expenses than the average. Their net earnings were $3,058 as compared with $465 for the average operator.

Table 1. SUMMARY OF BUSINESS ANALYSIS OF 270 FARMS AND OF THE BEST 12 FARMS.

	Average of 270 farms	Average of best 12 farms
Farm investment (operator's dwelling not included)	$15,234	$22,954
Farm receipts*	2,995	6,665
Farm expenses	1,616	2,230
Net receipts (line 3 subtracted from line 2)	1,379	4,435
Interest on farm investment, at 6 per cent	914	1,377
Farmers' net earnings for labor and management (line 5 subtracted from line 4)	465	3,058
Value of food and other perquisites furnished by farm for the family living	299	331

CAPITAL INVESTMENT.

An analysis of capital investment of the farms is shown in Table 2.

*Includes value of perquisites furnished by the farm for the family living.

Table 2. DISTRIBUTION OF CAPITAL INVESTMENT.

	Average of 270 farms	Per acre	Per cent of total investment
Investment in land	$10,796	$53.5	62.5
Investment in dwelling	2,036	10.1	11.8
Investment in other buildings	1,814	9.0	10.5
Investment in machinery	533	2.6	3.1
Investment in live stock	1,293	6.4	7.5
Investment in feed and supplies	798	4.0	4.6
Total investment	17,270	85.6	100.0
Total business investment†	15,234	75.5	88.2

It will be noted that land represented 62½ per cent of the total investment, the dwelling house nearly 12 per cent, other buildings 10½ per cent, machinery 3.1 per cent, live stock 7.5 per cent, feed and supplies 4.6 per cent.

FARM RECEIPTS.

Farm receipts are classified in Table 3 according to their sources. Of the total receipts crops furnished 42.34 per cent, live stock 33.88 per cent, other items 6.4 per cent, increase in feed and supplies 7.4 per cent.

Sales of corn amounted to $401 or 13.37 per cent of the total receipts; hay, $169 or 5.64 per cent; wheat, $218 or 7.29 per cent; tobacco, $427 or 14.28 per cent; other crops, $53 or 1.77 per cent: dairy products and dairy stock, $152 or 5.09 per cent; beef cattle, $237 or 7.92 per cent; sheep, $24 or .81 per cent; hogs, $515 or 17.2 per cent; poultry $99 or 3.31 per cent.

Receipts of $191.49 from other sources consisted of cash rent, wood, lumber and miscellaneous items.

†Total investment minus dwelling.

Table 3. DISTRIBUTION OF RECEIPTS.

	Average	Per cent of total receipts
Crops	$1,268.34	42.34
Live stock	1014.67	33.88
Other sources	191.49	6.40
Increase in feed and supplies	221.73	7.40
Value of things furnished by the farm to the family	299.00	9.98
Total receipts	2,995.23	100.00
Receipts:		
Corn	$400.54	13.37
Hay	169.06	5.64
Wheat	218.22	7.29
Tobacco	427.43	14.27
Other crops	53.09	1.77
Cows	152.49	5.09
Cattle	237.35	7.92
Sheep	24.38	.81
Hogs	514.87	17.20
Poultry	99.32	3.32
Other live stock	1.57	.05
Value of products furnished family	299.00	9.98
Horses*	—15.31	—.51
Other receipts	413.22	13.80

THE VALUE OF PRODUCTS FURNISHED BY THE FARM FOR THE FAMILY LIVING.

Table 4 shows the value of products furnished by the farm to the family living. On the 270 farms it will be noted that the meat used had an average farm value of $119; milk, cream, butter and eggs, $117; vegetables, fruit, potatoes and wheat, $63; and wood, approximately, $1.

Table 4. VALUE OF PRODUCTS FURNISHED BY THE FARM FOR THE FAMILY USE.

Butter	$42.77	
Butter fat and cream	25.20	
Milk	25.31	
Eggs	23.36	
Total live stock products		$116.64

*Loss.

Wheat	$ 1.39	
Potatoes	2.92	
Fruit	9.80	
Garden and vegetables	48.56	
Total crops		$62.67
Hogs	81.52	
Poultry	36.30	
Other meat	1.33	
Total meats		$119.15
Wood		.93

FARM EXPENSES.

Farm expenses, in the order of their importance, consisted of current expenses, cropper labor, depreciation on buildings and machinery, unpaid family labor, decreased inventories of feed and supplies, and decreased inventories of live stock. The amounts of these expenses and the relation of each to the total expenses are shown in Table 5.

Table 5. DISTRIBUTION OF EXPENSES.

	Amount of total	Per cent of total
Current expenses	$910.76	56.34
Cropper labor	303.47	18.77
Depreciation on buildings, fences and machinery	159.83	9.89
Unpaid family labor	146.85	9.08
Decrease in feed and supplies	94.03	5.82
Decrease in live stock	1.57	.10
Total expense	$1,616.51	100.00

CURRENT EXPENSES.

The distribution of current expenses is shown in Table 6. The largest items were hired labor which represents 29 per cent of the total current expenses, taxes 19 per cent, purchased feeds, 15 per cent, and seeds about 6 per cent. A study of Tables 5 and 6 may be suggestive to farmers as to points wherein they may reduce costs.

Table 6. DISTRIBUTION OF CURRENT EXPENSES.

	Amount of total	Per cent of total
Hired labor	$262.23	28.79
Board and rations	13.03	1.43
Machinery repairs	4.37	.48
Tenant house repairs	1.24	.14
Other repairs	3.15	.35
Drain and terrace repairs	10.06	1.10
Fence repairs	10.50	1.15
Feed: roughage	29.54	3.24
Feed: grain	108.00	11.86
Pasture	1.81	.20
Silo filling	2.05	.23
Horse shoeing	11.91	1.31
Veterinary, etc.	11.71	1.29
Breeding fees	2.05	.23
Registry fees	.59	.06
Seeds	52.67	5.78
Fertilizer W. land	18.43	2.02
Fertilizer Cr. land	1.10	.12
Spray material	3.83	.42
Twine	4.51	.50
Threshing	26.13	2.87
Baling and wire	30.89	3.38
Other machine work hired	.93	.10
Fuel and oil for farm use	21.05	2.31
Auto for farm use	26.16	2.87
Telephone	9.56	1.05
Bags, crates, etc.	2.59	.28
Insurance (other)	39.83	4.37
Taxes	173.79	19.08
Farm Bureau dues	4.07	.45
Other current expenses	22.98	2.53
Total current expenses	$910.76	100.00

CASH AND NON-CASH RECEIPTS AND EXPENSES.

Of the $2,995 classed as total receipts certain items did not represent actual cash. These were: Increased inventories, $308; "sales" of tenants' crops, $295; "sales" of landlords' crops, $75; and other non-cash receipts, $0.50; making a total of $678 and leaving $2,317 in cash receipts. (See Table 7.)

Likewise, not all the $1,616 classified as total expenses consisted of actual cash items. The non-cash items consisted of cropper labor, $303; decreased inventories, $276; unpaid family labor, $147; depreciation on other buildings, $54; depreciation on machinery, $53; depreciation on fences, $54; making a total of $888 of non-cash expenses. This leaves $728 of expenses represented by cash items.

Table 7. NON-CASH RECEIPTS AND EXPENSES.

Non-Cash Receipts		
Increase in inventories	$308.24	
"Sales" of tenant crops	294.63	
"Sales" of landlord crops	75.06	
Other non-cash receipts	.50	
Total non-cash receipts		$678.43
Non-Cash Expenses		
Cropper labor	$303.47	
Decrease inventories	276.17	
Unpaid family labor	146.84	
Depreciation (other buildings)	53.61	
Depreciation (machinery)	53.25	
Depreciation (fences)	54.39	
Total non-cash expenses		$887.73

DISTRIBUTION OF FARM ACREAGE.

Table 8 shows the distribution of total farm land in crops, pasture and waste. A little more than half of the acreage was in crops and a little more than half the crop land was in corn. The acreage of wheat was about one-third that of corn, and of hay about two-fifths that of corn.

Table 8. DISTRIBUTION OF FARM ACREAGE.

Acres in crops		109.15
Acres in corn	57.80	
Acres in wheat	18.83	
Acres in hay	22.68	
Acres in tobacco	3.89	

Acres in oats	3.70	
Acres in rye	.71	
Acres in sorghum	.05	
Acres in orchard	1.00	
Acres in garden	.49	
Acres in pasture		82.31
Acres in waste		10.45
Total acres		201.91

LIVE STOCK.

There was a total of 29.45 live stock units* on the average farm. The most important class of live stock was hogs of which there were almost exactly seven units. There were about six units of mature dairy stock and two units of young dairy stock, 5.1 units of beef cattle, 1.1 units of poultry, and 7.3 units of horse stock.

PRICES DURING THE PERIOD STUDIED.

The average farm prices of feeds and grains were as follows: Corn, 80 cents per bushel; oats, 60 cents per bushel; wheat, $1.10 per bushel; loose hay, $15.00 per ton; baled hay, $18.00 per ton; fodder, 20 cents per shock; bran, $40.00 per ton; cotton seed meal, $48.00 per ton.

The average prices for live stock on farms of the section were: Fat cattle, $7.50 per hundredweight; stock cattle, $7.00 per hundredweight; calves, $6.25 per hundredweight; fat hogs, $7.00 per hundredweight; stock hogs, $5.50 to $6.00 per hundredweight.

The average farm price of butter was 40 cents per pound; eggs, 25 cents to 35 cents per dozen; whole milk, 20 cents per gallon.

FACTORS INFLUENCING PROFITS.

It has been shown that the net earnings of the most efficient twelve farmers were more than six and a half times those of

*A live stock unit or animal unit is the equivalent of a 1000-pound animal. It is represented by 1 cow or horse, 5 hogs, 7 sheep or 100 hens.

the average of all the farmers whose business was analyzed. In an attempt to find the causes of this great difference in earnings the farm records were classified on the basis of factors which might cause differences in profits.

INFLUENCE OF EFFICIENCY OF LABOR ON PROFITS.

To determine the efficiency of labor it was necessary to reduce to a common unit of labor requirements the crops grown, the live stock cared for, and other work performed. The unit commonly used in economic studies is the "work unit" which represents approximately a ten-hour day. The term "productive work unit"* is applied to work on crops and stock which contributes to the total sales of the farm. Work done in caring for work stock and other work which does not contribute to the direct income or sales of the farm is not included in computing the total productive work units.

The total productive labor performed on each farm was converted into productive work units, which figure was divided by the figure representing the "man equivalent" for the farm during the year. This gave the number of productive work units accomplished per man for each farm. The average number of productive work units for all farms was approximately 219, and on the best twelve farms, 264.

The marked influence of high productivity of farm workers is shown in Table 9. The 67 operators who accomplished the least work per man made upon an average but $196 for their year's labor and management. The next higher group made $456, the next higher $493 and the next higher $633. The group of 53 operators who secured the highest labor accomplishment per man made the highest net earnings, $656, as compared with $196 made by farmers of the lowest labor efficiency group.

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*A full discussion of the method of computing total work units is given in Kentucky Station Bulletin 253, Pp. 47-48.

Table 9. INFLUENCE OF LABOR EFFICIENCY ON FARM PROFITS.

Productive work units per man (A work unit is approximately the equivalent of a 10-hour day).	Number of farms	Average productive work units per man	Net earnings
Under 169 work units	67	131	$196
169-211 units	49	190	456
211-253 units	62	230	493
253-295 units	39	272	633
Over 295 units	53	347	656

INFLUENCE OF CONTROL OF COSTS ON PROFITS.

The study showed that the amount of expenses incurred in relation to receipts exerted a very marked influence on farm profits in this area. Table 10 presents this relationship.

There were 55 farms whose average expenses were 21 cents per $1.00 of receipts. The operators of this group secured $1,182 as earnings for their year's work and management.

There were 51 farms with expenses averaging 37 cents per $1.00 of receipts. Their operators secured net earnings of $1,174 for the year. There were 55 operators who had farm expenses averaging 49 cents per $1.00 receipts. These made $716. There were 52 operators with expenses averaging 62 cents per $1.00 receipts and the average net earnings of these were $227.

The least efficient group in this classification spent an average of 93 cents for each $1.00 of receipts and the average operator of this group had net earnings of minus $862 for his year's work and management.

Table 10. INFLUENCE OF CONTROL OF COSTS ON FARM PROFITS.

Expenses per $1.00 of receipts	Number of farms	Average expenses per $1.00 receipts	Net earnings
Under 30 cents	55	21c	$1,182
30 cents to 43 cents	51	37c	1,147
43 cents to 56 cents	55	49c	716
56 cents to 69 cents	52	62c	227
Over 69 cents	57	93c	—862

INFLUENCE OF VOLUME OF RECEIPTS ON PROFITS.

Some of the farms in this study secured a large volume of receipts per 100 acres operated, others a very small volume of receipts. This factor had a large effect on their net earnings.

There were 23 operators whose receipts exceeded $2,350 per 100 acres operated. These had net earnings of $1,906.

There were 63 operators (the lowest group) whose receipts were less than $850 per 100 acres operated and the average net earnings of this group were minus $377.

Between these two extremes the group of 90 operators with receipts ranging between $850 and $1,350 per farm secured net earnings averaging $179; the 60 with receipts ranging from $1,350 to $1,850 had net earnings which averaged $863; the 34 with receipts ranging from $1,850 to $2,350 had net earnings which averaged $1,091.

Table 11. INFLUENCE OF VOLUME OF RECEIPTS ON PROFITS.

Receipts per 100 acres Range	Average receipts per 100 acres operated	Number of farms	Net earnings
Under $850	$ 602	63	$—377
850 to 1,350	1,092	90	179
1,350 to 1,850	1,552	60	863
1,850 to 2,350	2,033	34	1,091
Over 2,350	4,865	23	1,906

INFLUENCE OF CROP YIELDS ON PROFITS.

The figures obtained in this study showed a marked effect exerted by the size of crop yields on the profits secured by farm operators.

The average yield for the most important crops on the 270 farms and on the most successful 12 farms are shown in Table 12.

Table 12. AVERAGE CROP YIELDS OF ALL FARMS STUDIED AND THE BEST 12 FARMS.

	Average of 270 farms	Average of best 12 farms
Yield of corn per acre	33.87 bu.	37.28 bu.
Yield of tobacco per acre	924.96 lbs.	1,036 lbs.
Yield of wheat per acre	13.69 bu.	15.78 bu.
Yield of hay per acre	1¼ tons	1¼ tons.

Investigators in problems of farm organization have adopted the "crop index" as a measure for comparing the composite production of crops on any one farm with that of the community average. The latter is considered as 100. Suppose a given farmer had:*

20 acres of corn yielding 50 bu. per acre or a total of 1,000 bu.
10 acres of tobacco yielding 1,500 lbs. per acre or a total of 15,000 lbs.
30 acres of wheat yielding 10 bu. per acre or a total of 300 bu.
30 acres of hay yielding 1½ tons per acre or a total of 45 tons.

90 acres total acreage.

Suppose the average yield per acre of all farms in the community were: Corn, 40 bu.; tobacco, 1,000 lbs.; wheat, 15 bu.; hay, 1 ton. Then to produce

1,000 bu. of corn would require.....25 acres (1,000÷40)
15,000 lbs. of tobacco would require..15 acres (15,000÷1,000)
300 bu. of wheat would require.....20 acres (300÷15)
45 tons of hay would require.....45 acres (45÷1)

Or a total of .....105 acres

The crop index of this farm would be determined by dividing 105 acres, the average acreage required to produce the amounts of the crops produced on this farm, by the actual acreage used on this farm to produce those amounts. This gives

*Kentucky Bulletin 253. "A study of Farm Organization and Management in Mason and Fleming Counties."

116.7 which means that the yields of the crops on this farm are 116.7 per cent of those of the community. That is, the crop index of the farm is 116.7.

Table 13. INFLUENCE OF CROP YIELDS ON FARM PROFITS.

Crop index (Average crop yield of all farms=100)	Number of farms	Net earnings
Under 79 per cent	67	$220
79 per cent to 91 per cent	48	346
91 per cent to 103 per cent	47	419
103 per cent to 115 per cent	50	501
Over 115 per cent	58	853

Table 13 shows the influence of crop yields on the profits of the farm operators whose business was analyzed in this study.

There was a group of 67 operators with low crop yields (averaging 79 per cent of the community average). The average earnings of these operators were but $220 for the year.

There was a group of operators having high crop yields (more than 15 per cent above the average yields of the community). The average net earnings of these operators were $853.

The other groups in the classification show that profits, on an average, increased as yields increased. The 48 farms with yields ranging between 79 per cent and 91 per cent showed earnings of $346. The next higher group with yields ranging between 91 per cent and 103 per cent earned $419 and the groups ranging between 103 per cent and 115 per cent in yields earned $501.

INFLUENCE OF GOOD LIVE STOCK AND FEEDING EFFICIENCY ON PROFITS.

The influence of the productivity of live stock and the feeding efficiency of the 270 farmers was studied. The farms were classified on the basis of returns from live stock per dollar's worth of feed fed. (Table 14.)

On 58 farms there was less than 40 cents returned per dollar's worth of feed fed. The net earnings of these operators was $119.

On 60 farms there was an average return of $1.32 for each dollar's worth of feed fed. These operators had net earnings averaging $1,189.

The other groups in the classification showed that the farmers' net earnings increased as the quality of live stock and feeding efficiency increased.

Table 14. INFLUENCE OF GOOD LIVE STOCK AND FEEDING EFFICIENCY ON PROFITS.

Receipts per dollar's worth of feed fed	Average receipts per dollar's worth feed fed	Number of farms	Net earnings
Under 40 cents	.28	58	$ 119
40 cents to 57 cents	.50	53	145
57 cents to 74 cents	.65	57	386
74 cents to 91 cents	.82	42	749
Over 91 cents	$1.32	60	1,189

WELL BALANCED FARMS MOST PROFITABLE

The five major factors influencing profits in this region were shown by this study to be: (1) labor utilization, (2) control of expenses, (3) volume of sales, (4) crop yields, and (5) productiveness of live stock feeding operations. Some farms were strong in all these points and some in none of them and between these two extremes were farms varying in the number of points in which they made a good showing.

The farms were classified according to the number of these points in which they exceeded the average by 10 per cent or more. The effect on farm profits is shown in Table 15.

Table 15. EFFECT OF NUMBER OF STRONG POINTS IN THE FARM ORGANIZATION ON PROFITS*.

Number of strong points	Number farms	Net earnings
No strong points	52	$—474
One strong point	67	80
Two strong points	58	343
Three strong points	55	1,018
Four strong points	26	1,699
Five strong points	12	2,062
All farms	270	465

CAMPARISON OF EFFICIENCY FACTORS OF INDIVIDUAL FARMS WITH AVERAGE FARM AND THE MOST SUCCESSFUL FARMS

For the benefit of those who contributed their farm records to this study, a factor sheet was made out for each of the 270 farmers, showing his efficiency in the various factors and comparing his factors with those of the average of all the farms and the best 12 farms. The form used for this purpose is shown in Table 16.

*Points are (1) labor utilization, (2) control of expenses, (3) volume of sales, (4) crop yields, and (5) productiveness of live stock feeding operations. "Strong" points are those in which a farm is better than the average by 10 per cent or more.

Table 16. COMPARISON OF YOUR FARM WITH 270 FARMS AND THE BEST 12 FARMS.

	Average of 270 farms	Average of best 12 farms
Net earnings for the year	465	3,058
Total acres operated	201.9	328.8
Total capital (including dwelling)	17,270	24,629
Total capital (without dwelling)	15,234	22,954
Total farm receipts	2,995	6,665
Total farm expenses	1,616	2,230
Receipts per 100 acres operated	1,484	2,027
Expenses per 100 acres operated	800	678
Expenses per $100 income	53.96	33.46
Crop index	100	107.7
Yield of corn per acre	33.87	37.28
Yield of tobacco per acre	924.96	1,036
Yield of wheat per acre	13.69	15.78
Yield of hay per acre	1¼ Tons	1¼ Tons
Productive day's work per man	218.86	264.33
Productive day's work per horse	53.61	87.81
Price per pound for tobacco	8.5c	10.27c
Value of things furnished by the farm to the family	299	331

Kentucky

Agricultural Experiment Station

University of Kentucky

Root-rot of Tobacco in Kentucky and its Control
A Progress Report

BULLETIN NO. 262

Lexington, Ky.
December, 1925

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BULLETIN NO. 262.

Root-rot of Tobacco in Kentucky and its Control

(A Progress Report)

By W. D. Valleau, Ralph Kenney and E. J. Kinney

Since 1920 studies have been conducted by the Kentucky Experiment Station on the black root-rot of tobacco, caused by the fungus *Thielavia basicola* Zopf., as it occurs in Kentucky. These studies have centered on the relative resistance of the various so-called varieties of Burley tobacco to the disease, the selection of strains of tobacco, especially of the stand-up type, which are resistant to the disease and of high quality, and a study of the distribution of the disease in the State. After the work on Burley was well under way, a study was begun of the relative resistance of the Kentucky dark tobacco varieties to the disease, and of the possibility of developing highly resistant strains of the various types of dark tobacco. As certain phases of the work have been nearly completed, a progress report of the work up to the present time will be given in this bulletin.

DISTRIBUTION OF BLACK ROOT-ROT IN KENTUCKY (1).

Black-root has long been recognized as a serious hindrance to the tobacco industry of Kentucky. Altho growers have not understood the disease, they have recognized the futility of trying to use the same seedbed site two years in succession, and have recognized that tobacco will often fail almost completely if grown too often on the same soil. Thus, as a result of experience, they have gradually developed a system of culture which has tended to reduce the injury from black-root to a point where in some communities the disease is not recognized as a serious factor,

(1) A description of this disease may be found in Kentucky Experiment Station Circular No. 28, 1922.

many growers insisting that they do not have to contend with it. With the rapidly decreasing amount of virgin soil, however, the disease is causing an increasing amount of injury and each year more farmers are recognizing it as a limiting factor in tobacco production on certain pieces of land.

With the introduction of resistant strains of stand-up Burley it has been possible, by comparison of the rates of growth of resistant and susceptible varieties, to make an extensive survey of the distribution of the disease in the Burley section of the State. Preliminary surveys in 1920 and '21, in the vicinity of Lexington, in which records were made of the number of diseased and apparently disease free fields observed, indicated that about 50 per cent of the Burley tobacco crops were definitely injured by black root-rot and that another 10 per cent were so affected that the loss probably would be extensive if the same fields were again set to tobacco. Later and more extensive data indicate that these figures are rather high for the Burley section as a whole.

In 1923 approximately 2,000, and in 1924 approximately 1,200 teaspoon packages of seed of resistant strains of Burley tobacco were distributed to farmers who requested it. Some of them knew that they were having difficulty with black-root, but the majority probably did not know whether they were troubled with the disease or not. This amount of seed was usually sufficient for planting three or four rows of the resistant strain thru a field of the local variety. Thus comparisons of the relative rates of growth of the two types could readily be made. As most of the commonly grown varieties of Burley are quite susceptible to the disease, differences in the rates of growth in favor of the resistant type have in our experience always indicated the presence of the black-root fungus. The results of these trials have been collected by the writers where possible, by county agents and thru questionnaires. Altho the chance for error in data collected in this way is recognized, yet in the striking examples where the local variety made poor growth and the resistant grew normally, it is fairly certain that the difference in growth was due to the presence of the black-root organism in the soil. In 1923, of the reports received of comparative tests of local and resistant strains 840 appeared sufficiently accurate to be used. Of these, 252, or 30 per

cent, reported *striking* differences in growth in favor of the root-rot-resistant strain. These tests were distributed as shown on the map (Fig. 1). The results obtained in 1924, altho less extensive than in 1923, are entirely comparable. Of 142 reports received, 73, or 51.4 per cent, reported that the resistant variety started quicker after setting, and 75 reported more rapid growth of the resistant strain during the summer. The distribution of these tests was similar to those of 1923. Only a comparatively few tests and observations have been made in the dark tobacco areas, but the same results probably will be obtained there when a more accurate survey can be conducted (2).

The results reported indicate a wide distribution of black root-rot in the Burley section of Kentucky, and suggest that sooner or later the disease is one with which nearly every tobacco grower will have to contend unless resistant varieties are grown.

THE RELATIVE RESISTANCE OF BURLEY VARIETIES TO BLACK ROOT-ROT

Burley tobacco is supposed to have originated from a few light colored plants found in a dark tobacco variety grown in Brown County, Ohio, in 1864. The cultivation of it spread rapidly thru Central Kentucky and adjoining parts of Ohio and Indiana. At the present time there are several quite distinct types of Burley tobacco. Such a variety of types suggests the possibility of a multiple origin of Burley tobacco from two or more distinct dark tobacco varieties. The Kentucky Burleys are for the most part quite susceptible to black root-rot, but we have recently received a strain of Burley from Ontario, Canada, (Routt's Resistant) that is highly resistant and possibly immune to the disease.

The most popular type of Burley now grown in Kentucky is the Stand-up. There are several so-called varieties of Stand-up Burley, all very much alike but possibly differing slightly in certain characters. These as a group are very susceptible to black root-rot and in a badly diseased field make but poor growth until late in the summer when growth may be fairly rapid. Of the

(2) An examination by the senior author and County Agent Middleton of 12 tobacco fields on the Bradshaw pike near Hopkinsville in July, 1925, showed that seven of them were infected with black root-rot. The injury in some of these fields was severe.

Fig. 1. The figures indicate the number of demonstrations in each county striking enough to indicate the presence of black root-rot in the field. 1923 crop.

stand-up types, the varieties known as Kelley, Judy's Pride, Pepper and Vimont Kelley are those most commonly grown. These are all highly susceptible to the disease. A number of other local stand-up varieties have been tested, all of which have proved to be susceptible except a strain known as Carr. The fact that it was resistant to black-root was not known to Mr. Carr until a test was conducted at the Experiment Station in 1923. It probably originated from one of the commonly grown stand-up Burley varieties by unconscious selection for disease resistance in a field infected with black-root, as most of the stand-up varieties have an occasional plant which is resistant.

There are several slightly different types of drooping leaf Burley called red, twist bud, big silk, etc. For the most part these are just as susceptible to black-root as the Stand-up Burleys. However, resistant strains of drooping types have been received from several sources. A variety known as King; another, Green Briar; a strain grown by Mr. Gregg near Georgetown; and a strain obtained from Mr. J. W. Duncan, Jr., of Nicholasville, have all proved to be resistant. Resistant plants were found in Griffin's broad-leaf white Burley, and in a red Burley variety sent to the station for trial (Fig. 2). Altho the degree of resistance in any of these types is not high, it is sufficient to permit them to make good growth on badly diseased soil when set after the first of June.

Fig. 1. The figures indicate the number of demonstrations in each county striking enough to indicate the presence of black root-rot in the field. 1923 crop.

THE DEGREE OF RESISTANCE OF THE RESISTANT BURLEY TOBACCO STRAINS AND OTHER TOBACCO VARIETIES

Resistance of tobacco to the black root-rot fungus probably is always a relative condition. The term resistance, as it is used in referring to the Kentucky Burley selections, means simply that these Burley varieties and strains are resistant enough that under the average temperature conditions existing in Kentucky at planting time they will be able to make practically a normal growth, an occasional rootlet only being attacked. The susceptible varieties, on the other hand, are injured when set in diseased soil, altho they also may make a fair growth under the higher temperature conditions later in the season. Under lower temperature conditions than those existing at setting time in Kentucky the resistant strains of Burley may appear nearly as susceptible as the suscepti-

ble varieties of Burley. Altho highly resistant strains of Burley would be more desirable than these slightly resistant strains, yet because of the fact that these strains are identical in type and quality with the varieties from which they have been selected, and because they are resistant enough to largely eliminate loss from black root-rot, they are filling a very definite need in the tobacco industry of the Burley sections of Kentucky, and probably will continue to do so until highly resistant strains which are as satisfactory in other qualities, can be developed. The relative degree of resistance of the resistant Burleys as compared with other tobaccos grown in Kentucky and with some grown elsewhere, has been determined in several ways.

Plant-Bed Tests. A comparative test of Kentucky resistant strains of Burley with a highly resistant cigar tobacco called Kentucky Yellow, and several varieties of dark tobacco, including One-sucker, Yellow Pryor, Madole, Broadbent and Greenwood, was conducted in 1922, in a diseased plant-bed, placed at one end of a diseased plot. The resistant Burley seed was taken from several strains and thus illustrates rather accurately their resistance as a group. All the varieties made poor growth with the exception of Kentucky Yellow, which appeared to grow normally. The resistant Burleys as a group grew slightly better than the dark tobaccos. All showed extensive root injury with the exception of Kentucky Yellow which appeared to be immune. Later in the season the same varieties were set in the remainder of this plot, taking plants from a steamed bed. Under the higher temperature conditions then prevailing, the resistant Burley strains made nearly equal growth with Kentucky Yellow, the susceptible Burleys grew very slowly and the dark tobaccos made intermediate growth between the susceptible and resistant Burleys.

Greenhouse Plant-Bed Tests. If tobacco seed is sown in the fall in diseased soil in an unheated or partially heated greenhouse, quite accurate determinations of the relative resistance of various strains of tobacco may readily be made. In the falls of 1922 and 1923, tests of this kind were conducted for the purpose of comparing the resistance of a number of strains of dark tobacco with the resistant and susceptible Burleys. In the fall of 1922, thirty-two strains of dark tobacco collected at random in the dark tobacco

Fig. 2. A variety test conducted on badly infected soil on the Experiment Station farm. The five center rows are planted each with two varieties. Those in the foreground are susceptible stand-up varieties, and those in the background are resistant drooping types. On each side are full rows of a resistant stand-up selection (W).

The five center rows are as follows:

1. Pepper and Gregg.
2. Kelley and Twist-Bud (DeLong).
3. Judy's Pride and Griffin's Twist Bud.
4. Vimont Kelley and Duncan.
5. Improved Halley (1923 seed) and Twist Bud (Stafford). Photo July 24, 1924. Original condition of the plants, time and method of setting, and other conditions were as nearly alike as possible thruout this test.

section of the state were compared in this way with Kentucky Yellow, a susceptible Burley, three strains of Kentucky resistant Burley and one of Johnson's Hybrid Burley (3). Kentucky Yellow was most resistant, Johnson's Hybrid Burley next, the Kentucky selections of Burley next, a strain of one-sucker called Blue Ribbon and a variety called Clarksville appeared nearly as resistant as the Kentucky resistant selections while the remaining thirty strains varied down to some that were as susceptible as the susceptible Burley variety. The general order of resistance was thus the same as in the diseased plant-bed mentioned above.

The greenhouse test conducted in 1923 gave approximately the same results as that of the previous year. This test included a strain of Turkish tobacco, the highly resistant strain of Burley known as Routt's Resistant, received from Mr. D. D. Diggs, of Harrow, Ontario, Canada, and a number of hybrids of dark and Burley varieties with resistant forms. Under the greenhouse conditions Routt's Resistant and Turkish appeared practically immune as did also the F_1 hybrids of Turkish, Routt's and Kentucky Yellow with the susceptible varieties. Two Kentucky Burley selections (W and As. 9) were next in resistance, and the dark tobacco varieties most susceptible. A susceptible Burley was not included in this test.

Figure 3 shows quite accurately the results which may be expected when strains having varying degrees of resistance are tested in this way. Number 1 of figure 3 represents Routt's resistant, a highly resistant strain of Burley of poor quality; 2 is a first generation hybrid of 3 (As9, a Kentucky resistant Burley selection) by Routt's resistant, while 4 and 5 are One-sucker and Yellow Pryor. The relative sizes of the plants show quite accurately the comparative degree of resistance of these strains to the black-root organism. Altho the Kentucky selection, under these conditions, made only slightly better growth than the more susceptible varieties, yet the difference is significant. It has been found possible in greenhouse plant bed tests to select the very rare resistant plants which appear in such

(3) Johnson, James, Phytopathology 11:p 49, 1921.

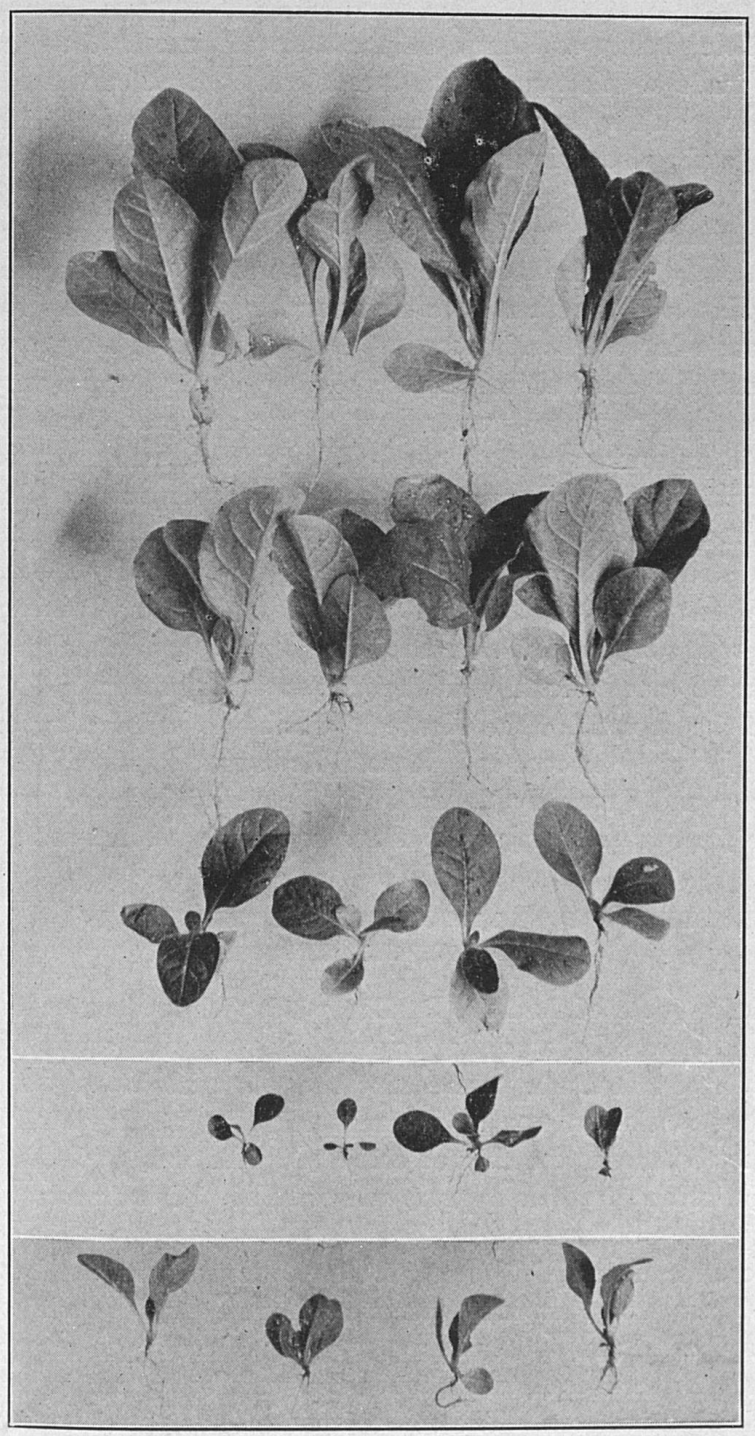

Fig. 3. Showing the relative resistance of four strains of tobacco and a hybrid, to black root-rot, under rather low temperatures. Photo, December 19, 1923.

a susceptible variety as Kelley, on the basis of size. In the four attempts made at selection by this means each proved successful, the progeny making nearly normal growth in diseased soil in the field, while plants from the original seed proved highly susceptible.

Field Trials. Field trials have been conducted during the past five years, in which the above mentioned varieties, together with other strains and varieties, have been tested. In these tests the same relative degree of resistance has been shown as in the greenhouse tests. In diseased soil the susceptible Burleys make very little growth during the greater part of the summer, the dark tobaccos in an ordinary season are held back for a time and then develop fairly well, but in a season that is unusually cold, as that of 1924, they also make very little growth (Fig. 5). The Kentucky resistant selections have made good growth every season so far, although in 1924 one of them showed signs of injury on black-root soil, but it also made less growth than other varieties on a soil not infected with the black-root organism.

Altho the growth of the Kentucky strains is satisfactory on heavily infected black-root soil, Routt's Resistant, Johnson's Hybrid Burley and Kentucky Yellow all make a slightly more rapid growth indicating some injury to these strains from black-root.

TEMPERATURE RELATIONS OF THE KENTUCKY RESISTANT STRAINS

At the request of Mr. D. D. Diggs, Superintendent of the Harrow, Ontario, Tobacco Experiment Station, two strains of Kentucky resistant Burley were sent him for trial in 1923 and three other strains in 1924. He reported that all five strains showed no resistance whatever as compared with susceptible Burleys. The reason for this appears to be the low temperatures at that station as compared with those in Kentucky. In 1922 the plants were set in the field June 9, at Harrow, and June 3 at Lexington. The average air temperature at Harrow for the month of June was 68.1°F and at Lexington 75.3°F, according to records kept on the Experiment Station farm, the weather bureau reporting 75°F for Lexington. The soil temperature at 3 inches aver-

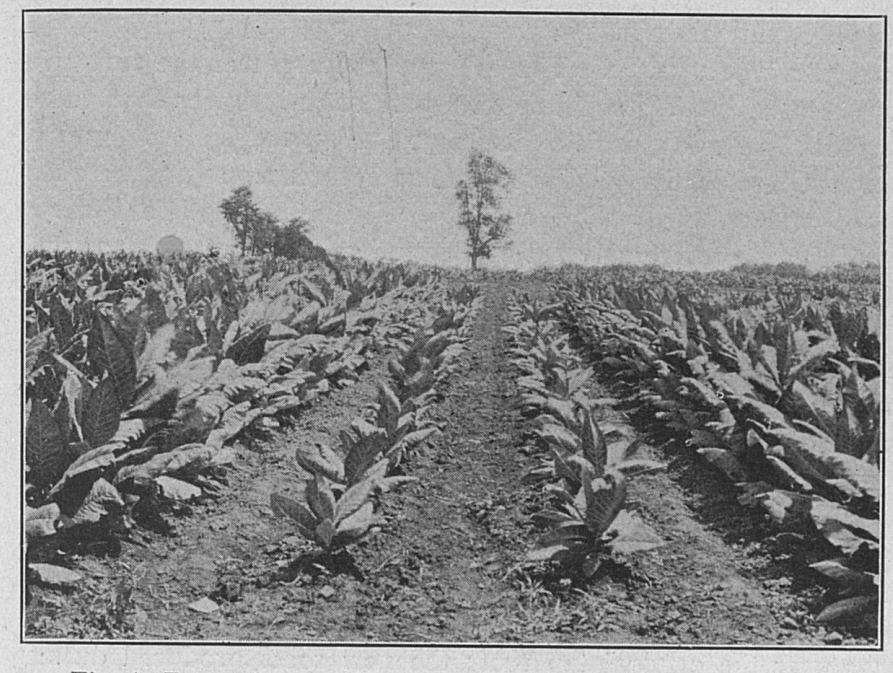

Fig. 4. Tests of two resistant strains V and W (at sides) in comparison with Judy's Pride and a drooping type (center) of susceptible Burley in diseased soil on the Experiment Station farm in 1922. Photo, July 22, 1922. The temperatures were rather high thru the summer and the susceptible varieties are making fair growth.

aged at Lexington for the same period 73.4°F (23°C) and the calculated average for Harrow was 66.3°F (19°C) a difference of 7.1°F (3.9°C). The range of air temperature at Harrow was from 45.5°F to 92.5°F, while at Lexington it was from 59°F to 92°F, indicating a much more uniform as well as higher temperature at Lexington than at Harrow during the period following setting. The average temperature at Lexington during the month of June (73.4°F or 23°C) was only 3°C (5.4°F) below the temperature (79°F, or 26°C) which Johnson (4) has shown to be sufficiently high to protect susceptible Burley from all but very slight injury. The susceptible Burleys in diseased soil at Lexington that year were injured considerably after setting, but by August 22 were two-thirds the size of the resistant Burleys. The average soil temperatures at Lexington at three inches, during four-week periods following setting, which correspond roughly

(4) Johnson, James, Jour. Agr. Res. XVII: No. 2, 1919.

to June, July and August, were 74.7°F (23.7°C) 78°F (25.5°C) and 78.2°F (25.7°C). The average temperatures the first two weeks after setting at Lexington were slightly lower than those of the four-week period, being 70.4°F (21.4°C) and 73.6°F (23.1°C) respectively. Thus, at temperatures averaging between 21°C and 23°C, (69.8°F and 73.4°F) the susceptible Burleys are injured considerably but at an average temperature of 25.5°C (78°F) they make fair growth (Fig. 4).

These results approximate the results obtained by Johnson using constant temperatures remarkably closely. Under the same conditions the Kentucky resistant strains appear not to be injured at all or only so slightly as not to be noticeable.

Under the same conditions Madole, Little Hill and Greenwood, three Western Kentucky dark tobaccos, made intermediate growth between the susceptible and resistant Burleys. They were definitely injured. Later in the season when plants of these varieties were dug, the only place rotted roots could be found was near the original tap root; the new roots produced during the higher temperatures appearing to be free from injury. The season of 1924 was colder than that of 1922, the Weather Bureau at Lexington reporting 73°F and 73.2°F for the months of June and July, 1924, and 75°F and 76°F for the same two months in 1922. Under these cooler conditions in 1924, susceptible Burley plants in many cases died, while the Western Kentucky dark tobaccos had made only very slight growth by the middle of August (Fig. 5). The Kentucky resistant Burleys grew but slightly slower than the very resistant Burleys. It would seem that the poor development of the dark tobaccos in black-root soil in 1924, was due to the continued cool weather thru July, 73.2°F, the normal temperature for the month being 76.6°F.

The question as to whether temperature conditions low enough to result in extensive injury to the Kentucky resistant strains during the month of June, are likely to be encountered, is an important one to the grower who is relying on these strains for controlling root-rot. Altho the average temperature at which Kentucky resistant Burleys would be seriously injured has not been determined, it lies below an average air temperature of 71°F for

Fig. 5. Showing the relative resistance of a susceptible Burley, a susceptible dark tobacco and a resistant hybrid in black-root infested soil. The center row is Kelley; practically all the plants in the row have been killed by root-rot. A single resistant plant in the center of the row is growing normally. To the left is a row of One-sucker. This represents about the average degree of resistance of Kentucky dark tobaccos. On the right is a row of a hybrid of Madole x Dark G, back-crossed with Madole. Madole is as susceptible as One-sucker. Dark G we believe to be a resistant dark strain of tobacco derived from a resistant Burley. Photo, August 18, 1924. Kentucky Experiment Station.

the month of June, as in 1920 the resistant strain made good growth at this average air temperature. Whether it can be said that the point where extensive injury would occur lies between an average of 71°F and 68°F (the average temperature at which these strains failed at Harrow) can not be stated definitely, as the effect on root-rot of the low night temperatures there as compared with the higher night temperatures at Lexington can not be evaluated properly at present. The mean minimum for June, 1922, at Harrow was 57.3°F while the mean minimum for June in the cooler year of 1920 at Lexington was 63.1°F, a difference of 5.8°; while the difference in mean temperatures for these periods was only 2.9°F. In a 37-year period the mean temperature at Lexington for the month of June has fallen below 71°F only eight times; twice to 70° five times to 69° and once to 68°F. The latter year (1903) the mean minimum temperature fell to 59.3°F (15.2°C) which may be low enough to cause injury to the Kentucky resistant strains. It appears from these figures that there is a possibility of injury to these resistant strains in diseased soil, due to low temperatures, about once in six years. In 1922 when seed of the resistant strains was sowed April 7 in diseased soil the mean temperature for May, when most of the injury probably occurred, was 68.4°F (20.2°C) and the mean minimum for the month was 59.5°F. There was extensive injury to the resistant plants under these conditions in the diseased plant-bed. It will be noticed that these May temperatures are nearly identical with those of the cold June of 1903, when the mean and mean minimum were 68°F and 59.3°F, respectively, indicating that if planting were done at the usual time in such a year a partial failure might occur. Under such abnormal temperature conditions, however, plants probably would be late and thus planting would be delayed until more favorable temperatures prevailed.

DISTRIBUTION AND TESTING OF THE KENTUCKY RESISTANT STRAINS OF BURLEY

In circular 28 (5) a statement was made in regard to the

(5) Strains of stand-up white Burley tobacco resistant to root-rot. Kentucky Experiment Station Circular No. 28, 1922.

selection of strains of stand-up Burley resistant to root-rot and also the results of preliminary tests of some of these strains on Kentucky farms were given. Since that time more extensive tests have been conducted in order to determine the relative merits of the strains as compared with the commonly grown varieties and incidentally to gather more extensive data on the distribution of black root-rot and the damage caused by it, in the Burley section.

The method used in conducting these tests was to furnish either directly from the Experiment Station or thru county agents or other agencies in the State, level teaspoon samples of seed to anyone wishing to make a comparative test. The small samples were used because they furnished sufficient plants to carry on a reliable trial, usually three or four rows across the field, without a grower risking a large acreage on something with which he was not familiar. Many persons were willing to conduct a trial in this way who would not have done so if a larger planting were required. The method also conserved seed, allowing many more tests to be conducted than if larger samples were distributed. The follow-up work on these tests has not been as extensive as was desired, but has been extensive enough to give a comprehensive idea of the value of the resistant strains. It has consisted of the personal inspection of fields wherever possible during the growing season for the purpose of obtaining records; inspection by county agents during the growing season and after curing; and of questionnaires being sent to growers where personal visits were not made.

Altho several strains have been tested during the progress of the work, the selections from Judy's Pride have received most attention. These are all similar. Some of the Vimont Kelley selections also, have been tested but less extensively. The degree of resistance to black-root seems about the same in both. The quality apparently is better in the Judy's Pride selections. In compiling results for this report, distinction has not been made between the different strains.

1922 Tests. In 1922, three hundred and eleven packets of resistant seed were distributed, primarily thru county agents, in twenty-six counties scattered over the Burley section of the State. Visits were made to 106 of the farms and records obtained on

89 crops, where direct comparison was made between the resistant and the local variety. Fifteen other records were obtained by mail. The resistant tobacco was grown in comparison with 21 so-called varieties of Burley. Fifty-nine comparisons were with stand-up types, 19 with drooping types and the types of the remainder were not recorded.

Of the fields inspected 29, or 32.6 per cent, were definitely infected with black-root, 28 appeared not to be infected and 32 were questionable. On 42 farms, or 47 per cent, the resistant tobacco made more rapid growth and ripened earlier than the local sort. This is fairly good evidence that black-root was present in each of these fields. On 42 farms the rate of growth of the resistant and local variety was identical, and on five farms the local variety grew faster. Forty-three of the growers liked the resistant tobacco best, eight were partial to their own type and the remainder had not yet determined their preferences when the records were obtained.

The records on quality after stripping were less extensive. Mr. H. F. McKenney, then county agent in Fleming County, reported that the quality was as good as that of the local variety, or better, in 20 of 21 tests, while in one test Kelley was considered better. In two counties, Marion and Breckenridge, tobacco grading demonstrations were being conducted co-operatively by the Burley Tobacco Growers' Co-operative Association and the Extension Division of the College of Agriculture. In both counties the official graders of the Co-operative Association compared crops of the resistant tobacco with those of the local varieties, and in all cases pronounced the quality of the resistant crops inspected to be satisfactory.

1923 Tests. In 1923, 1,985 teaspoon samples of resistant seed were distributed for testing, in 67 counties of Kentucky. Thru personal visits made to over 82 farms, thru the efforts of County Agents and thru two sets of questionnaires sent to the demonstrators, a total of 840 individual records were obtained which seemed worthy of tabulation. Tests were conducted in direct comparison with 28 so-called varieties, the majority being with Kelley (295) Judy's Pride (151) and Pepper (45).

Records on the relative rates of growth of two varieties grow-

ing side by side are probably fairly accurate even tho obtained largely by the questionnaire method. Of the 840 records obtained, 242 or 28.8 per cent indicated a very striking difference in the rate of growth between the local and the resistant strain, in favor of the resistant plants.

In these cases the answers to the questions, "Which made the most pounds per acre?" and "How much more do you think it made?" usually were emphasized by such statements as "one-third more," "250 pounds more," "Resistant out-grew mine in same field," "Resistant one-third to one-half larger," "More than twice," "Resistant plants grew much faster," "25 per cent more," etc., leaving little doubt that root-rot was present and that the resistant strain was proving its superiority under these conditions. These cases were distributed rather evenly over the Burley section. Of the 840 answers tabulated, on the relative rates of growth of the resistant and the local strains, 310, or 36.9 per cent stated that the growth was equal; 367, or 43.7 per cent stated that the growth of the resistant plants was superior to that of the local variety, while 163 or 19.4 per cent, stated that the growth of the local variety was superior to that of the resistant. Of these 163 cases, Kelley was reported superior in 36 cases, Judy's Pride in 27 cases, Twistbud in 15 and Red Burley 19, the remaining 66 cases being miscellaneous and unamed varieties. In the cases of the heavier types such as Twistbud and Red Burley there may have been no superiority in growth but merely heavier weight due to a heavier type of tobacco. In cases where Kelley and Judy's Pride were reported as superior, some of the cases may have little significance, due to error in judgment, but certainly in some cases these varieties have proved themselves definitely superior to at least one of the resistant strains under certain soil conditions. These cases will be considered later under brown root-rot.

Taking up the commonly grown varieties separately, in comparison with the resistant; Kelly and the resistant were considered to have made equal growth in 122 cases, the resistant better growth in 137 cases and poorer in 36 cases. Judy's Pride and the resistant made equal growth in 62 cases, the resistant was superior in 62 cases, and Judy's Pride superior in 27 cases. Pepper and the resistant were equal 30 times; the resistant superior 14 times

and Pepper once. Of the heavier types, Twistbud and resistant were equal three times, resistant superior 12 times and the resistant inferior 15 times. Red Burley and resistant were reported the same in 10 instances, the resistant superior in eight and Red Burley superior 19 times. The remaining varieties and the miscellaneous group taken together made equal growth with the resistant 83 times, resistant was superior 132 times and the local variety was superior 64 times. Summarizing the above results it may be stated that 37 times out of 100 equally good results may be expected by growing the resistant as the commonly grown local varieties, and that 19 times out of 100 heavier yields may be expected from the local strains. While 44 times out of 100 better results may be obtained as far as growth is concerned by using the resistant stand-up strains. Altho the local varieties have been reported to have outgrown the resistant in several cases, yet in our observations the differences in rates of growth, with a few exceptions, have not been striking, but where the resistant strains have outgrown the local type the differences due to black root-rot are often very marked.

Quality of the Resistant Tobacco in the 1923 Tests. In March, 1924, questionnaires were sent out to co-operators in an attempt to obtain opinion as to quality, ease of grading and the variety which would be grown the following year. Over 500 records were obtained, most of which could be tabulated for some of the questions. Of 439 expressions of opinion as to relative quality of the local variety and resistant strain, 80 could see no difference, 296 considered the resistant the better quality, and 63 considered the local variety the best.

The quality of Kelley, Judy's Pride and Pepper were considered the same as that of the resistant in 39, 11 and 5 cases respectively; the resistant was considered better than these varieties in 91, 54 and 11 cases respectively, and these varieties were considered better than the resistant in 23, 9 and 5 cases respectively. In 43 comparisons of Red Burley and Twistbud, they were considered as good as the resistant in six cases, better in four cases; and the resistant was considered best in 33 cases. Of 148 comparisons of miscellaneous varieties, these were con-

sidered equal in quality to the resistant in 19 cases, better in 22 cases and the resistant better in 107 cases.

Ease of grading is dependent to quite an extent upon uniformity of growth in the field, resulting in a uniform time of topping and a uniform plant size, and on uniformity of type of plant. As the strains tested in 1923 had each been selected from single plants for four consecutive years, the results on ease of grading are of interest in comparison with varieties that usually contain several types of plants. Of a total of 407 expressions in regard to relative ease of grading, 89 could see no difference between their own tobacco and the resistant, 40 considered their own easier to grade and 278 claimed to have found the resistant tobacco easier to grade.

In answer to the question as to what they would grow in 1924, 108 of 364 planned on growing their own variety, 117 expected to grow both their own and the resistant, and 139 or 38 per cent planned on putting their entire crop into the resistant strain.

1924 Tests. In 1924, nearly 1,200 samples of resistant seed were distributed for comparative tests. No attempt was made to visit many of these demonstrations. Questionnaires were sent out in August to obtain information on the relative rate of growth, time of maturity, adaptation of the resistant to the particular conditions, and the variety which would be grown the following year. One hundred and sixty of the answers to the questionnaires received, were considered worthy of tabulation. Eighteen of these growers were growing only the resistant tobacco, while 142 had a direct comparison with another variety. In answer to the question ,"Which variety started the quickest after setting?" 34 could see no difference, in eight cases the local variety, and in 73 cases the resistant was reported to have started first. In severe cases of root-rot the susceptible plants often die. In answer to the question, "Which required most re-setting?" 37 could see no difference, in eight cases the resistant, and in 55 cases the local variety required most re-setting.

As to rate of growth during the summer, 24 reported the two varieties the same, nine that the resistant was slowest, and 75 that the resistant grew more quickly. Twenty-four reported

that both matured at the same time, 12 that the local variety matured first, and 65 that the resistant matured first. Twelve could see no difference in adaptation of the two varieties tested to their soil, 19 considered their own variety best adapted, while 66 considered the resistant best adapted. Fifteen planned on growing their own variety the following year, 19 planned on trying both and 69 considered growing only the resistant in 1925.

SEEDSMEN

Following the preliminary tests of the resistant strains, several seedsmen began raising the resistant seed in quantities for sale. Altho there have been some accidents and susceptible seed has been sold or given away as resistant, the seedsmen who are handling the resistant seed appear now to be using every precaution to safeguard this seed from mixtures. Altho the Kentucky Experimental Station has no direct supervision over the production of resistant seed by private growers, the seedsmen have for the most part shown a desire to co-operate in keeping strains pure. In several cases seedsmen are being supplied each year with sufficient seed from the Experiment Station to plant their seed crop, and thus be more certain of the product. In other cases tests have been conducted during the winter to determine whether seed to be sold was resistant or not, while one seedsman brings plants from his bed from which he will raise his seed crop and tests them in diseased soil at the Experiment Station to make certain of resistance.

BROWN ROOT-ROT OF TOBACCO

Altho black root-rot is very common thruout the Burley section of Kentucky and probably also in the dark section, it is not the only cause of irregular stands of tobacco and of severe stunting in certain fields. A condition quite similar to black root-rot but differing from it in that the roots usually are a brown dead color or sometimes pinkish instead of coal black, as in the case of black root-rot, is quite prevalent. This disease, known in some tobacco areas as brown root-rot, may occur in fields where tobacco has never been grown before, even

tho healthy plants are used. In the most severe cases it appears to be associated with low available fertility, often occurring when tobacco is set in old pastures which have been grazed heavily, altho it has been observed in fields of high fertility. In contrast, black root-rot is notoriously a disease of fertile fields high in organic matter. Brown root-rot may be quite severe after corn, and has caused considerable injury on the Experiment Station Farm in a rotation of alfalfa, corn, tobacco and wheat. Several species of Fusaria and a fungus tentatively identified by Dr. C. L. Shear as *Staganospora arundinis* or as a species of Hendersonia have been isolated from the small rotting rootlets in about equal numbers. So far is has not been possible to demonstrate that any of these organisms are certainly the cause of the trouble, altho several of the species of Fusaria have proved to be injurious to plants growing in test-tubes of agar and also in some instances slightly injurious to plants growing in soil. *Staganospora arundinis* is also slightly injurious to tobacco plants growing in test-tubes of agar. One instance has been seen in which tobacco followed about ten years of continuous corn. The tobacco in this field was injured severely by the disease, making practically no growth until late in the summer. A portion of the same field was set with several varieties of tobacco the following year, but as far as could be determined the disease was not present, or at least only in such small amounts as to be negligible. In preliminary tests a disease entirely similar to brown root-rot has been produced on tobacco by introducing into sand cultures of tobacco (6) dead corn roots collected during the winter from a continuous corn plot.

In 1924, possibly because of the prolonged cool period, this type of injury was very prevalent in Kentucky. The plants in a large percentage of fields in certain of the poorer areas in the State had made very little growth by the middle of August. In more fertile fields, altho there might be considerable injury, it was more difficult to detect.

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(6) Unpublished data obtained by Mr. P. E. Karraker and the senior author. Microscopic studies of rotting corn roots, and tobacco roots apparently affected with brown root-rot, growing in sand cultures in the greenhouse have constantly revealed the presence of a phycomycetous fungus at the rotting borders, and behind in the decayed tissue numerous oospores of the pythium type.

One of the black-root resistant strains of tobacco which has been tested quite widely appears to be more susceptible to brown root-rot than the other resistant strains and the commonly grown varieties. This fact undoubtedly explains why in some cases these resistant plants have made inferior growth when compared with the local varieties. A quite striking example of the apparent susceptibility of this strain (W) as compared with other varieties appeared on corn land on the Experiment Station Farm in 1924 (Fig. 6).

It is doubtful whether much progress will be made in combating this disease by plant selection from our commonly grown varieties altho the example given indicates possibilities along this line. Of the nine varieties grown in this field (each repeated four times) the other eight made approximately equal growth and the plants in the rows were quite uniform in size, giving no suggestion that any of the eight varieties contained superior strains. Two of these eight were black-root resistant strains, showing that resistance to black root-rot is not correlated with susceptibility to brown root-rot as might be suggested by the one resistant strain which was more susceptible to brown root-rot. Until more is known in regard to the nature of the brown root-rot, no specific recommendations can be made for its control other than the selection of fields known to be high in available fertility.

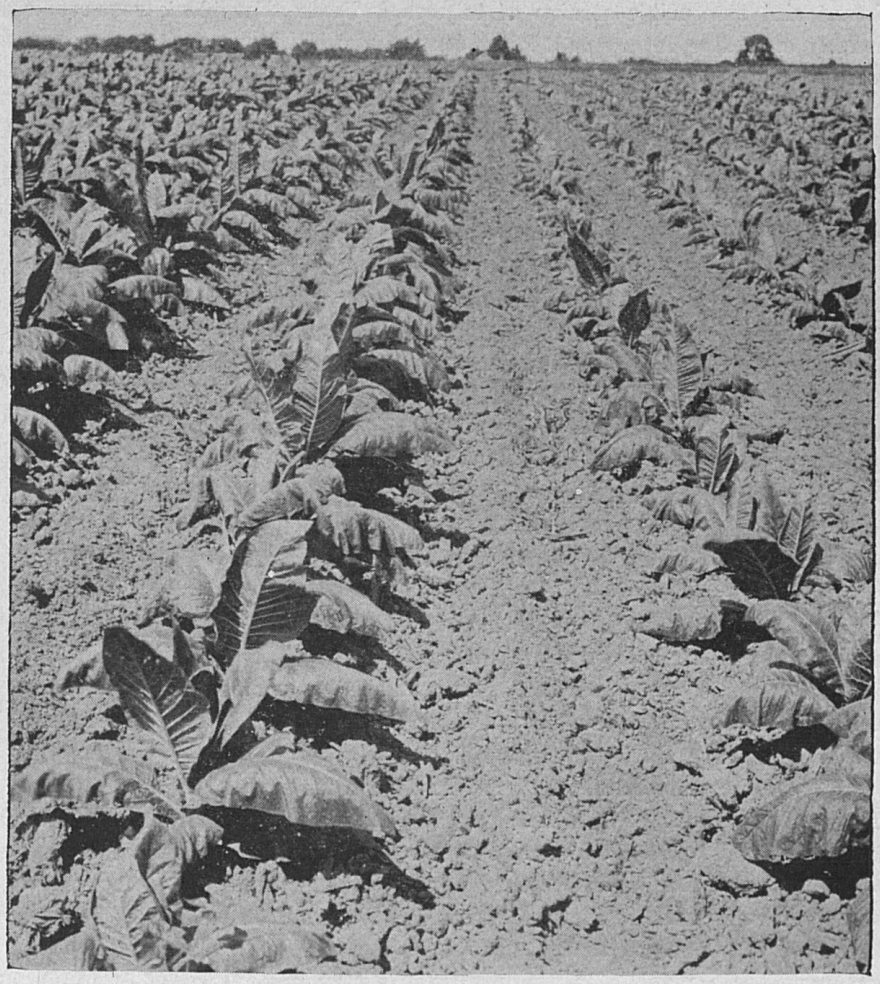

Fig. 6. Brown root-rot following corn. On the left is Vimont Kelley only slightly affected, while on the right is an apparently more susceptible strain of tobacco (W) as shown by the small size of the plants thru the entire row. The roots of most of these plants were considerably rotted. Photo, July 24, 1924.

CONCLUSIONS

1. The results of a study of the distribution of black root-rot of tobacco in the Burley section of the State and of the relative resistance of the so-called varieties and selected strains of Burley to the causal organism (*Thielavia basicola* Zopf) are presented.

2. Survey studies carried on over a period of five years, based on observations of random fields and on comparative rates of growth of re-

sistant and susceptible strains of tobacco indicate that black root-rot is causing extensive injury in 30 per cent of the fields set to tobacco each year and a less amount of injury in another 10 to 20 per cent.

3. The commonly grown varieties of the stand-up and drooping Burleys are highly susceptible to black-root but resistant strains of both these types have been found.

4. The resistant Burley selections are not highly resistant to the disease, but are sufficiently resistant that in heavily infested soils they usually make nearly normal growth under the temperature conditions existing at setting time in Kentucky. They are less resistant than the cigar tobacco variety Kentucky Yellow, and more resistant than the Kentucky dark tobacco varieties. In a diseased plant bed or under the lower temperatures farther north (Harrow, Ontario, Canada) the Kentucky selections show no resistance.

5. In extensive field trials, the Kentucky resistant selections have proved superior to the commonly grown varieties on diseased soil both in rate of growth and quality. On disease-free soil the growth of the resistant strains is usually equal to that of the local varieties, but the quality on an average is slightly higher than the local varieties due to more uniformity of type. Planting of resistant strains has reduced the amount of re-setting necessary in diseased fields.

6. Black root-rot is not the only cause of irregular stands of tobacco. A disease known as brown root-rot, the cause of which is not certainly known, may have much the same effect as black root-rot.

7. It is recommended that growers test a resistant strain of tobacco in comparison with their own strain to determine whether or not their soil is infected with black-root. Losses of 200 or 300 pounds of tobacco per acre often occur which would be hard to detect unless a comparative test were conducted. Several distinct types of resistant Burley tobacco have been developed so that the resistant types as a group should not be condemned as a result of a single unsatisfactory test.

NOTE:—Since this bulletin was written, Miss McCormick has published the results of her work on "Perithecia of *Thielavia basicola* Zopf in culture and the stimulation of their production by extracts from other fungi" (Conn. Agr. Exp. Sta. Bul. 269) in which she has apparently shown that cultures from ascospores of *Thielavia basicola* are distinct from chlamydospore cultures and that the latter organism which is the cause of black root-rot of tobacco should properly be called *Thielaviopsis basicola* (Berk) Ferraris.

Kentucky

Agricultural Experiment Station

University of Kentucky

Analyses of Commercial Fertilizers

BULLETIN NO. 263



December, 1925
Lexington, Ky.

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BULLETIN NO. 263

Analyses of Commercial Fertilizers

By H. E. Curtis, H. R. Allen and Lelah Gault

This Bulletin gives the names of all brands of fertilizer registered in this State during the year 1925, the names of the manufacturers, and the official analyses.

Those interested in the use of fertilizers for different crops should apply to the College of Agriculture, the Experiment Station, or to their County Agent, and such literature as bears on the subject in which they are interested will be furnished. Bulletin No. 228 of the Experiment Station, showing the results obtained on the soil experiment fields, is of special interest to all users of fertilizers.

Samples Analyzed.

There were registered during the year a total of 782 brands of fertilizer as follows:

Complete fertilizers, containing all three of the essential ingredients—phosphoric acid, nitrogen and potash	461 brands
Nitrogenous superphosphates	67 brands
Acid phosphate and potash mixtures	67 brands
Acid phosphates	112 brands
Bones, tankage, etc	58 brands
Nitrate of soda	7 brands
Ammonium sulfate	4 brands
Potash salts	6 brands

We have analyzed 751 samples of fertilizer collected by our inspectors or sent in by various persons in the State, in addition to the official samples. These analyses are to be found in the following pages, and have been divided into two groups—The first group, Table I, contains all analyses that are considered satisfactory, either because the analyses run high in all respects, or the deficiency in one ingredient is fully met by the excess in another. The second group, Table II, contains those analyses that are considered deficient.

As has been our custom in the past, we have shown an index of relative value for the purpose of comparison. The following factors have been used in computing these values:

Available phosphoric acid in mixed fertilizers	1.5
Available phosphoric acid in acid phosphates	1.2
Insoluble phosphoric acid in complete fertilizers	0.4
Insoluble phosphoric acid in nitrogenous superphosphates	0.4
Phosphoric acid in bone	0.8
Nitrogen in all fertilizers	5.0
Potash in all fertilizers	2.0

Explanation of the Tables.

In the tables of analyses, following the name of each brand will be found the analyses of such samples as have been collected by our inspectors, sent in by farmers, or furnished by the manufacturers, and the manufacturer's guaranty, printed last in italic figures. In Table II the figures set in bold face type are those results which are considered too low to be acceptable. In a number of cases the same brand of fertilizer will be found in both Tables, I and II—in which case they are marked in each table with a (†) dagger.

In Table I there are a number of analyses that, notwithstanding they are considered good enough to be placed in Table I, have objectionable features to which we desire to call attention: There are quite a number of cases where the potash is guaranteed from sulfate and the analyses made of some of these brands show the potash to be from muriate, no sulfate whatever having been used. Four or five companies have too many analyses of this class.

It will be noticed in Table II that a large number of analyses have been put into this table on account of the deficiency in total phosphoric acid. This comes from attempting to show a large amount of insoluble phosphoric acid in addition to the guaranty of available phosphoric acid, and, on account of this tendency to show a larger per cent of insoluble phosphoric acid than the goods contain, it has been deemed advisable to classify them among the deficient brands of fertilizer, hoping in this manner to induce the manufacturer to change these large guarantees of 4% or 5% insoluble phosphoric acid to 1% or 2%.

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	A. D. Adair and McCarty Bros., Inc. Atlanta, Ga., and Chattanooga, Tenn.	
68006	A. and M. Old Glory Mixture	Manufacturer Guaranteed
68007	Adair's Soluble Pacific Guano	* Guaranteed
68008	A. and M. Standard Tobacco Grower	Manufacturer Guaranteed
68010	A. and M. Special Tobacco and Potato Grower	* Guaranteed
68011	A. and M. High Grade Potash Compound	* Guaranteed
68012	A. & M. High Grade Acid Phosphate	Manufacturer Guaranteed
68013	A. and M. High Grade Complete Fertilizer No. 765	* Guaranteed
68014	A. and M. Old Reliable Fertilizer	Manufacturer Guaranteed
68015	A. & M. High Grade Acid Phosphate No. 18	Manufacturer Guaranteed
68016	Nitrate of Soda	Manufacturer Guaranteed
68017	Muriate of Potash	Manufacturer Guaranteed
	Alabama Chemical Co. (of Alabama), Inc., Montgomery, Ala.	
68635	Red Cross Tobacco Special	Manufacturer Guaranteed
68970 69424	Red Cross Acid Phosphate	Cayce-Yost Co., Hopkinsville Calloway Co., Farm Bureau, Murray Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.95 *9.00*	2.10	12.05			0.72	1.74 *1.65*	2.11 *2.00*	3.55 *3.00*		31.6 *27.8*	68006
10.00						*1.65*	*2.00*	*2.00*		*27.3*	68007
7.90 *8.00*	3.00	10.90			0.71	1.59 *1.65*	1.93 *2.00*	2.56 *2.00*		26.1 *24.3*	68008
8.00						*1.65*	*2.00*	*4.00*		*28.2*	68010
10.00								*4.00*		*23.0*	68011
19.90 *16.00*	0.40	20.30								23.9 *19.2*	68012
7.00						*4.94*	*6.00*	*5.00*		*45.2*	68013
10.50 *10.00*	1.70	12.20			1.57	2.64 *2.47*	3.20 *3.00*	3.51 *3.00*		36.7 *33.4*	68014
20.10 *18.00*	1.10	21.20								24.1 *21.6*	68015
						15.40 *15.00*	18.70 *18.22*			77.0 *75.0*	68016
								53.00 *50.00*		106.0 *100.0*	68017
10.70 *10.00*	1.10	11.80			1.86	2.56 *2.47*	3.11 *3.00*	4.36 *3.00*		38.0 *33.4*	68635
18.00 17.75 *16.00*	1.70 0.50	19.70 18.25								21.6 21.3 *19.2*	68970 69424

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Agricultural Chemical Co., Inc., Cincinnati, O.	
68649	A. A. C. Kentucky Tobacco Grower	J. R. Nelson, Eubank
68650		J. W. Schoolcraft, Somerset
68971		D. M. Brakefield, Adairville
69211		J. T. Butler, McKinney
		Guaranteed
68651	A. A. C. Ground Bone	J. W. Schoolcraft, Somerset
68652		Hill Hardware Co., Bowling Green
68653		E. S. Ferrill and Son, Buffalo
69212		R. H. Mayhew Feed Co., Franklin
		Guaranteed
67923	A. A. C. High Grade Bone and Potash	Manufacturer
		Guaranteed
68654	A. A. C. High Grade Fertilizer	E. S. Ferrill and Son, Buffalo
		Guaranteed
68972	A. A. C. Corn and Cotton Grower	Vine Grove Feed Co., Vine Grove
		Guaranteed
68657	A. A. C. Basic Lime Phosphate	Burks Bros. and Edwards, Upton
68658		E. S. Ferrill and Son, Buffalo
68856		J. H. Campbell, Salt Lick
69213		Farm Bureau, Elizabethtown
69214		J. W. Schoolcraft, W. Somerset
69215		J. T. Butler, McKinney
69216		Skaggs and Carver, Horse Cave
		Guaranteed
67929	Bowker's Soluble Bone	Manufacturer
		Guaranteed
68659	Bowker's 16% Acid Phosphate	J. W. Schoolcraft, Somerset
68660		Rupert Devasher, Glasgow
68661		Skaggs and Carver, Horse Cave
69217		J. W. Schoolcraft, W. Somerset
69218		J. T. Butler, McKinney
69219		Estes and Hines, Science Hill
69220		R. H. Mayhew Feed Co., Franklin
		Guaranteed
68662	Bowker's Harvest Bone Phosphate	Skaggs and Carver, Horse Cave
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.00	2.00	11.00			1.17	1.49	1.81	2.10		26.0	68649
8.40	2.00	10.40			1.46	1.75	2.12	2.39		26.9	68650
8.50	2.20	10.70			1.43	1.78	2.16	2.37		27.3	68971
8.45	1.60	10.05			1.37	1.72	2.09	2.20		26.3	69211
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
		28.60	84	16		1.99	2.42			32.8	68651
		28.40	76	24		1.82	2.21			31.8	68652
		28.60	83	17		1.90	2.31			32.4	68653
		30.00	80	20		1.83	2.22			33.2	69212
		27.00				*1.65*	*2.00*			*29.9*	
10.50	1.50	12.00						5.29		26.3	67923
10.00	*2.00*	*12.00*						*5.00*		*25.0*	
9.20	1.60	10.80			2.15	2.61	3.17		5.86	39.2	68654
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
12.00	2.70	14.70			1.39	1.68	2.04	2.13		31.7	68972
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*2.00*		*31.1*	
13.40	2.40	15.80								16.1	68657
13.80	2.30	16.10								16.6	68658
14.20	1.90	16.10								17.0	68856
12.85	1.80	14.65								15.4	69213
14.00	2.00	16.00								16.8	69214
16.55	2.35	18.90								19.9	69215
13.00	1.85	14.85								15.6	69216
13.00	*2.00*	*15.00*								*15.6*	
14.00	2.40	16.40								16.8	67929
14.00	*2.00*	*16.00*								*16.8*	
16.30	1.60	17.90								19.6	68659
17.30	0.80	18.10								20.8	68660
17.00	0.90	17.90								20.4	68661
17.05	1.10	18.15								20.5	69217
16.20	2.20	18.40								19.4	69218
16.65	2.60	19.25								20.0	69219
17.15	1.55	18.70								20.6	69220
16.00	*2.00*	*18.00*								*19.2*	
8.90	1.70	10.60			0.55	0.75	0.91	0.94		19.7	68662
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Agricultural Chemical Co., Inc., Cincinnati, O.	
68663	Bowker's Fish Guano	Gooch and Payne, Eubank Guaranteed
68664	†Bowker's Grain and Grass Grower	Jno. B. Riffe, Hustonville Guaranteed
68665 68973	Bowker's High Grade Tobacco Grower	Skaggs and Carver, Horse Cave W. R. Strange and Co., Middlesboro Guaranteed
68666 68667 69222	Bowker's Potash Fertilizer	Mayhew Feed Co., Franklin Skaggs and Carver, Horse Cave Estes and Hines, Science Hill Guaranteed
68668 68974	Bowker's Tobacco Grower	Mayhew Feed Co., Franklin Harvey Stout and Son, Buechel Guaranteed
67940	Bowker's 20% Acid Phosphate	Manufacturer Guaranteed
68669 68670	Bowker's High Grade Fertilizer	Gooch and Payne, Eubank Jno. B. Riffe, Hustonville Guaranteed
67943	Bradley's High Grade Tobacco	Manufacturer Guaranteed
67944	Bradley's Soluble Dissolved Bone	Manufacturer Guaranteed
68975	Bradley's 16% Acid Phosphate	W. L. Anderson and Son, Caneyville Guaranteed
67952	Bradley's 20% Acid Phosphate	Manufacturer Guaranteed
67953	Cleveland Dryer Works Horsehead Phosphate	Manufacturer Guaranteed
67954	Cleveland Dryer Works XXX Super-Phosphate	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
9.40	1.70	11.10			0.68	0.88	1.07	2.95		25.1	68663
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
9.30	1.70	11.00			1.23	1.52	1.85	2.51		27.3	68664
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
11.30	2.10	13.40			2.00	2.62	3.18		3.11	37.1	68665
12.00	2.00	14.00			2.01	2.32	2.82	0.84	2.13	36.0	68973
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
11.70	1.00	12.70							5.20	28.4	68666
10.50	1.70	12.20						4.60		25.6	68667
10.90	1.30	12.20						5.37		27.6	69222
10.00	*2.00*	*12.00*						*5.00*		*25.0*	
8.80	2.50	11.30			1.29	1.74	2.11		5.39	33.7	68668
8.80	2.90	11.70			1.35	1.77	2.15	0.56	4.50	33.3	68974
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*31.9*	
20.20	1.50	21.70								24.2	67940
20.00	*2.00*	*22.00*								*24.0*	
8.50	2.40	10.90			2.06	2.57	3.12	0.84	5.55	39.3	68669
8.20	2.70	10.90			2.11	2.60	3.16	0.84	5.70	39.5	68670
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
10.20	2.10	12.30			2.00	2.52	3.06	0.84	2.33	35.1	67943
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
14.00	2.40	16.40								16.8	67944
14.00	*2.00*	*16.00*								*16.8*	
17.40	0.90	18.30								20.9	68975
16.00	*2.00*	*18.00*								*19.2*	
20.20	1.50	21.70								24.2	67952
20.00	*2.00*	*22.00*								*24.0*	
10.10	1.60	11.70								12.1	67953
10.00	*2.00*	*12.00*								*12.0*	
14.00	2.40	16.40								16.8	67954
14.00	*2.00*	*16.00*								*16.8*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Agricultural Chemical Co., Inc., Cincinnati, O.	
67955	Cleveland Dryer Works 16% Acid Phosphate	Manufacturer Guaranteed
67962	Cleveland Dryer Works, High Grade Tobacco Grower	Manufacturer Guaranteed
67963	Cleveland Dryer Works 20% Acid Phosphate	Manufacturer Guaranteed
68964	Red Line Phosphate	Manufacturer Guaranteed
68673	Michigan Carbon Works 16% Acid Phosphate	Morehead Feed Co., Morehead
68674		Brownlee, Kennady and Crutcher, Munfordville
68675		Lebanon Carriage & Impl. Co., Lebanon
69223		Hill Hardware Co., Bowling Green
69224		Skaggs and Carver, Horse Cave Guaranteed
68976	†Red Line Complete Manure	Lindsey Orr and Co., Elkton
69226		J. W. Schoolcraft, W. Somerset
69227		Skaggs and Carver, Horse Cave Guaranteed
68677	†Michigan Carbon Works Sure Crop	J. W. Schoolcraft, W. Somerset Guaranteed
68977	Homestead A-1 Potash Fertilizer	C. L. Cummings, Crab Orchard Guaranteed
68678	Michigan Carbon Works Corn and Wheat Phosphate	J. H. Campbell, Salt Lick
68978		Conner-Hayden Co., Bardstown
69229		Lindsey Orr and Co., Elkton
69230		Conner-Hayden Co., Bardstown Guaranteed
68679	†Homestead A. Bone Black Fertilizer	Woodson Lewis and Son, Greensburg
68680		J. F. Collings, Shepherdsville
68681		Woodson Lewis and Son, Greensburg
68979		J. W. Schoolcraft, W. Somerset
68980		E. S. Ferrill and Son, Buffalo Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
16.55	1.10	17.65								19.9	67955
16.00	*2.00*	*18.00*								*19.2*	
10.20	2.10	12.30			2.00	2.52	3.06	0.84	2.33	35.1	67962
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
20.20	1.50	21.70								24.2	67963
20.00	*2.00*	*22.00*								*24.0*	
14.00	2.40	16.40								16.8	67964
14.00	*2.00*	*16.00*								*16.8*	
17.30	2.00	19.30								20.8	68673
17.50	1.00	18.50								21.0	68674
15.50	1.30	16.80								18.6	68675
17.35	2.50	19.85								20.8	69223
16.85	2.45	19.30								20.2	69224
16.00	*2.00*	*18.00*								*19.2*	
8.50	1.90	10.40			0.72	0.99	1.20	1.17		20.8	68976
8.15	1.85	10.00			0.60	0.85	1.03	1.27		19.8	69226
8.55	1.80	10.35			0.59	0.84	1.02	1.08		19.9	69227
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	
8.50	2.00	10.50			0.95	1.06	1.29	1.68		22.2	68677
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*21.7*	
8.40	2.10	10.50			0.59	0.90	1.09	3.06		24.1	68977
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
10.30	3.50	13.80			0.69	1.00	1.21	0.80	0.49	24.4	68678
10.80	1.70	12.50			0.61	0.83	1.01	1.07		23.2	68978
10.10	2.70	12.80			0.47	0.86	1.04	1.43		23.4	69229
10.95	1.40	12.55			0.74	0.89	1.08	1.06		23.6	69230
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.09*		*22.7*	
9.10	2.10	11.20			1.57	2.03	2.46	1.48		27.6	68679
8.60	1.40	10.00			1.80	2.15	2.61	1.57		27.4	68680
11.10	1.40	12.50			2.07	2.49	3.02	2.92		35.5	68681
8.50	2.20	10.70			1.74	2.25	2.73	1.64		28.2	68979
9.80	1.00	10.80			1.67	2.25	2.73	1.46		29.3	68980
8.00	*4.00*	*12.00*				*2.06*	*2.50*	*1.50*		*26.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Agricultural Chemical Co., Inc., Cincinnati, O.	
68682	Homestead Tobacco and Truck Grower	Lebanon Car. and Impl. Co., Lebanon
68981		W. S. Overstreet, LaGrange
		Guaranteed
68683	†Homestead Tobacco Grower	Burke Bros. and Edwards, Upton
68684		J. R. Davis and Bro., Campbellsville
68685		Brownlee, Kennady & Crutchfield, Munfordville
68982		E. S. Ferrill and Son, Buffalo
		Guaranteed
68984	Michigan Carbon Works High Potash Phosphate	Geo. T. Gillum and Son, Russellville
69236		Skaggs and Carver, Horse Cave
		Guaranteed
68686	†Homestead Potato and Tobacco Special	Staggs Bros., Vanceburg
68687		J. H. Campbell, Salt Lick
68688		J. W. Schoolcraft, Somerset
68985		C. P. Clark and Son, Owensboro
68987		Morehead Feed Co., Morehead
		Guaranteed
68689	Michigan Carbon Works 20% Acid Phosphate	J. H. Campbell, Salt Lick
		Guaranteed
68690	Michigan Carbon Works High Grade Fertilizer	Burks Bros. and Edwards, Upton
		Guaranteed
67978	N.-W. Horseshoe Br. Square Deal Phosphate	Manufacturer
		Guaranteed
68691	N.-W. Horseshoe Br. 16% Acid Phosphate	J. R. Nelson, Eubank
68692		Woodson Lewis and Son, Greensburg
68988		G. W. Hill Grocery Co., Covington
		Guaranteed
68693	N.-W. Horseshoe Br. Dark Tobacco Grower	J. W. Schoolcraft, Somerset
68694		Woodson Lewis and Son, Greenburg
		Guaranteed
68696	†N-W Horseshoe Br. C. and W. Phosphate	J. W. Schoolcraft, Somerset
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
11.00	2.60	13.60			1.81	2.46	2.99	0.60	2.40	35.8	68682
10.55	1.95	12.50			2.24	2.62	3.18	1.32		32.4	68981
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*31.0*	
11.30	2.20	13.50			2.10	2.61	3.17		3.08	37.0	68683
11.70	1.90	13.60			2.07	2.62	3.18		3.28	38.0	68684
11.90	1.20	13.10			2.00	2.49	3.02		2.92	36.6	68685
10.80	2.80	13.60			1.73	2.42	2.94		2.68	34.8	68982
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
10.70	1.70	12.40						4.93		25.9	68984
11.20	1.90	13.10						5.34		27.5	69236
10.00	*2.00*	*12.00*						*5.00*		*25.0*	
8.60	2.60	11.20			1.40	1.78	2.16	0.80	4.36	33.2	68686
8.30	3.10	11.40			1.42	1.90	2.31	0.96	4.45	34.0	68687
8.00	2.80	10.80			1.34	1.80	2.19	0.52	4.51	32.2	68688
9.95	1.70	11.65			1.35	1.60	1.94		4.96	33.5	68985
7.45	4.30	11.75			1.28	1.81	2.20	0.68	4.63	32.6	68987
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*31.9*	
20.75	1.35	22.10								24.9	68689
20.00	*2.00*	*22.00*								*24.0*	
8.80	2.20	11.00			2.15	2.61	3.17	0.84	5.16	39.1	68690
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
14.00	2.40	16.40								16.8	67978
14.00	*2.00*	*16.00*								*16.8*	
17.30	1.30	18.60								20.8	68691
16.50	1.80	18.30								19.8	68692
18.15	0.90	19.05								21.8	68988
16.00	*2.00*	*18.00*								*19.2*	
8.50	2.20	10.70			0.56	0.85	1.03	1.00		19.9	68693
8.90	1.20	10.10			0.60	0.85	1.03	1.10		20.3	68694
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	
10.80	2.40	13.20			0.72	1.00	1.21	1.20		24.6	68696
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*22.7*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	
	The American Agricultural Chemical Co., Inc., Cincinnati, O.		
68697	†N-W Horseshoe Br. Challenge Corn Grower	Grayson County Supply Co., Litchfield Guaranteed	8 8
67987	N-W Horseshoe Br. High Grade Tobacco Grower	Manufacturer Guaranteed	10 10
67988	N-W Horseshoe Br. 10-5 Potash Manure	Manufacturer Guaranteed	10 10
67990	N-W Horseshoe Br. 20% Acid Phosphate	Manufacturer Guaranteed	20 20
69240	N-W Horseshoe Br. Quick Acting Phosphate	E. S. Ferrill and Sons, Buffalo Guaranteed	13 10
67992	N-W Horseshoe Br. High Grade Fertilizer	Manufacturer Guaranteed	8 8
67993	Packers Boar's Head Br. Soluble Phosphate	Manufacturer Guaranteed	10 10
67994	Packers Boar's Head Br. Gilt Edge Phosphate	Manufacturer Guaranteed	14 14
68698	Packers Boar's Head Br. 16% Acid Phosphate	H. D. Jones, Glasgow Guaranteed	16 16
68002	Packers Boar's Head Br. High Grade Tobacco Grower	Manufacturer Guaranteed	10 10
68003	Packers Boar's Head Br. Potash Phosphate Fertilizer	Manufacturer Guaranteed	10 10
68005	Packers Boar's Head Br. 20% Acid Phosphate	Manufacturer Guaranteed	20 20
	Armour Fertilizer Works, Louisville, Cincinnati, Nashville.		
68700	†Big Crop Burley Tobacco Grower	J. W. Hicks, Upton	7
68701		Durham Implement Co., Danville	7
68989		Broaddus Forbes Co., Richmond Guaranteed	7 8
68157	Big Crop Potato Grower	Manufacturer Guaranteed	8 8

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
8.05	2.90	10.95			1.20	1.62	1.97	2.03		25.4	68697
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
10.20	2.10	12.30			2.00	2.52	3.06	0.84	2.33	35.1	67987
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
10.50	1.50	12.00						5.29		26.3	67988
10.00	*2.00*	*12.00*						*5.00*		*25.0*	
20.20	1.50	21.70								24.2	67990
20.00	*2.00*	*22.00*								*24.0*	
13.30	2.10	15.40								16.0	69240
10.00	*2.00*	*12.00*								*12.0*	
8.50	1.80	10.30			2.15	2.49	3.02	4.40	1.71	38.1	67992
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
10.10	1.60	11.70								12.1	67993
10.00	*2.00*	*12.00*								*12.0*	
14.00	2.40	16.40								16.8	67994
14.00	*2.00*	*16.00*								*16.8*	
16.90	2.00	18.90								20.3	68698
16.00	*2.00*	*18.00*								*19.2*	
10.20	2.10	12.30			2.00	2.52	3.06	0.84	2.33	35.1	68002
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
10.50	1.50	12.00						5.29		26.3	68003
10.00	*2.00*	*12.00*						*5.00*		*25.0*	
20.20	1.50	21.70								24.2	68005
20.00	*2.00*	*22.00*								*24.0*	
7.80	1.80	9.60			1.40	2.42	2.94	0.68	5.28	36.4	68700
7.90	1.30	9.20			1.37	2.42	2.94		6.00	36.5	68701
7.80	1.20	9.00			1.43	2.57	3.12	1.00	4.84	36.7	68989
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
8.10	1.40	9.50			1.91	2.72	3.30	0.88	4.92	37.9	68167
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Armour Fertilizer Works, Louisville, Cincinnati, Nashville.	
68702	Big Crop Plant Bed Special	C. S. Brent Seed Co., Lexington
68703		T. C. Tatum, Springfield
68704		Harrodsburg Implement Co., Harrodsburg
68990		R. T. Kirkman, Elkton
69241		Humphry Bros., Bloomfield
		Guaranteed
68705	†Big Crop Dark Tobacco Grower	Farmers Supply Co., Hodgenville
		Guaranteed
68160	Big Crop 2-16-2 Fertilizer	Manufacturer
		Guaranteed
68707	Big Crop 2-12-2 Fertilizer	Taylor County Supply Co., Campbellsville
		Guaranteed
68708	Big Crop 2-10-4	R. D. Taylor Feed and Supply Co., Ashland
68992		Hudson and Farnau, Lancaster
69242		Durham Implement Co., Danville
		Guaranteed
69243	Armour's 1-12-1 Fertilizer	Taylor County Supply Co., Campbellsville
69244		T. J. Turley Co., Owensboro
		Guaranteed
68993	Armour's 2-8-2 Fertilizer	Cadiz Hardware Co., Cadiz
69245		Taylor County Supply Co., Campbellsville
69246		John P. Marriott, Cecilia
		Guaranteed
68165	Armour's 2-12-0 Fertilizer	Manufacturer
		Guaranteed
68166	Armour's 1-8-1 Fertilizer	Manufacturer
		Guaranteed
68167	Big Crop 4-10-4 Fertlizer	Manufacturer
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
8.10	2.20	10.30			2.23	3.30	4.01	0.80	2.15	35.4	68702
7.60	2.50	10.10			2.08	3.22	3.91	0.76	2.30	34.6	68703
7.80	2.20	10.00			1.83	2.98	3.62	0.68	2.76	34.4	68704
8.60	1.20	9.80			2.10	3.51	4.26	0.56	2.25	36.6	68990
8.05	2.10	10.15			2.02	3.09	3.75		3.13	34.6	69241
8.00	*1.00*	*9.00*				*3.29*	*4.00*		*3.00*	*34.9*	
7.90	1.40	9.30			0.93	1.76	2.14		3.67	28.6	68705
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*28.7*	
16.90	0.50	17.40			2.07	2.07	2.51	2.62		41.1	68160
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*36.7*	
12.30	0.80	13.10			1.15	1.52	1.85	2.03		30.4	68707
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*30.7*	
10.10	0.70	10.80			1.25	1.62	1.97	4.11		31.8	68708
10.15	0.70	10.85			1.23	1.61	1.95	4.17		31.9	68992
10.40	0.65	11.05			1.32	1.54	1.87	3.95		31.5	69242
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*31.7*	
12.25	1.10	13.35			0.60	0.82	1.00	1.04		25.0	69243
12.00	2.50	14.50			0.77	0.97	1.18	1.47		26.8	69244
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*24.5*	
11.55	1.55	13.10			1.88	2.25	2.73	2.68		34.6	68993
8.00	0.50	8.50			1.35	1.64	1.99	1.28	0.78	24.5	69245
8.25	0.40	8.65			1.17	1.46	1.77	1.28	0.74	23.9	69246
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*24.7*	
12.95	1.95	14.90			1.56	1.94	2.36			29.9	68165
12.00	*1.00*	*13.00*				*1.65*	*2.00*			*26.7*	
9.10	2.90	12.00			0.75	0.95	1.15	1.32		22.2	68166
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*18.5*	
10.60	1.85	12.40			2.81	3.37	4.09	4.51		42.5	68167
10.00	*1.00*	*11.00*				*3.29*	*4.00*	*4.00*		*39.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Armour Fertilizer Works, Louisville, Cincinnati, Nashville.	
69247	†Big Crop Bone Meal	Anderson and Spilman, Danville
69249		Big Four Co., Franklin
		Guaranteed
68710	Big Crop Raw Bone	C. S. Brent Seed Co., Lexington
69250		Cayce-Yost Co., Hopkinsville
		Guaranteed
68711	Big Crop 16% Acid Phosphate	J. M. Gray, Tollesboro
68712		Taylor County Supply Co., Campbellsville
68713		Barren Co. Grocery and Hdw. Co., Glasgow
69251		C. I. Vransteter, Glasgow
69252		Johnson and Wilson, Auburn
69253		Taylor County Supply Co., Campbellsville
		Guaranteed
68714	Big Crop 20% Superphosphate	Taylor County Supply Co., Campbellsville
68997		Sam Terry, Big Clifty
68998		Hudson and Farnau, Lancaster
69255		The T. J. Turley Co., Owensboro
		Guaranteed
69000	†Big Crop 4-16-4 Fertilizer	D. M. Brakefield, Adairville
69257		The T. J. Turley Co., Owensboro
		Guaranteed
68174	Big Crop 4-12-4 Fertilizer	Manufacturer
		Guaranteed
68175	Big Crop High Grade Tobacco Grower	Manufacturer
		Guaranteed
69004	Big Crop Black Patch Special	D. M. Brakefield, Adairville
		Guaranteed
68177	Armour's Bonus "A" Humus	*
		Guaranteed
69005	†Big Crop 2-12-6 Fertilizer	Sweeney Bros., Lawrenceburg
		Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
		27.30	71	29		2.38	2.89			33.7	69247
		27.75	72	28		2.69	3.27			35.7	69249
		27.00				*2.47*	*3.00*			*34.0*	
		23.40	92	8		4.10	4.98			39.2	68710
		23.50	100			3.91	4.75			38.4	69250
		22.00				*3.71*	*4.50*			*36.2*	
16.75	0.65	17.40								20.1	68711
16.30	2.00	18.30								19.6	68712
17.10	0.90	18.00								20.5	68713
17.70	2.30	20.00								21.2	69251
16.55	2.90	19.45								19.9	69252
16.65	1.25	17.90								20.0	69253
16.00	*1.00*	*17.00*								*19.2*	
20.90	0.70	21.60								25.1	68714
19.90	0.50	20.40								23.9	68997
21.30	0.20	21.50								25.6	68998
21.30	0.90	22.20								25.6	69255
20.00	*1.00*	*21.00*								*24.0*	
16.00	0.70	16.70			3.32	3.32	4.03	4.56		50.0	69000
16.60	1.35	17.95			3.19	3.19	3.87	4.06		49.5	69257
16.00	*1.00*	*17.00*				*3.29*	*4.00*	*4.00*		*48.9*	
12.90	1.80	14.70			3.40	3.72	4.52	5.34		49.4	68174
12.00	*1.00*	*13.00*				*3.29*	*4.00*	*4.00*		*42.9*	
11.20	1.80	13.00			1.29	1.88	2.28	0.76	8.57	45.6	68175
10 00	*1.00*	*11.00*				*1.65*	*2.00*		*10.00*	*43.7*	
8.50	2.55	11.05			1.71	2.36	2.87	0.92	5.04	37.6	69004
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
											68177
12.00	*1.00*	*13.00*				*0.82*	*1.00*			*22.5*	
12.25	0.70	12.95			1.19	1.65	2.00	5.60		38.1	69005
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*6.00*		*38.7*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Armour Fertilizer Works, Louisville, Cincinnati, Nashville.	
68179	Big Crop 0-14-4 Fertilizer	Manufacturer Guaranteed
68180	Big Crop 0-10-10 Fertilizer	Manufacturer Guaranteed
68181	Armour's 1-8-4 Fertilizer	Manufacturer Guaranteed
69254	Ideal 16% Acid Phosphate	The T. J. Turley Co., Owensboro Guaranteed
68592	Ideal 17% Acid Phosphate	Manufacturer Guaranteed
68715	Armour's Champion	Farmers Supply Co., Hodgenville Guaranteed
68966	Big Crop 2-16-8 Fertilizer	* Guaranteed
	The C. S. Brent Seed Co., Lexington, Ky.	
69426	Brent's Grain Grower	Manufacturer's Warehouse Guaranteed
	The Buhner Fertilizer Co., Seymour, Ind.	
68717 69008	Buhner's 1-11-3	Farmers Supply Co., Loretto Burnett and Horn, Vine Grove Guaranteed
68718 69258 69259	Buhner's ½-11-1	Farmers Supply Co., Hodgenville I. K. Miller and Sons, Campbellsville J. S. McMurtry, Elizabethtown Guaranteed
68719	Buhner's 3-10-4	Farmers Supply Co., Hodgenville Guaranteed
68720	Buhner's 0-10-2	Farmers Supply Co., Hodgenville Guaranteed
69009	Buhner's 3-8-6 (Muriate)	Burnett and Horn, Vine Grove Guaranteed

* The manufacturer failed to furnish sample as required by law

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
15.15	1.50	16.65						4.24		31.2	68179
14.00	*1.00*	*15.00*						*4.00*		*29.0*	
10.35	1.50	11.85						11.18		37.9	68180
10.00	*1.00*	*11.00*						*10.00*		*35.0*	
8.90	2.60	11.50			0.50	0.91	1.10	0.92	3.03	26.8	68181
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*24.5*	
17.00	2.40	19.40								20.4	69254
16.00	*1.00*	*17.00*								*19.2*	
17.50	0.60	18.10								21.0	68592
17.00	*1.00*	*18.00*								*20.4*	
8.10	0.70	8.80			0.52	0.79	0.96	3.80		24.0	68715
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*24.5*	
											68966
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*8.00*		*48.7*	
7.80	0.70	8.50			0.51	0.80	0.97	0.97		17.9	69426
8.00						*0.82*	*1.00*		*1.00*	*18.1*	
11.85	1.35	13.20			0.47	0.88	1.07	2.70		28.1	68717
10.80	1.50	12.30			0.33	0.89	1.08	3.15		27.6	69008
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*3.00*		*27.4*	
10.70	1.30	12.00				0.58	0.70	1.07		21.6	68718
11.80	0.90	12.70				0.44	0.53	1.22		22.7	69258
12.20	0.80	13.00				0.41	0.50	1.22		23.1	69259
11.00	*2.00*	*13.00*				*0.41*	*0.50*	*1.00*		*21.4*	
9.55	3.80	13.35			1.04	2.40	2.91	4.20		36.3	68719
10.00	*2.00*	*12.00*				*2.47*	*3.00*	*4.00*		*36.2*	
9.60	0.80	10.40						1.95		18.3	68720
10.00	*1.00*	*11.00*						*2.00*		*19.0*	
8.90	1.20	10.10			1.82	2.44	2.96	6.25		38.5	69009
8.00	*2.00*	*10.00*				*2.47*	*3.00*	*6.00*		*37.2*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The Buhner Fertilizer Co., Seymour, Ind.	
69261	Buhner's Raw Bone	Farmers Supply Co., Loretto Guaranteed
68724	Buhner's 16%	Farmers Supply Co., Loretto
68725		J. S. McMurtry, Elizabethtown
69262		J. S. McMurtry, Elizabethtown
69263		I. K. Miller and Sons, Campbellsville
		Guaranteed
68726	†Buhner's Special Crop Grower	J. S. McMurty, Elizabethtown
68728		A. W. Tarter, Columbia
69264		Farmers Supply Co., Loretto
		Guaranteed
68536	Buhner's Nitrate Soda	Manufacturer Guaranteed
68537	Buhner's Ground Bone	Manufacturer Guaranteed
68538	Buhner's 2-8-3	Manufacturer Guaranteed
68957	Buhner's 2-8-6	Manufacturer Guaranteed
69206	Buhner's 4-16-4	Manufacturer Guaranteed
69207	Buhner's 0-10-5	Manufacturer Guaranteed
	Calumet Fertilizer Co., New Albany, Ind.	
68729	Calumet Br. 16% Acid Phosphate	Geo. W. Richardson, Somerset
68730		A. W. Tarter, Columbia
69010		Patrick Dillon, Hardinsburg
69265		J. H. Jasper, W. Somerset
69266		Geo. Richardson, Somerset
		Guaranteed
69267	Calumet Br. 20% Acid Phosphate	L. Montgomery, Greensburg
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		24.00	58	42		3.33	4.04			35.9	69261
		21.00				*3.71*	*4.50*			*35.4*	
17.00	1.00	18.00								20.4	68724
15.80	1.50	17.30								19.0	68725
16.85	0.80	17.65								20.2	69262
16.90	0.80	17.70								20.3	69263
16.00										*19.2*	
7.60	3.55	11.15			0.51	1.55	1.88	6.64		33.9	68726
8.15	3.50	11.65			0.55	1.67	2.03	6.88		35.7	68728
7.95	3.35	11.30			0.71	1.68	2.04	6.00		33.7	69264
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*6.00*		*33.9*	
						15.48	18.80			77.4	68536
						15.00	*18.21*			*75.0*	
		29.20	75	25		2.15	2.61			34.1	68537
		24.00				*2.47*	*3.00*			*31.6*	
7.40	2.70	10.10			0.59	1.32	1.60	5.14		29.1	68538
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*3.00*		*27.1*	
10.00	2.60	12.60			0.55	1.52	1.85	6.00		35.6	68957
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*6.00*		*33.1*	
15.30	1.70	17.00			2.61	3.21	3.90	5.03		49.7	69206
16.00						*3.29*	*4.00*	*4.00*		*48.5*	
10.15	2.50	12.65						19.46		54.3	69207
10.00								*5.00*		*25.0*	
16.25	1.20	17.45								19.5	68729
17.45	0.75	18.20								20.9	68730
15.75	0.70	16.45								18.9	69010
16.30	1.20	17.50								19.6	69265
15.95	1.75	17.70								19.1	69266
16.00	*2.00*	*18.00*								*19.2*	
21.50	0.50	22.00								25.8	69267
20.00	*2.00*	*22.00*								*24.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Calumet Fertilizer Co., New Albany, Ind.	
68731	†Calumet Br. 2-12-2	G. W. Richardson, Somerset Guaranteed
69269	Calumet Br. 2-12-6	J. H. Jasper, W. Somerset Guaranteed
68281	Calumet Br. Potato and Tobacco Special	* Guaranteed
69011 69012 69270	Calumet Br. Corn and Wheat Special	H. C. Baughman, Stanford Barnett Bros. Hdw. Co., London B. G. Taylor, Monticello Guaranteed
68283	Calumet Br. Otto Voyles Two in One	* Guaranteed
68732 69013	†Calumet Br. Kentucky Tobacco Grower	G. W. and W. T. Spaun, Monticello Patrick Dillon, Hardinsburg Guaranteed
68285	Calumet Br. High Grade Tobacco and Truck Grower	* Guaranteed
69014 69271	Calumet Br. Onion and Tobacco Grower	Farmers Supply Co., Williamsburg J. H. Jasper, W. Somerset Guaranteed
69272	Calumet Br. Crop Grower	J. H. Jasper, W. Somerset Guaranteed
69274	Calumet Br. Half and Half	Vine Grove Feed Co., Vine Grove Guaranteed
68497	Calumet Br. Tobacco Grower	* Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
11.80	3.80	15.60			0.81	1.55	1.88	1.94		30.9	68731
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*31.9*	
12.05	2.10	14.15			0.82	1.63	1.98	5.90		38.9	69269
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*6.00*		*39.9*	
											68281
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*31.9*	
8.15	2.25	10.40			1.03	1.89	2.29	2.74		28.1	69011
8.20	2.40	10.60			0.69	1.63	1.98	2.12		25.7	69012
9.80	1.80	11.60			0.78	1.59	1.93	1.93		27.2	69270
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
											68283
16.00	*4.00*	*20.00*				*1.65*	*2.00*	*2.00*		*37.9*	
7.35	3.20	10.55			0.73	1.52	1.85	9.28		38.5	68732
8.20	2.20	10.40			0.74	1.53	1.86	7.97		36.8	69013
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*8.00*		*37.9*	
											68285
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*4.00*		*37.0*	
8.50	2.00	10.50			0.37	0.78	0.95	3.18		23.8	69014
9.80	1.35	11.15			0.47	1.02	1.24	3.48		27.3	69271
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
13.90	1.65	15.55			0.56	1.21	1.47	1.93		31.4	69272
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	
9.50	2.65	12.15			0.81	1.88	2.28	1.57		27.9	69274
6.00	*6.00*	*12.00*				*2.06*	*2.50*	*1.00*		*23.7*	
											68497
8.00	*4.00*	*12.00*				*2.47*	*3.00*	*6.00*		*38.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Consolidated Chemical Co., Louisville, Ky.	
68736	Camel Br. Extra High Grade Phosphate	G. B. Pruitt, Moreland Guaranteed
69276	Camel Br. Harvest King	Lonnie Jackson, Caneyville Guaranteed
68133	Camel Br. High Grade Fertilizer	Manufacturer Guaranteed
69021 69278	Camel Br. High Grade Phosphate	W. G. Kirk, Fordsville E. S. Ferrill & Son, Buffalo Guaranteed
68139	Camel Br. Acid Phosphate	Manufacturer Guaranteed
68964	Camel Br. Steamed Bone Meal	Manufacturer Guaranteed
	Duncan and Sherley, LaGrange, Ky.	
69022	Tiger Br. Phosphate and Tankage	Manufacturer's Warehouse Guaranteed
69023	Tiger Br. Potato Grower	Manufacturer's Warehouse Guaranteed
69024	Tiger Br. Corn and Wheat Grower	Manufacturer's Warehouse Guaranteed
69025	Tiger Br. A-1 Tobacco Grower	Manufacturer's Warehouse Guaranteed
69026	Tiger Br. Special Tobacco Grower	Manufacturer's Warehouse Guaranteed
	The Empire Guano Co., Nashville, Tenn.	
68037	High Grade Acid Phosphate	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
18.30 *18.00*	1.80 *2.00*	20.10 *20.00*								22.0 *21.6*	68736
9.80 *8.00*	1.00 *4.00*	10.80 *12.00*			0.75	1.03 *0.82*	1.25 *1.00*	2.34 *2.00*		24.9 *21.7*	69276
10.70 *10.00*	0.60 *4.00*	11.30 *14.00*			0.95	1.75 *1.65*	2.12 *2.00*			25.0 *24.9*	68133
18.15 18.30 *16.00*	0.15 0.70 *2.00*	18.30 19.00 *18.00*								21.8 22.0 *19.2*	69021 69278
15.60 *14.00*	0.70 *2.00*	16.30 *16.00*								18.7 *16.8*	68139
		25.65 *24.00*	69	31		2.48 *2.47*	3.01 *3.00*			32.9 *31.6*	68964
12.50 *12.00*	1.50 *2.00*	14.00 *14.00*			0.44	0.93 *0.82*	1.13 *1.00*			24.0 *22.9*	69022
11.20 *10.00*	3.20 *2.00*	14.40 *12.00*			1.84	2.95 *3.29*	3.58 *4.00*	4.11	*4.00*	41.1 *40.3*	69023
10.80 *10.00*	2.00 *2.00*	12.80 *12.00*			0.23	0.60 *0.41*	0.73 *0.50*			20.0 *17.9*	69024
8.20 *8.00*	3.10 *2.00*	11.30 *10.00*			1.55	2.60 *2.47*	3.16 *3.00*	6.83	*6.00*	40.2 *37.2*	69025
10.10 *10.00*	2.20 *2.00*	12.30 *12.00*			1.22	2.01 *1.65*	2.44 *2.00*	5.16	*4.00*	36.7 *32.1*	69026
14.70 *14.00*	7.00 *4.00*	21.70 *18.00*								17.6 *16.8*	68037

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The Empire Guano Co., Nashville, Tenn.	
68737	Climax Acid Phosphate	G. M. Stevenson, Columbia
68738		Darnell and Combess, Russell Springs
69279		G. M. Stevenson, Columbia
		Guaranteed
68039	Premium Acid Phosphate	Manufacturer
		Guaranteed
68040	High Grade Potash Mixture	Manufacturer
		Guaranteed
68041	Blood, Bone and Potash	Manufacturer
		Guaranteed
68739	Climax Tobacco Grower	Darnell and Combess, Russell Springs
		Guaranteed
69028	Red Banner Tobacco Grower	Miner Denton, Hillsboro
		Guaranteed
68044	High Grade Tobacco Grower	Manufacturer
		Guaranteed
68045	Ky. Tobacco and Truck Grower	Manufacturer
		Guaranteed
68740	Ky. Premium Guano	G. M. Stevenson, Columbia
68741		C. I. Medaris, Esto
		Guaranteed
68047	Wheat and Corn Grower	Manufacturer
		Guaranteed
68048	Half and Half	Manufacturer
		Guaranteed
68049	Pure Raw Bone Meal	Manufacturer
		Guaranteed
69199	Superb Golden Harvest	Manufacturer
		Guaranteed
	The Evansville Packing Co., Evansville, Ind.	
69280	High Grade Acid Phosphate	Eldred Hardware Co., Princeton
69029		Atherton, Kidd and Co., Livermore
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
17.00	3.75	20.75								20.4	68737
17.75	3.85	21.60								21.3	68738
18.50	3.40	21.90								22.2	69279
16.00	*2.00*	*18.00*								*19.2*	
18.90	3.60	22.50								22.7	68039
18.00	*2.00*	*20.00*								*21.6*	
10.50	10.20	20.70						4.52		24.8	68040
10.00	*5.00*	*15.00*						*4.00*		*23.0*	
8.70	9.40	18.10			0.38	1.79	2.17	2.64		31.0	68041
8.00	*5.00*	*13.00*				*1.65*	*2.00*	*2.00*		*26.3*	
9.30	9.75	19.05			0.48	1.22	1.48	1.59		27.1	68739
8.00	*6.00*	*14.00*				*0.82*	*1.00*	*1.00*		*20.5*	
8.70	8.40	17.10			0.83	1.81	2.20	2.76		31.0	69028
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*2.00*	*26.3*	
10.00	3.60	13.60			0.61	2.11	2.56	0.68	3.80	36.0	68044
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*4.00*	*29.9*	
7.80	5.60	13.40			0.47	2.90	3.52	1.08	6.14	42.9	68045
8.00	*3.00*	*11.00*				*2.47*	*3.00*		*6.00*	*37.6*	
7.75	10.75	18.50			0.30	0.64	0.78	4.20	0.72	29.0	68740
8.70	10.35	19.05			0.22	0.46	0.56	4.35		28.1	68741
8.00	*6.00*	*14.00*				*0.41*	*0.50*	*4.00*		*24.5*	
13.80	3.60	17.40			0.31	0.51	0.62	1.26		27.2	68047
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*22.6*	
		21.40	68	32		2.15	2.61			27.9	68048
		20.00				*1.85*	*2.25*			*25.3*	
		20.80	47	53		3.93	4.77			36.3	68049
		20.00				*3.71*	*4.50*			*34.6*	
10.80	3.30	14.10			0.23	0.52	0.63	3.97		28.1	69199
8.00						*0.82*	*1.00*	*3.00*		*22.1*	
16.95	2.35	19.30								20.3	69280
16.40	2.50	18.90								19.7	69029
16.00										*19.2*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The Evansville Packing Co., Evansville, Ind.	
68061	Grain Booster	Manufacturer Guaranteed
68062	Golden Harvest	Manufacturer Guaranteed
69030	Phosphate and Potash Special	Atherton, Kidd and Co., Livermore Guaranteed
68064	Wonder Growth	Manufacturer Guaranteed
69281 69031	Three "B"	Eldred Hardware Co., Princeton Lambert Gresham Hdw. Co., Henderson Guaranteed
68066	Potato and Tobacco Grower	Manufacturer Guaranteed
68067	Tobacco Booster	Manufacturer Guaranteed
68068	Special Ten-Ten	Manufacturer Guaranteed
68069	Half and Half Mixture	Manufacturer Guaranteed
68071	Tobacco Special	Manufacturer Guaranteed
68072	Corn and Wheat Special	Manufacturer Guaranteed
68073	Farmers Special	Manufacturer Guaranteed
68074	Vegetable Special	Manufacturer Guaranteed
68075	Pure Raw Bone	Manufacturer Guaranteed
69198	Superb Corn and Wheat Special	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
16.10 *8.00*	1.20	17.30			2.15	2.15 *0.82*	2.61 *1.00*		3.30 *1.00*	42.0 *18.1*	68061
12.50 *8.00*	0.70	13.20			2.21	2.21 *0.82*	2.68 *1.00*	0.68	5.33 *3.00*	42.1 *22.1*	68062
9.50 *10.00*	2.20	11.70						4.09	 *4.00*	22.4 *23.0*	69030
16.20 *10.00*	1.00	17.20			3.66	3.66 *1.65*	4.44 *2.00*			43.0 *23.3*	68064
9.45 8.50 *8.00*	1.80 1.80	11.25 10.30			0.73 0.88	1.38 1.86 *1.65*	1.68 2.26 *2.00*	2.22 2.13	 *2.00*	26.2 27.0 *24.3*	69281 69031
8.30 *8.00*	0.40	8.70			2.06	2.06 *1.65*	2.50 *2.00*	2.68	3.41 *5.00*	35.1 *30.3*	68066
9.70 *8.00*	0.70	10.40			2.91	3.26 *2.47*	3.96 *3.00*		8.61 *6.00*	48.4 *36.4*	68067
11.60 *10.00*	0.70	12.30							11.19 *10.00*	39.8 *35.0*	68068
15.30 *10.00*	0.50	15.80			3.42	3.42 *2.47*	4.15 *3.00*		3.40 *1.00*	47.1 *29.4*	68069
12.30 *10.00*	0.50	12.80			3.78	3.78 *3.29*	4.59 *4.00*	0.56	5.49 *4.00*	49.7 *39.5*	68071
16.10 *12.00*	1.00	17.10			1.48	1.70 *0.82*	2.06 *1.00*		4.98 *3.00*	43.0 *28.1*	68072
15.60 *12.00*	0.80	16.40			2.41	2.41 *1.65*	2.93 *2.00*		3.93 *2.00*	43.6 *30.3*	68073
13.40 *12.00*	0.70	14.10			1.73	2.04 *1.65*	2.48 *2.00*		7.40 *6.00*	45.4 *38.3*	68074
		25.30 *23.00*	57	43		3.76 *3.71*	4.56 *4.50*			39.0 *37.0*	68075
12.45 *12.00*	1.55	14.00			0.47	1.09 *0.82*	1.32 *1.00*	3.14 *3.00*		31.0 *28.1*	69198

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The Evansville Packing Co., Evansville, Ind.	
69200	Superb 18% Acid Phosphate	Manufacturer Guaranteed
69201	Superb 16% Acid Phosphate	Manufacturer Guaranteed
69202	Superb Raw Bone	Manufacturer Guaranteed
69203	Superb Steam Bone	Manufacturer Guaranteed
	Farmers Fertilizer Co., Montgomery, Ala.	
68637	Farmers Acid Phosphate	Manufacturer Guaranteed
68638	Farmers Peerless Mixture	Manufacturer Guaranteed
68639	Farmers Omega Guano	Manufacturer Guaranteed
68640	Farmers Blood and Bone	Manufacturer Guaranteed
	Federal Chemical Co., Inc., Louisville, Ky.	
68308	Standard Grain Grower	Manufacturer Guaranteed
69282 69034	Ammoniated Potash Ten	Guenther Hardware Co., Owensboro Wilson Hdw. and Lumber Co., Fordsville Guaranteed
69035	Tobacco, Truck and Tomato Fertilizer	W. S. Overstreet, LaGrange Guaranteed
68311	Potato Maker and Tobacco Fertilizer	Manufacturer Guaranteed
68742	†Standard Corn and Wheat Grower	Farmers Feed Co., Lebanon Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
21.05 *18.00*	3.45	24.50								25.3 *21.6*	69200
18.20 *16.00*	3.40	21.60								21.8 *19.2*	69201
		20.10 *20.00*	89	11		3.95 *3.29*	4.80 *4.00*			35.8 *32.5*	69202
		30.70 *30.00*	68	32		1.20 *0.82*	1.46 *1.00*			30.6 *28.1*	69203
18.20 *16.00*	1.20	19.40								21.8 *19.2*	68637
9.90 *8.00*	1.00	10.90			2.30	2.76 *2.47*	3.35 *3.00*	6.55 *6.00*		42.2 *36.4*	68638
10.70 *10.00*	1.10	11.80			1.87	2.56 *2.47*	3.11 *3.00*	4.36 *3.00*		38.0 *33.4*	68639
12.30 *12.00*	1.90	14.20			1.59	1.88 *1.65*	2.28 *2.00*	3.05 *2.00*		34.7 *30.3*	68640
14.30 *10.00*	2.20 *2.00*	16.50 *12.00*			1.18	1.18 *0.82*	1.43 *1.00*	1.93 *1.00*		32.1 *21.9*	68308
9.70	2.40	12.10			0.82	1.28	1.55	9.54		41.0	69282
8.00 *8.00*	1.50 *2.00*	9.50 *10.00*			0.42	1.02 *0.82*	1.24 *1.00*	10.07 *10.00*		37.8 *36.9*	69034
9.40 *9.00*	1.60 *2.00*	11.00 *11.00*			0.98	1.60 *1.65*	1.94 *2.00*	1.08 *1.00*	0.38	25.7 *24.6*	69035
13.30 *9.00*	2.20 *2.00*	15.50 *11.00*			2.25	2.25 *1.65*	2.73 *2.00*	1.56 *1.00*		35.2 *24.6*	68311
8.85 *8.00*	0.45 *2.00*	9.30 *10.00*			1.02	1.74 *1.65*	2.11 *2.00*	2.15 *2.00*		26.5 *25.1*	68742

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
68313	Premium High Grade Fertilizer	Manufacturer Guaranteed
69036 69037	†Special Tobacco Maker	Owen Hulett, Williamstown L. R. Hart, Big Clifty Guaranteed
68744	Beef, Blood and Bone	Grayson County Supply Co., Leitchfield Guaranteed
69285 69427 69038	Loam Land Fertilizer	Farm Bureau, Florence City Feed and Flour Co., Mayfield J. S. Noe, Stanford Guaranteed
69039	†Mid-West High Grade Mixture	Smith and Watkins, Adairville Guaranteed
69040	2-8-5 Tobacco Fertilizer	Farmers Supply Co., Williamsburg Guaranteed
68746 68747 69041	†Plant Bed Special	Farmers Feed Co., Lebanon J. C. Everett and Co., Maysville W. S. Overstreet, LaGrange Guaranteed
68748 68749	Special Tobacco and Potato Grower	Smith and Smith Co., Shepherdsville Lake Bros., Springfield Guaranteed
69043 69044	†Ky. Tobacco and Potato Grower	W. W. Cornett, Poor Fork S. A. Browning, Vanceburg Guaranteed
68322	High Grade Tobacco Grower	Manufacturer Guaranteed
68323	Tip Top Potato Grower	Manufacturer Guaranteed
68324	A-1 Fertilizer	Manufacturer Guaranteed
69045 69046	A-1 Corn and Wheat Fertilizer	Cub Russell, Stanford T. H. O'Bryan, Dawson Springs Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
13.70	1.60	15.30			2.11	2.11	2.56	3.27		38.3	68313
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*2.00*		*28.1*	
10.00	1.30	11.30			1.53	2.09	2.54	1.76	1.21	31.9	69036
9.90	1.70	11.60			1.27	1.78	2.16	2.01		28.5	69037
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*2.00*		*28.1*	
11.55	0.60	12.15			0.43	1.69	2.05	2.02		30.1	68744
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*2.00*		*28.1*	
11.30	2.90	14.20			1.12	1.74	2.11	2.15		31.1	69285
13.30	1.25	14.55			0.70	1.49	1.81	2.07		32.0	69427
11.90	0.60	12.50			0.67	1.89	2.29	2.92		33.4	69038
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*2.00*		*31.1*	
10.90	3.10	14.00			0.52	1.62	1.97	4.29		34.3	69039
10.00	*2.00*	*12.00*				*1.65*	*2.00*		*4.00*	*32.1*	
9.20	0.80	10.00			0.46	1.48	1.80	4.52	0.52	31.6	69040
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*5.00*		*31.1*	
11.50	0.40	11.90			1.47	2.42	2.94	1.00	2.73	37.0	68746
10.85	0.45	11.30			1.60	2.61	3.17	1.36	1.99	36.2	68747
10.10	2.00	12.10			1.81	2.43	2.95	0.72	2.49	34.5	69041
10.00	*2.00*	*12.00*				*2.47*	*3.00*		*3.00*	*34.2*	
8.95	0.30	9.25			1.78	2.64	3.20	1.04	5.03	38.9	68748
7.95	0.35	8.30			1.35	2.42	2.94	0.80	5.70	37.2	68749
8.00	*2.00*	*10.00*				*2.47*	*3.00*		*6.00*	*37.2*	
8.75	0.70	9.45			1.35	2.40	2.91	5.88	0.45	38.1	69043
9.45	1.15	10.60			1.10	2.08	2.53	5.60	0.46	37.2	69044
8.00	*2.00*	*10.00*				*2.47*	*3.00*	*6.00*		*37.2*	
12.90	1.30	14.20			3.86	3.86	4.69		4.51	48.2	68322
8.00	*2.00*	*10.00*				*3.29*	*4.00*		*4.00*	*37.3*	
12.70	0.60	13.30			4.63	4.63	5.62		6.30	55.0	68323
10.00	*2.00*	*12.00*				*3.29*	*4.00*		*4.00*	*40.3*	
16.10	1.50	17.60			1.60	1.60	1.94			32.8	68324
12.00	*2.00*	*14.00*				*0.82*	*1.00*			*22.9*	
15.90	1.30	17.20			0.27	0.82	1.00			28.5	69045
15.00	1.20	16.20				0.73	0.89			26.6	69046
14.00	*2.00*	*16.00*				*0.82*	*1.00*			*25.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
68326	A-1 Formula	Manufacturer Guaranteed
68327	High Grade Fertilizer	Manufacturer Guaranteed
68328	A-1 Soluble Vegetable Manure	Manufacturer Guaranteed
68329	A-1 Potato Grower	Manufacturer Guaranteed
68330	A-1 Extra Tobacco Special	Manufacturer Guaranteed
68331	Standard Meal Mixture	Manufacturer Guaranteed
68332	Potash Special	Manufacturer Guaranteed
68334	Potash Compound	Manufacturer Guaranteed
68335	Black Land Special	Manufacturer Guaranteed
68750 68751 68752 69288	20% Phosphate	S. A. Browning, Vanceburg H. D. Jones, Glasgow T. Z. Leachman, Greensburg A. W. Tarter, Columbia Guaranteed
68338	A. A. Phosphate	Manufacturer Guaranteed
68754 69289 69290	†Pure Bone	The Big Four Co., Franklin The Big Four Co., Franklin Grayson County Supply Co., Leitchfield. Guaranteed
68755 69291 69049	Nitrate of Soda	I. K. Miller and Sons, Campbellsville Guenther Hdw. Co., Owensboro T. J. Whittinghill, Fordsville Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
14.50 *10.00*	1.50 *2.00*	16.00 *12.00*			2.85	2.85 *1.65*	3.46 *2.00*			36.6 *24.1*	68326
15.45 *12.00*	1.35 *2.00*	16.80 *14.00*			2.50	2.50 *1.65*	3.04 *2.00*			36.2 *27.1*	68327
15.45 *12.00*	1.35 *2.00*	16.80 *14.00*			2.50	2.50 *1.65*	3.04 *2.00*			36.2 *27.1*	68328
14.30 *10.00*	1.30 *2.00*	15.60 *12.00*			3.90	3.90 *3.29*	4.73 *4.00*			41.5 *32.4*	68329
14.30 *10.00*	1.30 *2.00*	15.60 *12.00*			3.90	3.90 *3.29*	4.73 *4.00*			41.5 *32.3*	68330
12.20 *10.00*	9.20 *10.00*	21.40 *20.00*			1.22	1.22 *.82*	1.48 *1.00*			28.1 *23.1*	68331
14.00 *10.00*	2.80	16.80						3.05 *2.00*		27.1 *19.0*	68332
16.50 *12.00*	1.60	18.10						3.23 *2.00*		31.2 *22.0*	68334
15.30 *12.00*	1.50	16.80						5.46 *4.00*		33.9 *26.0*	68335
20.10 19.50 22.10 21.20 *20.00*	0.80 1.60 0.80 0.50	21.90 21.10 22.90 21.70								24.1 23.4 26.5 25.4 *24.0*	68750 68751 68752 69288
14.40 *10.00*	3.10	17.50								17.3 *12.0*	68338
		29.35 30.80 29.40 *30.00*	75 79 78	25 21 22		1.66 1.61 1.52 *1.03*	2.02 1.95 1.85 *1.25*			31.8 32.7 31.1 *29.2*	68754 69289 69290
						15.38 15.12 15.30 *15.00*	18.68 18.36 18.58 *18.25*			76.9 75.6 76.5 *75.0*	68755 69291 69049

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
68757	Special Mixture Tobacco and Vegetable Grower	I. K. Miller and Sons, Campbellsville Guaranteed
68758	Special Mixture Plant Bed Special	H. C. Clay, Waynesburg Guaranteed
68542	3-8-10 Special Mixture Tobacco Grower	Manufacturer Guaranteed
68543	Special Mixture High Grade Tobacco Grower	Manufacturer Guaranteed
68544	Special MixtureTip Top Potato Grower	Manufacturer Guaranteed
68545	Special Mixture Potato and Tobacco Grower	Manufacturer Guaranteed
68546	2-8-3 Formula	Manufacturer Guaranteed
68759	Best Burley Tobacco Grower	Hardin County Farm Bureau, Elizabethtown Guaranteed
68548	2-8-3 Special Mixture	Manufacturer Guaranteed
68342	Daybreak A-1 Champion	Manufacturer Guaranteed
68763 68764 69292 69293	†Daybreak Wheat and Corn Special	W. W. Cornett, Poor Fork A. W. Tarter, Columbia S. O. Powell, McKinney A. W. Tarter, Columbia Guaranteed
68344	Daybreak Cracker-Jack	Manufacturer Guaranteed
68345	Daybreak Special	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
8.00	1.20	9.20			0.83	1.18	1.43	6.70		31.8	68757
8.00	*2.00*	*10.00*				*1.23*	*1.50*	*6.00*		*31.0*	
10.85	0.70	11.55			1.46	2.29	2.78	2.95		33.9	68758
10.00	*2.00*	*12.00*				*2.47*	*3.00*	*3.00*		*34.2*	
11.30	1.20	12.50			2.58	2.58	3.13	11.90		54.2	68542
8.00	*2.00*	*10.00*				*2.47*	*3.00*	*10.00*		*45.2*	
11.05	1.35	12.40			3.73	3.73	4.53	6.02		47.8	68543
8.00	*2.00*	*10.00*				*3.29*	*4.00*	*4.00*		*37.3*	
12.95	0.55	13.50			4.44	4.44	5.39	4.33		50.5	68544
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*4.00*		*40.3*	
11.70	1.60	13.30			2.27	2.27	2.76	7.91		45.4	68545
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*7.50*		*36.1*	
12.20	2.20	14.40			2.03	2.03	2.46		3.58	36.5	68546
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*3.00*	*27.1*	
8.05	0.45	8.50			0.86	1.58	1.92	2.16	6.40	37.3	68759
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*7.50*	*36.1*	
12.65	2.35	15.00			1.76	1.76	2.14	3.42		35.6	68548
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*3.00*		*27.1*	
15.45	1.85	17.30			0.84	0.84	1.02	1.02		30.2	68342
11.50	*2.00*	*13.50*				*0.41*	*0.50*	*0.50*		*21.1*	
10.70	0.45	11.15				0.51	0.62	1.37		21.5	68763
13.85	1.55	15.40				0.35	0.42	0.85		24.9	68764
11.00	1.50	12.50				0.34	0.41	1.06		20.9	69292
11.10	1.00	12.10				0.41	0.50	0.98		21.1	69293
11.00	*2.00*	*13.00*				*0.41*	*0.50*	*1.00*		*21.4*	
16.25	1.55	17.80			0.75	0.75	0.91	2.12		33.0	68344
13.00	*2.00*	*15.00*				*0.41*	*0.50*	*1.00*		*24.4*	
13.90	1.60	15.50			0.71	0.71	0.86		6.63	38.3	68345
11.00	*2.00*	*13.00*				*0.41*	*0.50*		*5.00*	*29.4*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
69051	Royal Wheat and Grain Special	Alver West and Co., Maysville Guaranteed
68348	Daybreak Tobacco Manure	Manufacturer Guaranteed
69295	Daybreak Favorite	Farmers Feed Co., Lebanon Guaranteed
68350	Standard Crop and Tobacco Grower	Manufacturer Guaranteed
68766 69052	Daybreak Tobacco Grower	Farmers Feed Co., Lebanon J. A. Shaver, Greenville Guaranteed
68352	Daybreak Vegetable Grower	Manufacturer Guaranteed
68354	Red Rooster Mixture	Manufacturer Guaranteed
68355	Daybreak Nitro-Phosphate	Manufacturer Guaranteed
68356	Royal Meal Mixture	Manufacturer Guaranteed
68357	Daybreak Half and Half Meal Mixture	Manufacturer Guaranteed
68358	Daybreak Potash Special	Manufacturer Guaranteed
68360	Daybreak Phosphate and Potash	Manufacturer Guaranteed
68767 68768 68769 69297 69298 69299	Daybreak High Grade Phosphate	S. E. Bedford, Glasgow Robinson Sub. Experiment Station, Quicksand Farmers Feed Co., Lebanon R. C. Johnston and W. E. Wilson, Russellville A. W. Tarter, Columbia S. O. Powell, McKinney Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
11.90	1.25	13.15			0.52	0.98	1.19	1.51		26.3	69051
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.9*	
13.30	2.25	15.55			1.11	1.11	1.35	3.10		32.6	68348
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	
11.25	2.50	13.75			0.20	0.73	0.89	2.81		27.2	69295
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*3.00*		*27.4*	
12.50	2.00	14.50			1.22	1.22	1.48		4.73	35.1	68350
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*4.00*	*24.9*	
8.70	0.50	9.20			0.89	1.54	1.87	2.17		25.3	68766
9.15	3.00	12.15			0.24	1.42	1.72	2.43		26.9	69052
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
11.65	1.70	13.35			2.23	2.23	2.71	0.56	5.36	41.2	68352
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*5.00*	*31.1*	
15.65	1.90	17.55			0.72	0.72	0.87			27.8	68354
12.00	*2.00*	*14.00*				*0.41*	*0.50*			*20.9*	
17.75	1.00	18.75			0.69	0.69	0.84			30.5	68355
15.00	*2.00*	*17.00*				*0.41*	*0.50*			*25.4*	
12.20	9.20	21.40			1.22	1.22	1.48			28.1	68356
10.00	*10.00*	*20.00*				*0.82*	*1.00*			*23.1*	
11.60	9.05	20.65			1.93	2.15	2.61			31.8	68357
10.00	*10.00*	*20.00*				*1.65*	*2.00*			*27.3*	
14.00	2.80	16.80						3.05		27.1	68358
10.00								*2.00*		*19.0*	
16.50	1.60	18.10						3.23		31.2	68360
12.00								*2.00*		*22.0*	
17.55	1.55	19.10								21.1	68767
17.30	0.65	17.95								20.8	68768
17.10	0.65	17.75								20.5	68769
16.80	1.85	18.65								20.2	69297
17.80	1.30	19.10								21.4	69298
17.50	1.45	18.95								21.0	69299
16.00										*19.2*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
68362	Daybreak Royal Phosphate	Manufacturer Guaranteed
68363	Daybreak Standard Phosphate	Manufacturer Guaranteed
68364	Daybreak Special Phosphate Mixture	Manufacturer Guaranteed
68365	Daybreak Raw Bone	Manufacturer Guaranteed
68366	1st Prize Corn and Wheat Champion	Manufacturer Guaranteed
68770	1st Prize Corn, Wheat and Oats Grower	Hardin County Farm Bureau, Elizabethtown Guaranteed
68368	1st Prize Grain Maker	Manufacturer Guaranteed
68369	1st Prize Special	Manufacturer Guaranteed
68370	1st Prize Wheat and Grain Special	Manufacturer Guaranteed
68371	Blue Ribbon Corn and Wheat Grower	Manufacturer Guaranteed
68372	Blue Ribbon Tobacco Grower	Manufacturer Guaranteed
68373	1st Prize Formula	Manufacturer Guaranteed
68375	1st Prize Tobacco and Vegetable Grower	Manufacturer Guaranteed
68376	1st Prize Phosphate Mixture	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
17.25 *14.00*	1.50	18.75								20.7 *16.8*	68362
15.75 *12.00*	2.20	17.95								18.9 *14.4*	68363
11.55 *10.00*	13.25 *10.00*	24.80 *20.00*								13.9 *12.0*	68364
		23.50 *22.00*	48	52		4.45 *3.71*	5.40 *4.50*			41.1 *36.2*	68365
15.45 *11.50*	1.85 *2.00*	17.30 *13.50*			0.84	0.84 *0.41*	1.02 *0.50*	1.02 *0.50*		30.2 *21.1*	68366
13.80 *11.00*	0.55 *2.00*	14.35 *13.00*				0.34 *0.41*	0.41 *0.50*	0.96 *1.00*		24.5 *21.4*	68770
16.25 *13.00*	1.55 *2.00*	17.80 *15.00*			0.75	0.75 *0.41*	0.91 *0.50*	2.12 *1.00*		33.0 *24.4*	68368
13.90 *11.00*	1.60 *2.00*	15.50 *13.00*			0.71	0.71 *0.41*	0.86 *0.50*		6.63 *5.00*	38.3 *29.4*	68369
15.85 *12.00*	1.45 *2.00*	17.30 *14.00*			1.24	1.24 *0.82*	1.51 *1.00*	2.02 *1.00*		34.6 *24.9*	68370
13.30 *10.00*	2.25 *2.00*	15.55 *12.00*			1.11	1.11 *0.82*	1.35 *1.00*	3.10 *2.00*		32.6 *23.9*	68371
13.30 *10.00*	2.25 *2.00*	15.55 *12.00*			1.11	1.11 *0.82*	1.35 *1.00*	3.10 *2.00*		32.6 *23.9*	68372
13.65 *11.00*	1.75 *2.00*	15.40 *13.00*			1.32	1.32 *0.82*	1.60 *1.00*	4.01 *3.00*		35.8 *27.4*	68373
10.90 *8.00*	1.80 *2.00*	12.70 *10.00*			1.91	1.91 *1.23*	2.32 *1.50*	0.80	7.88 *6.00*	44.0 *31.0*	68375
15.65 *12.00*	1.90 *2.00*	17.55 *14.00*			0.72	0.72 *0.41*	0.87 *0.50*			27.8 *20.9*	68376

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
68377	1st Prize Am. Bone Phosphate	Manufacturer Guaranteed
68378	Mogul Corn and Wheat Fertilizer	Manufacturer Guaranteed
68379	Blue Ribbon Meal Mixture	Manufacturer Guaranteed
68381	1st Prize Phosphate	Manufacturer Guaranteed
68382	1st Prize Standard Phosphate	Manufacturer Guaranteed
68383	1st Prize Special Phosphate Mixture	Manufacturer Guaranteed
	Ford Motor Co., Detroit, Mich.	
69300 69056	Ford Ammonium Sulfate	Lashbrook Motor Co., Russellville J. B. Taylor and Son, Lewisport Guaranteed
	Fox Chem. Co., Br. Federal Chem. Co., Inc., Lou., Ky.	
68385	Fox Ideal Fertilizer	Manufacturer Guaranteed
68772 68773	Fox Blood, Bone Phosphate and Potash	J. H. Frost, Gap Creek H. C. Clay, Waynesburg Guaranteed
68387	Red Fox Grain and Grass Grower	Manufacturer Guaranteed
68388	Fox Soil Builder	Manufacturer Guaranteed
68389	Fox High Grade Special	Manufacturer Guaranteed
69057 69058	Fox Wheat and Grain Special	W. C. Bonta, Pleasureville Cub Russell, Stanford Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
17.75 *15.00*	1.00 *2.00*	18.75 *17.00*			0.69	0.69 *0.41*	0.84 *0.50*			30.5 *25.4*	68377
15.85 *12.00*	1.45 *2.00*	17.30 *14.00*			1.24	1.24 *0.82*	1.51 *1.00*	2.02		34.6 *22.9*	68378
11.60 *10.00*	9.05 *10.00*	20.65 *20.00*			2.15	2.15 *1.65*	2.61 *2.00*			31.8 *27.3*	68379
17.25 *14.00*	1.50	18.75								20.7 *16.8*	68381
15.75 *12.00*	2.20	17.95								18.9 *14.4*	68382
11.55 *10.00*	13.25 *10.00*	24.80 *20.00*								13.9 *12.0*	68383
						20.72 20.88 *20.80*	25.16 25.34 *25.26*			103.6 104.4 *104.0*	69300 69056
15.45 *11.50*	1.85 *2.00*	17.30 *13.50*			0.84	0.84 *0.41*	1.02 *0.50*	1.02 *0.50*		30.2 *21.1*	68385
11.75 11.05 *11.00*	0.60 0.60 *2.00*	12.35 11.65 *13.00*			0.23	0.48 0.61 *0.41*	0.58 0.74 *0.50*	1.28 2.38 *1.00*		22.8 24.6 *21.4*	68772 68773
15.20 *11.00*	2.05 *2.00*	17.25 *13.00*			0.71	0.71 *0.41*	0.86 *0.50*	1.88 *1.00*		30.9 *21.4*	68387
16.25 *13.00*	1.55 *2.00*	17.80 *15.00*			0.75	0.75 *0.41*	0.91 *0.50*	2.12 *1.00*		33.0 *24.4*	68388
13.90 *11.00*	1.60 *2.00*	15.50 *13.00*			0.71	0.71 *0.41*	0.86 *0.50*		6.63 *5.00*	38.3 *29.4*	68389
12.90 13.10 *12.00*	1.30 3.10 *2.00*	14.20 16.20 *14.00*			0.42	0.77 0.76 *0.82*	0.93 0.92 *1.00*	1.10 1.08 *1.00*		25.9 26.9 *24.9*	69057 69058

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Fox Chem. Co., Br. Federal Chem. Co., Inc., Lou. Ky.	
69301	Fox Early Harvest	Clarence C. Holman, Adairville Guaranteed
68392	Early Harvest Tobacco Grower	Manufacturer Guaranteed
68393	Fox Formula	Manufacturer Guaranteed
68774	Fox Crop and Tobacco Grower	Tollesboro Supply Co., Tollesboro Guaranteed
68775	†Fox Wheat and Corn Manure	H. C. Clay, Waynesburg Guaranteed
69059 69060	Fox Tobacco Grower	Cub Russell, Stanford J. S. Whitfill, Big Clifty Guaranteed
68397	Fox Wheat and Corn Grower	Manufacturer Guaranteed
68398	Fox Vegetable Grower	Manufacturer Guaranteed
68400	Red Fox Mixture	Manufacturer Guaranteed
68401	Fox Ammoniated Phosphate	Manufacturer Guaranteed
68402	Fox Half and Half Meal Mixture	Manufacturer Guaranteed
68403	Fox Potash Special	Manufacturer Guaranteed
69303	†Fox Bone Phosphate and Potash	Smith and Watkins, Adairville Guaranteed
68405	Fox Bone Phosphate	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
11.00	2.70	13.70				0.74	0.90	2.04		25.4	69301
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	
13.30	2.25	15.55			1.11	1.11	1.35	3.10		32.6	68392
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	
13.65	1.75	15.40			1.32	1.32	1.60	4.01		35.8	68393
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*3.00*		*27.4*	
10.75	2.80	13.55			0.40	1.10	1.34	4.09		30.9	68774
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*4.00*	*24.9*	
8.60	0.70	9.30			0.52	1.43	1.74	2.24		24.8	68775
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
9.60	0.10	9.70			0.56	1.67	2.03	2.12		27.0	69059
9.00	0.70	9.70			1.35	1.72	2.09	2.14		26.7	69060
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
13.70	1.60	15.30			2.11	2.11	2.56	3.27		38.3	68397
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*2.00*		*28.1*	
11.70	2.40	14.10			1.83	1.83	2.22	6.81		41.3	68398
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*5.00*	*31.1*	
15.65	1.90	17.55			0.72	0.72	0.87			27.8	68400
12.00	*2.00*	*14.00*				*0.41*	*0.50*			*20.9*	
17.75	1.00	18.75			0.69	0.69	0.84			30.5	68401
15.00	*2.00*	*17.00*				*0.41*	*0.50*			*25.4*	
11.60	9.05	20.65			1.93	2.15	2.61			31.8	68402
10.00	*10.00*	*20.00*				*1.65*	*2.00.*			*27.3*	
14.00	2.80	16.80						3.05		27.1	68403
10.00								*2.00*		*19.0*	
10.75	2.90	13.65						4.02		24.2	69303
10.00								*4.00*		*23.0*	
16.50	1.60	18.10						3.23		31.2	68405
12.00								*2.00*		*22.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Fox Chem. Co., Br. Federal Chem. Co., Inc., Lou. Ky.	
68778	†Fox High Grade Phosphate	Tollesboro Supply Co., Tollesboro
68780		H. C. Clay, Waynesburg
69304		Smith and Watkins, Adairville
69305		Wood and Locke, Horse Cave
69306		H. C. Clay, Waynesburg
		Guaranteed
68407	Fox Phosphate	Manufacturer
		Guaranteed
68408	Fox Standard Phosphate	Manufacturer
		Guaranteed
69061	Fox Special Phosphate Mixture	Cub Russell, Stanford
		Guaranteed
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
68411	Globe Good Grower Fertilizer	Manufacturer
		Guaranteed
68781	†Globe Blood, Bone Phosphate and Potash	I. K. Miller and Sons, Campbellsville
69308		Bresler, Son and Co., Owensboro
69063		Planters Hardware Co., Hopkinsville
		Guaranteed
68413	Globe Grain and Grass Grower	Manufacturer
		Guaranteed
68414	Globe Money Maker	Manufacturer
		Guaranteed
68415	Globe High Grade Special	Manufacturer
		Guaranteed
68416	Globe Wheat and Grain Special	Manufacturer
		Guaranteed
68783	†Progress Corn and Wheat Grower	Roy Reid, Eastwood
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
16.20	3.10	19.30								19.4	68778
17.35	0.70	18.05								20.8	68780
17.55	1.40	18.95								21.1	69304
16.85	1.40	18.25								20.2	69305
17.10	2.60	19.70								20.5	69306
16.00										*19.2*	
17.25	1.50	18.75								20.7	68407
14.00										*16.8*	
15.75	2.20	17.95								18.9	68408
12.00										*14.4*	
12.40	12.50	24.90								14.9	69061
10.00	*10.00*	*20.00*								*12.0*	
15.45	1.85	17.30			0.84	0.84	1.02	1.02		30.2	68411
11.50	*2.00*	*13.50*				*0.41*	*0.50*	*0.50*		*21.1*	
10.85	1.65	12.50				0.45	0.55	1.23		21.7	68781
11.15	3.35	14.50				0.37	0.45	0.80		21.5	69308
10.95	3.40	14.35				0.54	0.66	1.70		23.9	69063
11.00	*2.00*	*13.00*				*0.41*	*0.50*	*1.00*		*21.4*	
15.20	2.05	17.25			0.71	0.71	0.86	1.88		30.9	68413
11.00	*2.00*	*13.00*				*0.41*	*0.50*	*1.00*		*21.4*	
16.25	1.55	17.80			0.75	0.75	0.91	2.12		33.0	68414
13.00	*2.00*	*15.00*				*0.41*	*0.50*	*1.00*		*24.4*	
13.90	1.60	15.50			0.71	0.71	0.86		6.63	38.3	68415
11.00	*2.00*	*13.00*				*0.41*	*0.50*		*5.00*	*29.4*	
15.85	1.45	17.30			1.24	1.24	1.51	2.02		34.6	68416
12.00	*2.00*	*14.00*				*0.82*	*1.00*	*1.00*		*24.9*	
10.35	1.60	11.95			0.25	0.80	0.97	2.07		24.3	68783
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
68784	Progress Tobacco Grower	C. F. Shaw, Cave City
68785		J. W. Oates and H. C. Rogers, Russel Springs
		Guaranteed
69311	†Braden Formula	Vine Grove Feed Co., Vine Grove
		Guaranteed
68786	†Universal Crop and Tobacco Grower	A. L. Harmon and Son, Junction City
69064		Ben Hook, Brandenburg
		Guaranteed
69312	Eagle Wheat and Corn Grower	Big Four Co., Franklin
		Guaranteed
68789	†Big Four Tobacco Grower	W. H. Lyons, Loretto
68790		I. K. Miller and Son, Campbellsville
69066		Planters Hardware Co., Hopkinsville
		Guaranteed
69313	Globe Wheat Grower	Vine Grove Feed Co., Vine Grove
		Guaranteed
68424	Kentucky Tobacco Maker	Manufacturer
		Guaranteed
69067	Globe Soluble Vegetable Manure	Harvey Stout and Son, Buechel
		Guaranteed
69069	†Kentucky Standard Tobacco Grower	Farmers Union Co-op. Store, Augusta
		Guaranteed
68427	Globe Special Tobacco Grower	Manufacturer
		Guaranteed
68428	Globe Gold Medal Mixture	Manufacturer
		Guaranteed
68429	Globe Grain-O-Phosphate	Manufacturer
		Guaranteed
68431	Globe Potash Special	Manufacturer
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
10.80	3.40	14.20			0.70	0.99	1.20	1.79		26.1	68784
9.85	4.00	13.85			0.35	0.72	0.87	1.65		23.3	68785
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	
11.55	1.60	13.15			0.28	0.72	0.87	3.58		28.7	69311
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*3.00*		*27.4*	
8.80	1.30	10.10			0.41	0.75	0.91	3.89		25.3	68786
8.30	1.50	9.80			0.36	0.81	0.98	4.21		25.5	69064
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*4.00*	*24.9*	
9.50	3.10	12.60			0.74	1.60	1.94	1.69		26.9	69312
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
9.20	1.00	10.20			1.28	1.60	1.94	1.91		26.0	68789
8.40	0.40	8.80			1.47	1.76	2.14	2.56		26.7	68790
9.10	3.90	13.00			0.34	1.45	1.76	2.55		27.6	69066
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
9.95	1.90	11.85			0.86	1.42	1.72	2.14		27.1	69313
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*2.00*		*28.1*	
13.70	1.60	15.30			2.11	2.11	2.56	3.27		38.3	68424
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*2.00*		*28.1*	
8.55	1.65	10.20			1.12	1.60	1.94	0.88	4.20	31.7	69067
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*5.00*	*31.1*	
8.80	1.50	10.30			0.91	1.77	2.15	1.96	4.26	33.1	69069
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*5.00*	*31.1*	
11.30	1.20	12.50			2.58	2.58	3.13	11.91		54.2	68427
8.00	*2.00*	*10.00*				*2.47*	*3.00*		*10.00*	*45.2*	
15.65	1.90	17.55			0.72	0.72	0.87			27.8	68428
12.00	*2.00*	*14.00*				*0.41*	*0.50*			*20.9*	
17.75	1.00	18.75			0.69	0.69	0.84			30.5	68429
15.00	*2.00*	*17.00*				*0.41*	*0.50*			*25.4*	
14.00	2.80	16.80						3.05		27.1	68431
10.00								*2.00*		*19.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
68433	Globe Potash Compound	Manufacturer Guaranteed
68791 68793 69317 69318 69319 69320	†Globe High Grade Phosphate	Farmers Union Mercantile Co., Owenton A. E. Sullivan, Jamestown Farmers Union, Augusta Big Four Co., Franklin I. K. Miller and Son, Campbellsville Bresler, Son and Co., Owensboro Guaranteed
69321	Globe Phosphate	I. K. Miller and Son, Campbellsville Guaranteed
68794	Globe Standard Phosphate	I. K. Miller and Son, Campbellsville Guaranteed
68437	Globe Special Phosphate Mixture	Manufacturer Guaranteed
69322 69071	Globe Raw Bone	Planters Hardware Co., Hopkinsville Harvey Stout and Son, Buechel Guaranteed
	Groves Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.	
68795	†Square Brand 2-12-2	G. M. Hedrick, Monticello Guaranteed
68797	†Square Brand 3-8-6	H. D. Jones, Glasgow Guaranteed
68261	Square Brand 2-12-6	Manufacturer Guaranteed
68262	Square Brand 3-12-4	Manufacturer Guaranteed
68801 69072	†Square Brand 1-8-4	H. D. Jones, Glasgow Moore and Hughes, Litchfield Guaranteed
69326	Square Brand 0-10-5	J. C. Everett and Co., Maysville Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
16.50	1.60	18.10						3.23		31.2	68433
12.00								*2.00*		*22.0*	
17.20	0.60	17.80								20.6	68791
15.50	2.50	18.00								18.6	68793
16.50	2.20	18.70								19.8	69317
16.90	1.10	18.00								20.3	69318
16.65	1.60	18.25								20.0	69319
17.40	1.80	19.20								20.9	69320
16.00										*19.2*	
14.90	1.35	16.25								17.9	69321
14.00										*16.8*	
12.70	0.80	13.50								15.2	68794
12.00										*14.4*	
11.55	13.25	24.80								13.9	68437
10.00	*10.00*	*20.00*								*12.0*	
		21.20	45	55		3.87	4.70			36.3	69322
		24.30	41	59		4.13	5.01			40.1	69071
		22.00				*3.71*	*4.50*			*36.2*	
11.60	1.40	13.00			1.13	1.89	2.29	2.00	1.05	33.5	68795
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*30.7*	
8.35	2.20	10.55			1.48	2.29	2.78	2.04	4.47	37.9	68797
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
12.90	1.20	14.10			1.35	1.76	2.14	6.98		42.6	68261
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*6.00*		*38.7*	
12.80	1.60	14.40			1.70	2.44	2.96	4.97		42.0	68262
12.00	*1.00*	*13.00*				*2.47*	*3.00*	*4.00*		*38.8*	
7.80	3.60	11.40			0.39	0.95	1.15	4.36		26.6	68801
8.60	1.90	10.50				0.71	0.86	3.70		24.6	69072
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*24.5*	
9.35	1.05	10.40						5.16		24.4	69326
10.00	*1.00*	*11.00*						*5.00*		*25.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Groves Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.	
68266	Square Brand 0-10-10	Manufacturer Guaranteed
68268	Square Brand 0-8-24	Manufacturer Guaranteed
68802	†16% Acid Phosphate	H. D. Jones, Glasgow
68803		I. K. Miller and Son, Campbellsville
68804		H. D. Jones, Glasgow
69328		J. C. Everett and Co., Maysville
69329		H. D. Jones, Glasgow
69073		Moore and Hughes, Leitchfield Guaranteed
69331	20% Acid Phosphate	H. D. Jones, Glasgow Guaranteed
69332	Half and Half	Cayce-Yost Co., Hopkinsville Guaranteed
68805	2-27 Bone	H. D. Jones, Glasgow
69335		H. D. Jones, Glasgow
69336		V. B. Nuckols, Elkton Guaranteed
69337	Raw Bone	G. M. Hedrick, Monticello Guaranteed
68275	Muriate of Potash	Manufacturer Guaranteed
68276	Sulphate of Ammonia	* Guaranteed
	Hall Seed Co., Louisville, Ky.	
68244	Halco Tobacco Grower	Manufacturer Guaranteed
69338	Halco 16% Acid Phosphate	Ed. S. Rhea, Shepherdsville Guaranteed
68246	Halco 20% Superphosphate	Manufacturer Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
10.80	1.70	12.50						11.43		39.0	68266
10.00	*1.00*	*11.00*						*10.00*		*35.0*	
7.80	1.20	9.00						25.18		62.1	68268
8.00	*1.00*	*9.00*						*24.00*		*60.0*	
19.70	3.10	22.80								23.6	68802
17.15	1.65	18.80								20.6	68803
16.10	2.00	18.10								19.3	68804
16.00	2.10	18.10								19.2	69328
16.20	2.10	18.30								19.4	69329
15.55	1.55	17.10								18.7	69073
16.00	*1.00*	*17.00*								*19.2*	
20.30	2.20	22.50								24.4	69331
20.00	*1.00*	*21.00*								*24.0*	
10.65	7.55	18.20			0.38	1.31	1.59	3.45		32.5	69332
8.00	*8.00*	*16.00*				*1.65*	*2.00*	*2.00*		*27.5*	
		29.50	72	28		1.82	2.21			32.7	68805
		28.00	86	14		1.67	2.03			30.8	69335
		28.20	90	10		1.68	2.04			31.0	69336
		27.00				*1.65*	*2.00*			*29.9*	
		26.10	53	47		3.63	4.41			39.0	69337
		22.00				*3.71*	*4.50*			*36.2*	
								50.96		101.9	68275
								50.00		*100.0*	
											68276
						20.60	*25.00*			*103.0*	
10.65	1.60	12.25			0.68	0.90	1.09	2.20		25.5	68244
10.00	*1.00*	*11.00*				*0.82*	*1.00*	*2.00*		*23.5*	
16.20	1.20	17.40								19.4	69338
16.00	*1.00*	*17.00*								*19.2*	
21.80	0.30	22.10								26.2	68246
20.00	*1.00*	*21.00*								*24.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Hall Seed Co., Louisville, Ky.	
68247	Halco Corn and Wheat Grower	Manufacturer Guaranteed
68248	Halco Potato Grower	Manufacturer Guaranteed
68249	Halco Vegetable Grower	Manufacturer Guaranteed
68250	Halco Special Tobacco Grower	Manufacturer Guaranteed
68251	Halco Potato and Tobacco Grower	Manufacturer Guaranteed
68252	Halco Half Bone and Phosphate	* Guaranteed
68253	Halco Bone Meal	Manufacturer Guaranteed
68254	Halco Raw Bone	Manufacturer Guaranteed
68255	Halco High Grade Vegetable Grower	Manufacturer Guaranteed
68256	Halco 2-16-2 Fertilizer	Manufacturer Guaranteed
68257	Halco 4-16-4 Fertilizer	Manufacturer Guaranteed
	Hopkins Fertilizer Co., New Albany, Ind.	
68806	Wheat and Corn Grower No. 1	Crawford and Snyder, Milton Guaranteed
68291	Red Banner Special	Manufacturer Guaranteed
68292	General Crop Grower	Manufacturer Guaranteed
68293	Superior	Manufacturer Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
10.80	1.50	12.30			0.68	0.96	1.17			21.6	68247
10.00	*1.00*	*11.00*				*0.82*	*1.00*			*19.5*	
10.25	1.25	11.50			1.35	1.72	2.09			24.5	68248
10.00	*1.00*	*11.00*				*1.65*	*2.00*			*23.7*	
10.20	1.40	11.60			2.80	3.42	4.15			33.0	68249
10.00	*1.00*	*11.00*				*3.29*	*4.00*			*31.9*	
8.75	1.90	10.65			0.54	0.54	0.66	1.45		19.5	68250
8.00	*1.00*	*9.00*				*0.41*	*0.50*	*1.00*		*16.5*	
8.70	1.50	10.20			1.44	1.79	2.17	3.56		29.7	68251
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*3.00*		*26.7*	
											68252
10.00	*10.00*	*20.00*				*0.82*	*1.00*			*23.1*	
		26.70	69	31		2.41	2.93			33.4	68253
		27.00				*2.47*	*3.00*			*34.0*	
		23.85	100			3.96	4.81			38.9	68254
		22.00				*3.71*	*4.50*			*36.2*	
8.60	1.20	9.80			1.89	2.75	3.34	0.84	5.17	39.2	68255
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
16.80	0.60	17.40			2.09	2.09	2.54	2.58		41.1	68256
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*36.7*	
15.60	0.70	16.30			3.18	3.18	3.86	4.97		49.5	68257
16.00	*1.00*	*17.00*				*3.29*	*4.00*	*4.00*		*48.9*	
10.90	1.30	12.20			0.20	0.58	0.70	2.73		25.2	68806
10.00	*2.00*	*12.00*				*0.41*	*0.50*	*2.00*		*21.9*	
8.75	0.60	9.35			0.56	1.02	1.24	1.56	1.47	24.5	68291
8.00	*2.00*	*10.00*				*0.82*	*1.00*	*3.00*		*22.9*	
13.25	2.50	15.75			0.37	1.77	2.15	2.28		34.3	68292
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*2.00*		*31.1*	
9.60	3.50	13.10			0.92	2.25	2.73	5.24		37.5	68293
10.00	*2.00*	*12.00*				*1.65*	*2.00*	*4.00*		*32.1*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Hopkins Fertilizer Co., New Albany, Ind.	
68807	Burley Grower	Emmitt Shearer, Monticello
68808		Hayden Coal and Grain Co., Springfield
68809		Crawford and Snyder, Milton
69074		W. C. Richards, Fordsville
		Guaranteed
68810	Blackland Special	S. E. Redford, Glasgow
		Guaranteed
68296	Two-in-One	Manufacturer
		Guaranteed
68297	Half and Half No. 1	Manufacturer
		Guaranteed
68811	Climax Acid Phosphate	Emmett Shearer, Monticello
68812		Crawford and Snyder, Milton
68813		Hayden Coal and Grain Co., Springfield
69339		I. K. Miller and Son, Campbellsville
		Guaranteed
68300	Potato Grower	Manufacturer
		Guaranteed
68301	Ammoniated Special	Manufacturer
		Guaranteed
68815	20% Acid Phosphate	Bob Johnston, Glasgow
		Guaranteed
68304	Muriate of Potash	Manufacturer
		Guaranteed
68816	Nitrate of Soda	Robinson Sub-Experiment Station, Quicksand
		Guaranteed
68306	Sulphate of Ammonia	Manufacturer
		Guaranteed
68627	Tomato and Corn Formula No. 2	Manufacturer
		Guaranteed
69075	Ky. Tobacco Grower	W. C. Richards, Fordsville
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
8.65	3.75	12.40			0.95	2.45	2.97	5.42		37.6	68807
8.30	6.30	14.60			1.85	2.43	2.95	6.34		39.8	68808
8.80	2.80	11.60			1.71	2.92	3.54	6.50		41.9	68809
9.00	2.35	11.35			1.62	2.36	2.87	5.76		37.8	69074
8.00	*2.00*	*10.00*				*2.47*	*3.00*	*6.00*		*37.2*	
10.30	2.50	12.80						4.12	2.38	28.5	68810
10.00	*2.00*	*12.00*						*6.00*		*27.0*	
7.90	11.80	19.70			1.15	1.95	2.37	1.98		30.3	68296
8.00	*8.00*	*16.00*				*1.65*	*2.00*	*2.00*		*27.5*	
6.90	6.20	13.10			0.91	2.06	2.50	2.17		27.5	68297
6.00	*6.00*	*12.00*				*1.65*	*2.00*	*1.00*		*21.7*	
16.10	2.50	18.60								19.3	68811
18.50	2.20	20.70								22.2	68812
17.70	4.30	22.00								21.2	68813
17.45	3.40	20.85								20.9	69339
16.00	*2.00*	*18.00*								*19.2*	
7.90	4.00	11.90			0.20	1.60	1.94	3.41		28.3	68300
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*3.00*		*27.1*	
10.90	2.60	13.50			1.49	3.32	4.03			34.0	68301
10.00	*2.00*	*12.00*				*3.29*	*4.00*			*32.3*	
21.10	2.10	23.20								25.3	68815
20.00	*2.00*	*22.00*								*24.0*	
								51.72		103.4	68304
								50.00		*100.0*	
						14.98	18.18			74.9	68816
						14.83	*18.00*			*74.2*	
						20.88	25.34			104.4	68306
						20.60	*25.00*			*103.0*	
12.70	1.70	14.40			0.80	1.54	1.87	6.32		40.1	68627
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*6.00*		*39.9*	
6.40	2.10	8.50			0.92	1.78	2.16	2.54		24.4	69075
6.00	*2.00*	*8.00*				*1.65*	*2.00*	*2.00*		*22.1*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	International Agricultural Corporation, Inc., Cincinnati, O.	
68817	I. A. C. Standard Acid Phosphate	S. A. Montgomery, McKinney
68818		C. M. Langdon, Science Hill
69077		W. E. Ellis and Bro., Hartford
69340		W. D. Dickinson, Glasgow
		Guaranteed
68506	I. A. C. Bone Mixture	Manufacturer
		Guaranteed
68507	Henderson High Grade Tobacco Grower	Manufacturer
		Guaranteed
68508	Henderson High Grade Acid Phosphate	Manufacturer
		Guaranteed
68509	Multiple Strength 4-24-4	Manufacturer
		Guaranteed
68510	Multiple Strength Twenty-Twenty	Manufacturer
		Guaranteed
68514	I. A. C. High Grade Fertilizer	Manufacturer
		Guaranteed
68515	I. A. C. Standard Fertilizer	Manufacturer
		Guaranteed
68517	I. A. C. Complete Fertilizer	Manufacturer
		Guaranteed
68519	I. A. C. High Grade Special	Manufacturer
		Guaranteed
68822	I. A. C. 20% Acid Phosphate	S. A. Montgomery, McKinney
		Guaranteed
68522	Buffalo Tobacco Special	Manufacturer
		Guaranteed
68525	Buffalo Crop Grower	Manufacturer
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
15.90	2.00	17.90								19.1	68817
17.20	1.90	19.10								20.6	68818
16.70	1.50	18.20								20.0	69077
17.05	1.65	18.70								20.5	69340
16.00	*2.00*	*18.00*								*19.2*	
		25.10	78	22		1.08	1.31			25.5	68506
		22.00				*0.82*	*1.00*			*21.7*	
10.20	4.30	14.50			1.48	2.47	3.00		3.33	36.0	68507
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
16.65	2.80	19.45								20.0	68508
16.00	*2.00*	*18.00*								*19.2*	
23.80	1.75	25.55			2.71	3.22	3.91	4.34		61.2	68509
24.00	*1.00*	*25.00*				*3.29*	*4.00*	*4.00*		*60.9*	
20.65	1.65	22.30						20.38		71.7	68510
20.00	*1.00*	*21.00*						*20.00*		*70.4*	
12.70	2.35	15.05			1.28	1.67	2.03	2.25		32.8	68514
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*31.9*	
8.35	9.85	18.20			1.20	1.65	2.00	2.28		29.3	68515
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
9.15	9.35	18.50			0.73	0.98	1.19	4.46		31.3	68517
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*4.00*		*25.7*	
10.30	7.20	17.50			1.81	2.41	2.93			30.4	68519
10.00	*5.00*	*15.00*				*2.47*	*3.00*			*29.4*	
21.10	0.60	21.70								25.3	68822
20.00	*1.00*	*21.00*								*24.0*	
9.15	5.25	14.40			1.29	1.68	2.04	0.96	9.47	45.1	68522
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*10.00*	*41.9*	
12.70	2.35	15.05			1.28	1.67	2.03	2.25		32.8	68525
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*31.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	International Agricultural Corporation, Inc., Cincinnati, O	
69083	Buffalo Tobacco and Corn Grower	London Hdw. Co., London
69084		B. F. Beard and Co., Hardinsburg
		Guaranteed
68532	Buffalo 20% Acid Phosphate	Manufacturer
		Guaranteed
68825	Buffalo 16% Acid Phosphate	R. F. Emmons, Tollesboro
69342		Coffee and Van Hook, Moreland
69343		Earl F. Wright, Harned
69344		Austin Dowell, Harned
69090		W. H. Lynch, Leitchfield
69091		Walton Sanitary Flour Mills, Walton
		Guaranteed
68534	Buffalo Special Bone and Phosphate	Manufacturer
		Guaranteed
68535	Buffalo Bone Meal	Manufacturer
		Guaranteed
	Jarecki Chemical Co. (Armour owned), Louisville, Cincinnati, Nashville.	
68224	Jarecki's 2-10-4 Fertilizer	Manufacturer
		Guaranteed
68225	Jarecki's 1-12-1 Fertilizer	Manufacturer
		Guaranteed
68226	Jarecki's 2-8-2 Fertilizer	Manufacturer
		Guaranteed
68227	Jarecki's 2-12-0 Fertilizer	Manufacturer
		Guaranteed
68228	Jarecki's 1-8-1 Fertilizer	Manufacturer
		Guaranteed
68229	Jarecki's 0-12-4 Fertilizer	Manufacturer
		Guaranteed
68230	Jarecki's Bone Meal	Manufacturer
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
7.90	2.40	10.30			1.13	1.68	2.04	0.84	1.55	26.0	69083
8.15	3.20	11.35			0.97	1.62	1.97	0.52	1.73	26.1	69084
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*25.9*	
19.80	0.40	20.20								23.8	68532
20.00	*1.00*	*21.00*								*24.0*	
16.50	2.50	19.00								19.8	68825
16.45	2.35	18.80								19.7	69342
16.35	1.95	18.30								19.6	69343
16.20	2.00	18.20								19.4	69344
17.75	1.45	19.20								21.3	69090
18.30	0.50	18.80								22.0	69091
16.00	*2.00*	*18.00*								*19.2*	
		25.10	78	22		1.08	1.31			25.5	68534
		22.00				*0.82*	*1.00*			*21.7*	
		27.50	83	17		2.09	2.54			32.5	68535
		27.00				*1.65*	*2.00*			*29.9*	
11.15	2.00	13.15			1.71	2.08	2.53	4.52		37.0	68224
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*31.7*	
12.95	2.25	15.20			0.85	1.12	1.36	1.18		28.3	68225
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*24.5*	
9.30	2.70	12.00			1.66	2.14	2.60	2.29		25.3	68226
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*24.7*	
12.95	1.95	14.90			1.56	1.94	2.36			29.9	68227
12.00	*1.00*	*13.00*				*1.65*	*2.00*			*26.7*	
9.10	2.90	12.00			0.75	0.95	1.15	1.32		22.2	68228
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*18.5*	
13.00	2.00	15.00						3.99		27.5	68229
12.00	*1.00*	*13.00*						*4.00*		*26.0*	
		27.10	67	33		2.43	2.95			33.8	68230
		27.00				*2.47*	*3.00*			*34.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Jarecki Chemical Co. (Armour owned), Louisville, Cincinnati, Nashville.	
68231	Jarecki's Raw Bone	Manufacturer Guaranteed
68232	Jarecki's 16% Acid Phosphate	Manufacturer Guaranteed
68233	Jarecki's 20% Superphosphate	Manufacturer Guaranteed
68234	Jarecki's 4-16-4 Fertilizer	Manufacturer Guaranteed
68826	Jarecki's Burley Tobacco Grower	HarrodsburgImplementCo.,Harrodsburg Guaranteed
68236	Jarecki's Potato Grower	Manufacturer Guaranteed
68237	Jarecki's Plant Bed Special	Manufacturer Guaranteed
68238	Jarecki's Dark Tobacco Grower	Manufacturer Guaranteed
68239	Jarecki's 2-16-2 Fertilizer	Manufacturer Guaranteed
68240	Jarecki's 2-12-2 Fertilizer	Manufacturer Guaranteed
68241	Jarecki's 2-12-6 Fertilizer	Manufacturer Guaranteed
68242	Jarecki's 0-10-10 Fertilizer	Manufacturer Guaranteed
68243	Jarecki's 1-8-4 Fertilizer	Manufacturer Guaranteed
68643	Jarecki's Indian Brand Tobacco and Potato Fertilizer	Manufacturer Guaranteed
68969	Jarecki's 2-16-8 Fertilizer	* Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
		24.20 *22.00*	100			4.02 *3.71*	4.88 *4.50*			39.5 *36.2*	68231
17.20 *16.00*	1.70 *1.00*	18.90 *17.00*								20.6 *19.2*	68232
21.30 *20.00*	0.40 *1.00*	21.70 *21.00*								25.6 *24.0*	68233
15.50 *16.00*	0.90 *1.00*	16.40 *17.00*			3.20	3.20 *3.29*	3.88 *4.00*	4.97 *4.00*		49.6 *48.9*	68234
8.40 *8.00*	1.00 *1.00*	9.40 *9.00*			1.36	2.43 *2.47*	2.95 *3.00*		5.58 *6.00*	36.3 *36.8*	68826
8.10 *8.00*	1.40 *1.00*	9.50 *9.00*			1.91	2.72 *2.47*	3.30 *3.00*	0.88	4.92 *6.00*	37.9 *36.8*	68236
8.80 *8.00*	1.70 *1.00*	10.50 *9.00*			2.16	3.49 *3.29*	4.24 *4.00*		3.41 *3.00*	38.2 *34.9*	68237
8.70 *8.00*	2.50 *1.00*	11.20 *9.00*			1.22	1.84 *1.65*	2.23 *2.00*	0.56	3.92 *4.00*	32.2 *28.7*	68238
16.90 *16.00*	0.50 *1.00*	17.40 *17.00*			2.07	2.07 *1.65*	2.51 *2.00*	2.62 *2.00*		41.1 *36.7*	68239
12.80 *12.00*	1.60 *1.00*	14.40 *13.00*			1.55	1.84 *1.65*	2.23 *2.00*	2.23 *2.00*		33.5 *30.7*	68240
12.25 *12.00*	1.00 *1.00*	13.25 *13.00*			1.47	1.82 *1.65*	2.21 *2.00*	6.42 *6.00*		40.7 *38.7*	68241
10.35 *10.00*	1.50 *1.00*	11.85 *11.00*						11.18 *10.00*		37.9 *35.0*	68242
8.90 *8.00*	2.60 *1.00*	11.50 *9.00*			0.50	0.91 *0.82*	1.10 *1.00*	0.92 *4.00*	3.03	26.8 *24.5*	68243
8.10 *8.00*	1.40 *1.00*	9.50 *9.00*			1.91	2.72 *2.47*	3.30 *3.00*	0.88	4.92 *6.00*	37.9 *36.8*	68643
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*8.00*		*48.7*	68969

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	Available
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.		
68439	O. K. Special Mixture	Manufacturer	15.45
		Guaranteed	*11.50*
68827	O. K. Grain Grower	Smith and Smith Co., Shepherdsville	12.80
69345		Smith and Smith Co., Shepherdsville	10.50
		Guaranteed	*11.00*
68828	O. K. Corn, Wheat and Oats Grower	J. W. Burton, Columbia	11.80
		Guaranteed	*11.00*
68443	O. K. Special	Manufacturer	13.90
		Guaranteed	*11.00*
69429	O. K. Wheat and Grain Special	City Feed and Flour Co., Mayfield	11.90
		Guaranteed	*11.50*
69346	O. K. Corn and Wheat Grower	J. S. Noe, Rowland	11.15
		Guaranteed	*10.00*
68829	O. K. Tobacco Fertilizer	Smith and Smith Co., Shepherdsville	11.20
		Guaranteed	*10.00*
69347	O. K. High Grade Mixture	Smith and Smith Co., Shepherdsville	11.45
		Guaranteed	*11.00*
68448	O. K. Crop and Tobacco Grower	Manufacturer	12.50
		Guaranteed	*8.00*
69093	Golden Leaf Tobacco Grower	W. L. Kimbrough and Son, Guthrie	8.80
69094		J. S. Noe, Stanford	8.15
		Guaranteed	*8.00*
68450	O. K. Tobacco and Vegetable Grower	Manufacturer	10.90
		Guaranteed	*8.00*
68451	O. K. Mixture	Manufacturer	15.65
		Guaranteed	*12.00*
68452	O. K. Ammoniated Phosphate	Manufacturer	17.75
		Guaranteed	*15.00*
68453	O. K. Half and Half Meal Mixture	Manufacturer	11.60
		Guaranteed	*10.00*

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
15.45	1.85	17.30			0.84	0.84	1.02	1.02		30.2	68439
11.50	*2.00*	*13.50*				*0.41*	*0.50*	*0.50*		*21.1*	
12.80	1.40	14.20				0.37	0.45	0.92		23.5	68827
10.50	1.00	11.50				0.43	0.52	1.21		20.7	69345
11.00	*2.00*	*13.00*				*0.41*	*0.50*	*1.00*		*21.4*	
11.80	2.90	14.70			0.20	0.48	0.58	0.96		23.2	68828
11.00	*2.00*	*13.00*				*0.41*	*0.50*	*1.00*		*21.4*	
13.90	1.60	15.50			0.71	0.71	0.86		6.63	38.3	68443
11.00	*2.00*	*13.00*				*0.41*	*0.50*		*5.00*	*29.4*	
11.90	1.70	13.60			0.62	1.06	1.29	1.16		26.2	69429
11.50	*2.00*	*13.50*				*0.41*	*0.50*	*0.50*		*21.1*	
11.15	2.95	14.10				0.75	0.91	1.87		25.4	69346
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	
11.20	0.60	11.80				0.82	1.00	2.22		25.6	68829
10.00	*2.00*	*12.00*				*0.82*	*1.00*	*2.00*		*23.9*	
11.45	1.95	13.40			0.28	0.94	1.14	2.85		28.4	69347
11.00	*2.00*	*13.00*				*0.82*	*1.00*	*3.00*		*27.4*	
12.50	2.00	14.50			1.22	1.22	1.48		4.73	35.1	68448
8.00	*2.00*	*10.00*				*0.82*	*1.00*		*4.00*	*24.9*	
8.80	0.90	9.70			0.41	1.55	1.88	1.89		25.1	69093
8.15	0.70	8.85			0.59	1.57	1.91	2.13		24.6	69094
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
10.90	1.80	12.70			1.91	1.91	2.32	0.80	7.88	44.0	68450
8.00	*2.00*	*10.00*				*1.23*	*1.50*		*6.00*	*31.0*	
15.65	1.90	17.55			0.72	0.72	0.87			27.8	68451
12.00	*2.00*	*14.00*				*0.41*	*0.50*			*20.9*	
17.75	1.00	18.75			0.69	0.69	0.84			30.5	68452
15.00	*2.00*	*17.00*				*0.41*	*0.50*			*25.4*	
11.60	9.05	20.65			1.93	2.15	2.61			31.8	68453
10.00	*10.00*	*20.00*				*1.65*	*2.00*			*27.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	Available
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.		
68454	O. K. Potash Special	Manufacturer	14.00
		Guaranteed	*10.00*
68832	†O. K. High Grade Phosphate	J. W. Burton, Columbia	16.10
69348		Guenther Hdw. Co., Owensboro	16.45
69430		City Feed and Flour Co., Mayfield	15.60
		Guaranteed	*16.00*
68456	O. K. Phosphate	Manufacturer	17.25
		Guaranteed	*14.00*
68833	O. K. Standard Phosphate	Smith and Smith Co., Shepherdsville	15.70
		Guaranteed	*12.00*
68458	O. K. Special Phosphate Mixture	Manufacturer	11.55
		Guaranteed	*10.00*
69095	O. K. Raw Bone	W. L. Kimbrough and Son, Guthrie	
		Guaranteed	
	Knoxville Fertilizer Co., Knoxville, Tenn.		
67914	Dark Tobacco Brand	Manufacturer	8.90
		Guaranteed	*9.00*
69096	Knox Home Grower	Hignite and Patterson, Barbourville	8.20
		Guaranteed	*8.00*
69350	†Basic Ten-O-Four	W. B. Robertson, Springfield, Tenn	10.75
		Guaranteed	*10.00*
68835	Knox Magnesia Phosphate	W. W. Taylor, Somerset	16.70
69351		W. W. Taylor, Somerset	16.10
69352		W. B. Robertson, Springfield, Tenn	15.50
		Guaranteed	*16.00*
68836	Bright Burley Brand	W. W. Taylor, Somerset	10.00
68837		Hudson and Davis, Danville	9.35
		Guaranteed	*9.00*
68838	Knox Vegetable Grower	W. W. Taylor, Somerset	8.80
		Guaranteed	*8.00*
68595	Knox Blood and Bone	Manufacturer	11.65
		Guaranteed	*10.00*

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
14.00 *10.00*	2.80	16.80						3.05 *2.00*		27.1 *19.0*	68454
16.10 16.45 15.60 *16.00*	1.40 1.45 2.30	17.50 17.90 17.90								19.3 19.7 18.7 *19.2*	68832 69348 69430
17.25 *14.00*	1.50	18.75								20.7 *16.8*	68456
15.70 *12.00*	0.70	16.40								18.8 *14.4*	68833
11.55 *10.00*	13.25 *10.00*	24.80 *20.00*								13.9 *12.0*	68458
		24.50 *22.00*	35	65		4.01 *3.71*	4.87 *4.50*			39.7 *36.2*	69095
8.90 *9.00*	1.70	10.60			1.19	1.95 *2.00*	2.37 *2.43*	3.55	 *4.00*	30.9 *31.5*	67914
8.20 *8.00*	1.65	9.85			1.28	1.60 *1.65*	1.94 *2.00*	1.68 *2.00*		24.3 *24.3*	69096
10.75 *10.00*	5.40	16.15						3.93 *4.00*		24.0 *23.0*	69350
16.70 16.10 15.50 *16.00*	1.20 2.70 3.90	17.90 18.80 19.40								20.0 19.3 18.6 *19.2*	68835 69351 69352
10.00 9.35 *9.00*	1.90 2.00	11.90 11.35			1.16 1.30	1.95 2.09 *2.00*	2.37 2.54 *2.43*	1.20 1.12	1.61 1.87 *3.00*	31.1 31.3 *29.5*	68836 68837
8.80 *8.00*	2.20	11.00			1.87	2.39 *1.65*	2.90 *2.00*	3.73 *4.00*		33.4 *28.3*	68838
11.65 *10.00*	1.90	13.55			0.61	0.99 *1.00*	1.20 *1.21*	1.96 *1.00*		27.1 *22.0*	68595

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Knoxville Fertilizer Co., Knoxville, Tenn.	
68610	Half and Half (Acid Phosphate and Bone Meal)	Manufacturer Guaranteed
68611	Raw Bone Meal	Manufacturer Guaranteed
69177	Basic Bone Mix	Manufacturer Guaranteed
	Louisville Fertilizer Co., (owned and operated by Armour Fert. Wks.), Louisville, Cincinnati, Nashville.	
68840 68841	†Louisville Burley Tobacco Grower	R. J. Wilcoxson, Greensburg S. A. Browning, Vanceburg Guaranteed
68183	Louisville Potato Grower	Manufacturer Guaranteed
69097	†Louisville Dark Tobacco Grower	Elkins and Kimmel, Greenville Guaranteed
68186	Louisville 2-16-2 Fertilizer	Manufacturer Guaranteed
68187	Louisville 2-12-2 Fertilizer	Manufacturer Guaranteed
68845	Louisville 2-10-4 Fertilizer	J. T. Richardson, Campbellsville Guaranteed
68846	Louisville 1-12-1 Fertilizer	J. T. Richardson, Campbellsville Guaranteed
69353	Louisville 2-8-2 Fertilizer	D. L. D. Sandefur, Beaver Dam Guaranteed
68191	Louisville 2-12-0 Fertilizer	Manufacturer Guaranteed
68192	Louisville 1-8-1 Fertilizer	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		20.25 *20.00*	89	11		2.38 *1.65*	2.89 *2.00*			28.1 *24.3*	68610
		24.05 *20.00*	61	39		4.25 *3.50*	5.16 *4.25*			40.5 *33.5*	68611
11.25 *10.00*	4.90 *1.00*	16.15 *11.00*			1.26	1.72 *1.65*	2.09 *2.00*	2.92 *2.00*		33.3 *27.7*	69177
7.40	2.00	9.40			1.56	2.54	3.08		5.70	36.0	68840
7.60	2.10	9.70			1.42	2.54	3.08	0.68	5.22	36.5	68841
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
8.10 *8.00*	1.40 *1.00*	9.50 *9.00*			1.91	2.72 *2.47*	3.30 *3.00*	0.88	4.92 *6.00*	37.9 *36.8*	68183
7.60	4.30	11.90			1.22	1.91	2.32	1.48	2.23	30.1	69037
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*28.7*	
16.90 *16.00*	0.50 *1.00*	17.40 *17.00*			2.07	2.07 *1.65*	2.51 *2.00*	2.62 *2.00*		41.1 *36.7*	68186
12.80 *12.00*	1.60 *1.00*	14.40 *13.00*			1.55	1.84 *1.65*	2.23 *2.00*	2.23 *2.00*		33.5 *30.7*	68187
9.80 *10.00*	1.00 *1.00*	10.80 *11.00*			1.22	1.70 *1.65*	2.06 *2.00*	2.96 *4.00*	0.90	31.3 *31.7*	68845
12.00 *12.00*	1.80 *1.00*	13.80 *13.00*			0.52	0.83 *0.82*	1.01 *1.00*	1.24 *1.00*	1.05	27.5 *24.5*	68846
11.80 *8.00*	2.30 *1.00*	14.10 *9.00*				2.07 *1.65*	2.51 *2.00*	2.70 *2.00*		34.4 *24.7*	69353
12.95 *12.00*	1.95 *1.00*	14.90 *13.00*			1.56	1.94 *1.65*	2.36 *2.00*			29.9 *26.7*	68191
9.10 *8.00*	2.90 *1.00*	12.00 *9.00*			0.75	0.95 *0.82*	1.15 *1.00*	1.32 *1.00*		22.2 *18.5*	68192

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	PHOSP Available
	Louisville Fertilizer Co., (owned and operated by Armour Fert. Wks.), Louisville, Cincinnati, Nashville.		
68193	Louisville 4-10-4 Fertilizer	Manufacturer Guaranteed	10.60 *10.00*
68194	Louisville Bone Meal	Manufacturer Guaranteed	
69354	Louisville Raw Bone	D. L. D. Sandefur, Beaver Dam Guaranteed	
69355 69356 69098	Louisville 0-12-4 Fertilizer	Taylor Sullivan, Columbia Ratliffe Hdw. Co., Princeton Walter Young Coal Co., Owingsville Guaranteed	11.75 12.20 12.65 *12.00*
68847 68848 68849 69357 69358	Louisville 16% Acid Phosphate	John B. Marriott, Cecila R. J. Wilcoxson, Greensburg J. L. Tupman, Cane Valley Taylor Sullivan, Columbia Ratliffe Hdw. Co., Princeton Guaranteed	16.60 16.65 16.10 15.80 16.30 *16.00*
68850	Louisville 20% Superphosphate	R. J. Wilcoxson, Greensburg Guaranteed	19.80 *20.00*
69099	Louisville Special Tobacco Grower	M. B. Wallingford, Mt. Carmel Guaranteed	8.60 *8.00*
68201	Louisville 4-12-4 Fertilizer	Manufacturer Guaranteed	12.90 *12.00*
68203	Louisville Black Patch Special	Manufacturer Guaranteed	8.10 *8.00*
68967	Louisville 2-16-8 Fertilizer	* Guaranteed	*16.00*

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
10.60	1.85	12.40			2.81	3.37	4.09	4.51		42.5	68193
10.00	*1.00*	*11.00*				*3.29*	*4.00*	*4.00*		*39.9*	
		27.10	67	33		2.43	2.95			33.8	68194
		27.00				*2.47*	*3.00*			*34.0*	
		23.40	100			4.02	4.88			38.8	69354
		22.00				*3.71*	*4.50*			*36.2*	
11.75	2.30	14.05						3.82		25.3	69355
12.20	2.20	14.40						4.00		26.3	69356
12.65	1.35	14.00						3.72		26.4	69098
12.00	*1.00*	*13.00*						*4.00*		*26.4*	
16.60	1.00	17.60								19.9	68847
16.65	0.85	17.50								20.0	68848
16.10	0.90	17.00								19.3	68849
15.80	2.40	18.20								19.0	69357
16.30	2.30	18.60								19.6	69358
16.00	*1.00*	*17.00*								*19.2*	
19.80	1.50	21.30								23.8	68850
20.00	*1.00*	*21.00*								*24.0*	
8.60	0.70	9.30			0.49	0.80	0.97	1.33		19.8	69099
8.00	*1.00*	*9.00*				*0.82*	*1.00*		*1.00*	*18.5*	
12.90	1.80	14.70			3.40	3.72	4.52	5.34		49.4	68201
12.00	*1.00*	*13.00*				*3.29*	*4.00*	*4.00*		*42.9*	
8.10	1.40	9.50			1.91	2.72	3.30	0.88	4.92	37.9	68203
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*8.00*		*48.7*	68967

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Mt. Pleasant Fert. Co., Subsidiary of Va.-Car. Chem. Co., Inc., Nashville, Memphis, Tenn.	
68851	Mt. Pleasant Big Winner Acid Phosphate	Marion Hardware and Grocery Co., Marion
68852		Thomas Hinton Co., Bowling Green
69360		Rupert Devasher, Glasgow
69361		R. C. Johnston and W. E. Wilson, Russellville
69362		Grigsby and Co., Bardstown Guaranteed
68143	Mt. Pleasant High Grade Acid Phosphate	Manufacturer Guaranteed
68144	Mt. Pleasant 24% Acid Phosphate	Manufacturer Guaranteed
68145	Mt. Pleasant Special Tobacco Grower	* Guaranteed
68146	Mt. Pleasant Black Patch Tobacco Grower	Manufacturer Guaranteed
69101	Mt. Pleasant High Grade Tobacco Grower	T. H. O'Bryan, Dawson Springs Guaranteed
68148	Mt. Pleasant Superior Burley Grower	Manufacturer Guaranteed
69363	Grigsby's Special	Grigsby and Co., Bardstown Guaranteed
69103	Mt. Pleasant Corn Special	T. H. O'Bryan, Dawson Springs Guaranteed
68152	Black Patch Universal	Manufacturer Guaranteed
69105	†Mt. Pleasant Superior Tobacco Grower	J. Stotz, Greenville Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
18.80	2.50	21.30								22.6	68851
18.55	2.80	21.35								22.3	68852
17.70	2.90	20.60								21.2	69360
17.65	3.60	21.25								21.2	69361
17.85	1.75	19.60								21.4	69362
16.00	*2.00*	*18.00*								*19.2*	
20.65	0.25	20.90								24.8	68143
20.00	*2.00*	*22.00*								*24.0*	
24.90	0.25	25.15								29.5	68144
24.00	*2.00*	*26.00*								*28.8*	
8.00	*2.00*	*10.00*				*1.23*	*1.50*		*1.50*	*22.0*	68145
8.10	14.05	22.15			0.46	0.46	0.56		1.25	22.6	68146
7.00	*2.00*	*9.00*				*0.41*	*0.50*		*1.00*	*15.4*	
9.95	11.45	21.40			1.42	1.74	2.11		2.94	34.1	69101
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*3.00*	*27.1*	
8.10	7.95	16.05			0.97	1.63	1.98	2.48		28.4	68148
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*2.00*	*25.1*	
12.70	6.40	19.10			0.50	0.77	0.93	1.11		27.7	69363
10.00	*2.00*	*12.00*				*0.82*	*1.00*		*1.00*	*21.9*	
12.90	9.30	22.20			0.52	0.83	1.01			27.2	69103
12.00	*2.00*	*14.00*				*0.82*	*1.00*			*22.9*	
11.60	8.60	20.20			0.91	1.77	2.15			29.7	68152
10.00	*2.00*	*12.00*				*1.65*	*2.00*			*24.1*	
10.70	13.50	24.20							3.86	23.8	69105
8.00	*2.00*	*10.00*							*4.00*	*20.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Mt. Pleasant Fert. Co., Subsidiary of Va.-Car. Chem. Co., Inc., Nashville, Memphis, Tenn.	
68853 69106	Mt. Pleasant Half and Half	Thomas, Hinton Co., Bowling Green T. H. O'Bryan, Dawson Springs Guaranteed
68155	Mt. Pleasant Raw Bone Meal	Manufacturer Guaranteed
69107	Nitrate of Soda	Ed. G. Scruggs, Adairville Guaranteed
69165	Mt. Pleasant Grain Grower	Manufacturer Guaranteed
69166	Mt. Pleasant Wheat Grower	Manufacturer Guaranteed
69167	Mt. Pleasant Special Wheat Grower	Manufacturer Guaranteed
69168	Mt. Pleasant Potato Grower	Manufacturer Guaranteed
69170	Mt. Pleasant Bone Meal and Phosphate	Manufacturer Guaranteed
69171	Mt. Pleasant Pure Bone Meal (Steamed)	Manufacturer Guaranteed
69172	Mt. Pleasant Raw Bone Meal	Manufacturer Guaranteed
	New Louisville Rendering Co., Inc., Louisville, Ky.	
68608	Pure Animal Matter, Meat, Bones and Blood	Manufacturer Guaranteed
68609	Pure Bone Meal	Manufacturer Guaranteed
	Nitrate Agencies Co., New Orleans, La.	
68585	Nitrate of Soda	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		24.40	85	15		1.57	1.91			27.4	68853
		24.20	81	19		1.74	2.11			28.1	69106
		20.00				*1.65*	*2.00*			*24.3*	
		21.35	88	12		4.71	5.72			40.6	68155
		22.00				*3.71*	*4.50*			*36.2*	
						15.72	19.08			78.6	69107
						14.81	*17.98*			*74.1*	
12.75	4.85	17.60						1.88		22.9	69165
12.00	*2.00*	*14.00*						*2.00*		*22.0*	
8.30	11.05	19.35			0.39	0.73	0.89	2.08		24.7	69166
8.00	*2.00*	*10.00*				*0.82*	*1.00*	*2.00*		*20.9*	
8.20	7.90	16.10			0.92	1.58	1.92	2.41		28.2	69167
8.00	*2.00*	*10.00*				*1.65*	*2.00*	*2.00*		*25.1*	
13.10	0.95	14.05			1.50	1.96	2.38	1.90		32.6	69168
12.00	*2.00*	*14.00*				*1.65*	*2.00*	*2.00*		*31.1*	
		23.90	86	14	0.93	0.93	1.13			23.8	69170
		22.00				*0.82*	*1.00*			*21.7*	
		29.10	70	30		1.42	1.72			30.4	69171
		27.00				*1.65*	*2.00*			*29.9*	
		23.90	100			3.79	4.60			38.1	69172
		20.00				*3.71*	*4.50*			*34.6*	
		12.50	72	28		5.53	6.71			37.7	68608
		10.00				*4.00*	*4.86*			*28.0*	
		23.15	57	43		3.61	4.38			36.6	68609
		22.00				*3.50*	*4.25*			*35.1*	
						14.64	17.78			73.2	68585
						15.00	*18.21*			*75.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Premier Poultry Manure Co., Chicago, Ill.	
68854	Premier Brand Pulverized Poultry Manure	Wood, Stubbs and Co., Louisville, Ky. Guaranteed
	Price Chemical Co., Inc., Louisville, Ky.	
69108	†Special Corn and Wheat Fertilizer	Moore and Hughes, Leitchfield
69109		F. R. Dowell, Hardinsburg Guaranteed
69110	Walter Crady's Vegetable, Potato and Tobacco Special	Union Store Co., Fern Creek
69111		Moore and Hughes, Leitchfield
69112		Union Store, Buechel Guaranteed
68862	Potash Tobacco Fertilizer	Mayhew Feed Co., Franklin Guaranteed
68106	Extra High Grade Phosphate	Manufacturer Guaranteed
69116	High Grade Phosphate	Union Store Co., Fern Creek Guaranteed
68108	Acid Phosphate	Manufacturer Guaranteed
68963	Steamed Bone Meal	Manufacturer Guaranteed
	Rasin-Monumental Co. (Subsidiary of Va.-Car. Chem. Co.), Cincinnati, Nashville, Memphis.	
68863	†Rasin's 16% Acid Phosphate	J. G. Warriner, Waynesburg
68864		Lessenberry and Jones, Glasgow
69366		Lessenberry and Jones, Glasgow Guaranteed
68569	Rasin's 20% Acid Phosphate	Manufacturer Guaranteed
68865	Rasin's 24% Acid Phosphate	J. G. Warriner, Waynesburg Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
2.90	0.30	3.20			2.77	4.99	6.06	1.46		32.3	68854
2.50	*0.25*	*2.75*				*4.94*	*6.00*		*1.30*	*31.2*	
11.55	1.60	13.15			0.23	0.58	0.70	1.13		23.1	69108
12.20	1.30	13.50			0.27	0.52	0.63	0.81		23.0	69109
11.00	*4.00*	*15.00*				*0.41*	*0.50*	*1.00*		*22.2*	
11.70	1.70	13.40			0.53	0.98	1.19	2.95		29.0	69110
12.30	1.30	13.60			0.66	0.95	1.15	2.82		29.4	69111
12.00	1.40	13.40			0.50	1.01	1.23	3.26		30.1	69112
11.00	*4.00*	*15.00*				*0.82*	*1.00*	*3.00*		*28.2*	
11.10	1.10	12.20						4.89		26.4	68862
10.00	*4.00*	*14.00*						*5.00*		*25.0*	
18.65	0.35	19.00								22.4	68106
18.00	*2.00*	*20.00*								*21.6*	
16.20	0.90	17.10								19.4	69116
16.00	*2.00*	*18.00*								19.2	
15.30	0.30	15.60								18.4	68108
14.00	*2.00*	*16.00*								*16.8*	
		25.55	76	24		2.46	2.99			32.7	68963
		24.00				*2.47*	*3.00*			*31.6*	
17.30	0.90	18.20								20.8	68863
19.25	1.75	21.00								23.1	68864
18.20	2.80	21.00								21.8	69366
16.00	*1.50*	*17.50*								*19.2*	
22.95	0.65	23.60								27.5	68569
20.00	*1.50*	*21.50*								*24.0*	
26.90	0.50	27.40								32.3	68865
24.00	*1.50*	*25.50*								*28.8*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Rasin-Monumental Co. (Subsidiary of Va.-Car. Chem. Co.), Cincinnati, Nashville, Memphis.	
68571	Rasin's Phospho Tobacco (300 pounds Stems per ton)	Manufacturer Guaranteed
68866	Rasin's 10-5 Acid and Potash	Lessenberry and Jones, Glasgow Guaranteed
68573	Rasin's Royal Grain Grower	Manufacturer Guaranteed
68574	Rasin's Special Plant Food	Manufacturer Guaranteed
69368 69369 69117	Rasin's Reliable Wheat and Corn Fertilizer	H. A. Spradlin, Monticello Lessenberry and Jones, Glasgow J. H. Wyan, London Guaranteed
68576	Rasin's Big Giant Phosphate	Manufacturer Guaranteed
69118	Rasin's General Favorite	J. H. Wyan, London Guaranteed
69119	Rasin's Sweepstakes Fertilizer	J. H. Wyan, London Guaranteed
69370	Rasin's Sweepstakes Fertilizer	H. A. Spradlin, Monticello Guaranteed
68867	Rasin's 2-8-4 Tobacco Grower (Potash from Sulphate)	Lessenberry and Jones, Glasgow Guaranteed
68868	Rasin's Burley Tobacco Grower (Potash from Sulphate)	H. A. Spradlin, Monticello Guaranteed
68582	Rasin's Phosphate and Bone Meal	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
16.35	2.15	18.50								19.6	68571
16.00	*1.50*	*17.50*								*19.2*	
10.30	4.95	15.25						4.95		25.4	68866
10.00	*1.50*	*11.50*						*5.00*		*25.0*	
15.65	2.15	17.80						3.49		30.5	68573
12.00	*1.50*	*13.50*						*2.00*		*22.0*	
16.20	0.55	16.75			1.74	2.43	2.95			36.7	68574
12.00	*1.50*	*13.50*				*1.65*	*2.00*			*26.9*	
8.05	1.25	9.30			0.98	0.98	1.19	1.93		21.3	69368
9.35	9.50	18.85			0.48	0.80	0.97	1.94		25.7	69369
8.50	1.10	9.60			0.96	0.96	1.17	2.07		22.1	69117
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*2.00*		*20.7*	
9.05	1.00	10.05			0.72	1.04	1.26	3.29		25.8	68576
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*3.00*		*22.7*	
8.45	1.65	10.10			1.30	1.71	2.08	2.09		26.1	69118
8.00	*1.50*	*9.50*				*1.65*	*2.00*	*2.00*		*24.9*	
12.80	2.70	15.50			1.22	1.75	2.12	2.20		33.4	69119
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*30.9*	
12.45	2.45	14.90			1.20	1.71	2.08	1.89		32.0	69370
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*30.9*	
8.65	11.20	19.85			1.32	1.71	2.08		4.47	35.0	68867
8.00	*1.50*	*9.50*				*1.65*	*2.00*		*4.00*	*28.9*	
8.80	1.70	10.50			2.42	2.42	2.94		6.11	38.2	68868
8.00	*1.50*	*9.50*				*2.47*	*3.00*		*6.00*	*37.0*	
9.70	14.80	24.50				0.94	1.14			25.2	68582
10.00	*12.00*	*22.00*				*0.82*	*1.00*			*23.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Rasin-Monumental Co. (Subsidiary of Va.-Car. Chem. Co.), Cincinnati, Nashville, Memphis.	
68583	Rasin's Pure Bone Meal	Manufacturer Guaranteed
68584	Rasin's Raw Bone Meal	Manufacturer Guaranteed
69176	Rasin's Pure Bone Meal (Steamed)	Manufacturer Guaranteed
	Read Phosphate Co., Nashville, Tenn.	
68869 69371	High Grade Acid Phosphate	I. K. Miller and Sons, Campbellsville Vic Smith, Bowling Green Guaranteed
68870 68871 68872 69372	High Grade Red Diamond Acid Phosphate	Vic Smith, Bowling Green Estes and Hines, Science Hill U. L. Antle, Campbellsville Barren County Grocery and Hdw. Co., Glasgow Guaranteed
69120	Premium Acid Phosphate	Garrard County Farm Bureau, Lancaster Guaranteed
68873 68874 69373	Red Diamond 20% Acid Phosphate	F. E. Bernard, Jamestown O. D. Smith, Greasy Creek J. B. Bradshaw, Taylorsville Guaranteed
68022	Alkaline Bone	Manufacturer Guaranteed
68023	High Grade Potash Mixture	Manufacturer Guaranteed
69121	†Blood and Bone No. 1	J. E. Coombs, Greenville Guaranteed
68875 69375 69122	Kentucky Special	Blankenship and Richards, Greasy Creek U. L. Antle, Columbia J. E. Coombs, Greenville Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		26.50	89	11		2.43	2.95			33.4	68583
		22.00				*2.47*	*3.00*			*30.0*	
		23.10	74	26		4.30	5.22			40.0	68584
		20.00				*3.71*	*4.50*			*34.6*	
		28.90	76	24		1.40	1.70			30.1	69176
		27.00				*1.65*	*2.00*			*29.9*	
15.70	3.90	19.60								18.8	68869
18.25	3.35	21.60								21.9	69371
14.00	*4.00*	*18.00*								*16.8*	
18.40	1.00	19.40								22.1	68870
17.10	1.50	18.60								20.5	68871
16.35	2.05	18.40								19.6	68872
17.40	3.30	20.70								20.9	69372
16.00	*2.00*	*18.00*								*19.2*	
21.00	0.90	21.90								25.2	69120
18.00	*2.00*	*20.00*								*21.6*	
21.40	2.30	23.70								25.7	68873
21.50	2.00	23.50								25.8	68874
21.30	0.85	22.15								25.6	69373
20.00										*24.0*	
12.60	9.50	22.10						2.13		23.2	68022
10.00	*7.00*	*17.00*						*2.00*		*19.0*	
10.50	10.20	20.70						4.52		24.8	68023
10.00	*5.00*	*15.00*						*4.00*		*23.0*	
8.75	4.45	13.20			0.30	1.24	1.51	5.47		32.1	69121
8.00	*5.00*	*13.00*				*1.65*	*2.00*	*2.00*		*26.3*	
8.50	8.15	16.65				0.51	0.62	4.28		27.1	68875
9.55	8.35	17.90				0.53	0.64	2.96	1.00	28.2	69375
9.10	3.70	12.80				1.06	1.29	4.31		30.1	69122
8.00	*6.00*	*14.00*				*0.41*	*0.50*	*4.00*		*24.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Read Phosphate Co., Nashville, Tenn.	
68876	Kentucky Tobacco Grower	I. W. Bryant, Greasy Creek
68877		Hollingsworth-Young Hdw. Co., Bowling Green
69123		Young Hardware Co., Hopkinsville
		Guaranteed
68878	Read's High Grade Tobacco Grower	I. K. Miller and Sons, Campbellsville
68879		Vic Smith, Bowling Green
		Guaranteed
69441	Standard Tobacco Grower	T. R. Johnson, Barlow
69124		Garrard Co. Farm Bureau, Lancaster
		Guaranteed
69376	†High Grade Truck and Tobacco Special	J. S. Hamblin, Auburn
69126		Vic Smith, Bowling Green
69127		A. H. Dawson, Owingsville
		Guaranteed
68883	Old Kentucky Tobacco Special	Woodford Spears and Son, Paris
		Guaranteed
68884	†Prize Tobacco Grower	G. M. Stevenson, Columbia
		Guaranteed
68886	Farmers Special Manure	U. L. Antle, Columbia
68887		O. D. Smith, Greasy Creek
69378		U. L. Antle, Columbia
		Guaranteed
68888	Read's Corn and Wheat Grower	I. P. Williams, Sewellton
68889		T. W. Bryant, Greasy Creek
69379		J. H. Jasper, W. Somerset
		Guaranteed
69380	Premium Grain Grower	J. H. Jasper, W. Somerset
		Guaranteed
68035	Half and Half	Manufacturer
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.20	5.80	15.00				0.88	1.07	1.16		22.8	68876
8.20	9.30	17.50			0.40	1.06	1.29	1.46		24.2	68877
11.45	8.45	19.90			0.27	0.93	1.13	1.02		27.3	69123
8.00	*6.00*	*14.00*				*0.82*	*1.00*	*1.00*		*20.5*	
8.60	4.80	13.40			1.09	1.82	2.21	3.88	1.87	35.4	68878
7.55	7.00	14.55			0.68	1.97	2.39	3.84	0.66	33.0	68879
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*4.00*	*29.9*	
8.60	10.30	18.90			0.67	1.84	2.23		2.47	31.2	69441
8.50	7.20	15.70			0.91	1.82	2.21	2.74		30.2	69124
8.00	*5.00*	*13.00*				*1.65*	*2.00*		*2.00*	*26.3*	
9.15	6.00	15.15			0.51	1.56	1.89	2.48	5.20	39.3	69376
8.40	7.90	16.30			1.10	1.75	2.12	7.67		39.9	69126
8.60	4.90	13.50			1.14	1.83	2.22	4.16	3.93	40.2	69127
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*8.00*	*37.9*	
7.85	5.45	13.30			2.12	2.81	3.41	3.96	1.95	39.8	68883
8.00	*3.00*	*11.00*				*2.47*	*3.00*		*6.00*	*37.6*	
10.95	4.55	15.50			1.64	2.71	3.29	2.72		37.2	68884
10.00	*3.00*	*13.00*				*2.47*	*3.00*	*3.00*		*34.6*	
10.05	7.65	17.70			0.28	1.01	1.23	3.06		29.3	68886
10.40	3.40	13.80			0.20	0.96	1.17	2.67		27.1	68887
10.90	5.30	16.20				0.96	1.17	2.91		29.1	69378
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*3.00*		*26.7*	
12.55	7.45	20.00			0.22	0.44	0.53	0.72		25.5	68888
12.60	5.60	18.20				0.41	0.50	0.92		25.0	68889
12.85	5.85	18.70				0.52	0.63	0.93		26.1	69379
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*22.6*	
13.00	3.80	16.80			0.39	1.47	1.78	2.18		32.7	69380
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*2.00*		*31.5*	
		21.40	68	32		2.15	2.61			27.9	68035
		20.00				*1.85*	*2.25*			*25.3*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Read Phosphate Co., Nashville, Tenn.	
68890	Pure Raw Bone Meal	Vic Smith, Bowling Green
69381		Hollingsworth, Young Hardware Co., Bowling Green
69382		J. H. Jasper, W. Somerset
		Guaranteed
69129	Tobacco and Grain Grower	Young Hardware Co., Hopkinsville
		Guaranteed
	Smith Agricultural Chem. Co., Columbus, Ohio.	
68619	Smith's Sacco 20% Acid Phosphate	Manufacturer
		Guaranteed
69132	Smith's Sacco 16% Acid Phosphate	J. C. Everett and Co., Maysville
		Guaranteed
68621	Smith's Sacco 16% Acid Phosphate with Tankage Filler	Manufacturer
		Guaranteed
69133	Smith's Sacco Tobacco Grower	J. C. Everett and Co., Maysville
		Guaranteed
68623	Smith's Sacco Potato and Tobacco Special	Manufacturer
		Guaranteed
68624	Smith's Sacco 1-8-2	Manufacturer
		Guaranteed
68625	Smith's Sacco 2-12-2	Manufacturer
		Guaranteed
	Southern Fertilizer Co., Inc., Louisville, Ky.	
68613	Elk Tobacco Grower	Manufacturer
		Guaranteed
69431	Elk General Crop Grower	Corbin Supply Co., Corbin
69135		Corbin Supply Co., Corbin
		Guaranteed
68615	Elk Special Grain Grower	Manufacturer
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
		23.50	27	73		3.84	4.66			38.0	68890
		22.20	48	52		3.45	4.19			35.0	69381
		22.30	100			3.84	4.66			37.0	69382
		20.00				*3.71*	*4.50*			*34.6*	
8.30	2.90	11.20			0.94	1.88	2.28	5.54		34.1	69129
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*31.9*	
20.15	1.05	21.20								24.2	68619
20.00										*24.0*	
16.40	1.70	18.10								19.7	69132
16.00										*19.2*	
16.25	0.75	17.00								19.5	68621
16.00										*19.2*	
7.60	1.30	8.90			0.48	0.76	0.92	4.07		23.9	69133
8.00						*0.82*	*1.00*	*4.00*		*24.1*	
8.65	0.85	9.50			0.44	0.76	0.92	6.58		30.3	68623
8.00						*0.82*	*1.00*	*7.00*		*30.1*	
9.80	1.00	10.80			0.55	0.99	1.20	2.54		25.1	68624
8.00						*0.82*	*1.00*	*2.00*		*20.1*	
11.65	1.30	12.95			1.07	1.58	1.92	1.94		29.8	68625
12.00						*1.65*	*2.00*	*2.00*		*30.3*	
8.10	1.55	9.65			0.70	1.71	2.08		1.24	23.8	68613
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*1.00*	*22.7*	
10.70	0.90	11.60			0.51	0.51	0.62	0.68	0.72	21.8	69431
10.50	0.90	11.40				0.46	0.56		0.95	20.3	69135
10.00	*1.00*	*11.00*				*0.41*	*0.50*		*1.00*	*19.5*	
11.40	1.40	12.80			0.59	0.59	0.72	2.39		25.4	68615
11.00	*1.00*	*12.00*				*0.41*	*0.50*	*2.00*		*23.0*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Southern Fertilizer Co., Inc., Louisville, Ky.	
68616	Elk Corn and Wheat Grower	Manufacturer Guaranteed
68617	Elk Superior Phosphate	Manufacturer Guaranteed
68618	Atlas Phosphate	Manufacturer Guaranteed
69134	Elk Spl. Tobacco Grower	Conrad, Payne and Co., Cloverport Guaranteed
	Swift and Co., Inc., National Stock Yards, Ill.	
68470	Swift's Red Steer 4-12	Manufacturer Guaranteed
68471	Swift's Red Steer 2-12	Manufacturer Guaranteed
68472	Swift's Red Steer 2-10	Manufacturer Guaranteed
68473	Swift's Red Steer 12-4	Manufacturer Guaranteed
68474	Swift's Red Steer 14-2	Manufacturer Guaranteed
69385	Swift's Red Steer 20% Acid Phosphate Fertilizer	Vine Grove Feed Co., Vine Grove Guaranteed
68891 68892 69386 69387 69432 69443	Swift's High Grade Acid Phosphate Fertilizer	Staggs Bros., Vanceburg J. W. Hicks, Upton Jenkins-Essex Co., Elizabethtown I. K. Miller and Son, Campbellsville Denton Hdw. Co., Madisonville Yopp Seed Co., Paducah Guaranteed
69136	Swift's Bone Meal and Phosphate Fertilizer	J. W. Collier, Crab Orchard Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
7.70 *7.00*	3.40 *1.00*	11.10 *8.00*			0.76	1.00 *0.82*	1.21 *1.00*	1.21	 *1.00*	20.3 *17.0*	68616
21.20 *20.00*	0.60 *1.00*	21.80 *21.00*								25.4 *24.0*	68617
17.00 *16.00*	1.55	18.55								20.4 *19.2*	68618
10.10 *10.00*	0.80 *1.00*	10.90 *11.00*			0.26	0.57 *0.41*	0.69 *0.50*		1.22 *1.00*	20.8 *19.5*	69134
12.60 *12.00*	0.80 *1.00*	13.40 *13.00*			0.44	3.37 *3.29*	4.09 *4.00*			36.1 *34.9*	68470
12.20 *12.00*	0.70 *1.00*	12.90 *13.00*			0.35	1.70 *1.65*	2.06 *2.00*			27.1 *26.7*	68471
10.30 *10.00*	0.50 *1.00*	10.80 *11.00*			0.27	1.66 *1.65*	2.02 *2.00*			24.0 *23.7*	68472
12.70 *12.00*	0.40 *1.00*	13.10 *13.00*						3.88 *4.00*		26.8 *26.0*	68473
14.95 *14.00*	0.50 *1.00*	15.45 *15.00*						1.87 *2.00*		26.2 *25.0*	68474
20.75 *20.00*	1.10	21.85								24.9 *24.0*	69385
16.75	0.85	17.60								20.1	68891
16.65	0.75	17.40								20.0	68892
16.75	0.55	17.30								20.1	69386
15.85	0.60	16.45								19.0	69387
17.00	0.40	17.40								20.4	69432
17.00 *16.00*	0.80	17.80								20.4 *19.2*	69443
17.40 *15.00*	4.20 *5.00*	21.60 *20.00*			0.31	0.98 *0.82*	1.19 *1.00*			32.7 *28.6*	69136

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Swift and Co., Inc., National Stock Yards, Ill.	
69388	Swift's Raw Bone Meal Fertilizer	J. E. Shadoan, Frazer Guaranteed
68479	Swift's 2¼-29 Bone Meal Fertilizer	Manufacturer Guaranteed
68893 69137 69389 69390 69433	Swift's 1¼-29 Bone Meal Fertilizer	Mayhew Feed Co., Franklin J. W. Collier, Crab Orchard J. E. Shadoan, Frazer Vine Grove Feed Co., Vine Grove Young and Bishop, Providence Guaranteed
68481	Swift's Red Steer 1-12-0	Manufacturer Guaranteed
68482	Swift's Red Steer 14-4	Manufacturer Guaranteed
69391	Swift's Red Steer 1-12-1	Jenkins-Essex Co., Elizabethtown Guaranteed
68485	Swift's Red Steer 1-8-1	Manufacturer Guaranteed
68896 68897	†Swift's Red Steer 3-8-6	D. E. Patterson, Hodgenville J. F. Collings, Shepherdsville Guaranteed
68488	Swift's Red Steer 2-8-3	Manufacturer Guaranteed
68489	Swift's Red Steer 3-8-3	Manufacturer Guaranteed
68490	Swift's Red Steer 3-8-5	Manufacturer Guaranteed
68491	Swift's Red Steer 2-10-4	Manufacturer Guaranteed
68492	Swift's Red Steer 2-8-2	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		24.50	63	37		4.00	4.86			39.6	69388
		23.00				*3.71*	*4.50*			*37.0*	
		28.60	82	18		2.23	2.71			33.0	68479
		29.00				*1.85*	*2.25*			*32.5*	
		32.05	90	10		1.13	1.37			31.3	68893
		31.55	89	11		1.27	1.54			31.6	69137
		32.80	85	15		1.00	1.21			31.2	69389
		30.90	89	11		1.59	1.93			32.7	69390
		32.00	79	21		1.29	1.57			32.1	69433
		29.00				*1.03*	*1.25*			*28.4*	
12.10	0.60	12.70				0.81	0.98			22.4	68481
12.00	*1.00*	*13.00*				*0.82*	*1.00*			*22.5*	
14.30	0.35	14.65						4.48	0.66	31.7	68482
14.00	*1.00*	*15.00*						*4.00*		*29.0*	
13.20	0.90	14.10			0.50	0.84	1.02	0.96		26.3	69391
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*24.5*	
8.00	0.60	8.60			0.78	0.78	0.95	1.05		18.2	68485
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*1.00*		*18.5*	
8.60	0.45	9.05			1.94	2.40	2.91	0.68	4.97	36.4	68896
8.75	0.40	9.15			1.89	2.38	2.89		5.66	36.5	68897
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
7.95	2.10	10.05			1.46	1.67	2.03	2.99		27.1	68488
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*3.00*		*26.7*	
8.20	0.35	8.55				2.49	3.02	2.87		31.1	68489
8.00	*1.00*	*9.00*				*2.47*	*3.00*	*3.00*		*30.8*	
8.30	0.35	8.65			0.37	2.62	3.18	5.23		36.2	68490
8.00	*1.00*	*9.00*				*2.47*	*3.00*	*5.00*		*34.8*	
10.05	0.65	10.70			1.05	1.60	1.94	2.48	1.92	32.1	68491
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*31.7*	
7.80	3.40	11.20			1.51	1.51	1.83	2.36		25.3	68492
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*24.7*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Swift and Co., Inc., National Stock Yards, Ill.	
69392	Swift's Red Steer 2-12-2	J. E. Shadoan, Frazer Guaranteed
69140	Swift's Red Steer 3-8-6 Tobacco Grower	J. A. Bennett, Taylorsville Guaranteed
68496	Swift's Red Steer 4-8-6	Manufacturer Guaranteed
68586	Swift's Vigoro	Manufacturer Guaranteed
69141	Swift's Pulverized Manure	Byrley Supply, Pineville Guaranteed
69393 69394	Swift's Red Steer 2-16-2	J. E. Shadoan, Frazer Vine Grove Feed Co., Vine Grove Guaranteed
	Taylor and Powell Fertilizer Co., Inc., Springfield, Tenn.	
69142	No. 4 Tobacco Grower with Potash	John M. Keeling, Elkton Guaranteed
	Tennessee Chem. Co. (Armour owned) Louisville, Cincinnati, Nashville.	
68899 69144	†Ox Dark Tobacco Grower	W. F. Grainger, Franklin J. S. Duke, Crab Orchard Guaranteed
68205	Ox 2-16-2 Fertilizer	Manufacturer Guaranteed
68900	Ox 2-10-4 Fertilizer	Thomas Hinton Co., Bowling Green Guaranteed
68208	Ox 1-12-1 Fertilizer	Manufacturer Guaranteed
68209	Ox 2-8-2 Fertilizer	Manufacturer Guaranteed
68210	Ox 2-12-0 Fertilizer	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
12.30	1.00	13.30			1.14	1.72	2.09	1.92		31.3	69392
12.00	*1.00*	*13.00*				*1.65*	*2.00*	*2.00*		*30.7*	
8.40	0.80	9.20			1.93	2.42	2.94	0.56	4.81	35.8	69140
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
8.25	0.65	8.90			3.06	3.06	3.71	6.40		40.7	68496
8.00	*1.00*	*9.00*				*3.29*	*4.00*	*6.00*		*40.9*	
12.35	0.55	12.90			2.76	3.25	3.95	4.09		43.2	68586
12.00						*3.29*	*4.00*	*4.00*		*42.5*	
1.60	0.30	1.90			0.22	2.23	2.71	0.52	1.71	18.1	69141
1.00	*0.50*	*1.50*				*1.65*	*2.00*	*2.00*		*14.0*	
16.80	0.85	17.65			1.68	1.68	2.04	2.09		38.1	69393
17.15	0.70	17.85			1.64	1.64	1.99	2.08		38.4	69394
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*36.7*	
8.45	6.60	15.05			2.18	2.55	3.10	3.84		35.8	69142
8.00						*2.47*	*3.00*		*3.00*	*30.4*	
8.20	1.00	9.20			1.00	1.53	1.86	1.88	1.86	27.8	68899
8.60	1.25	9.85			0.87	1.57	1.91	1.04	3.03	29.6	69144
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*4.00*	*28.7*	
16.90	0.50	17.40			2.07	2.07	2.51	2.62		41.1	68205
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*2.00*		*36.7*	
10.45	0.80	11.25			1.34	1.68	2.04	3.90		32.2	68900
10.00	*1.00*	*11.00*				*1.65*	*2.00*	*4.00*		*31.7*	
12.95	2.25	15.20			0.85	1.12	1.36	1.18		28.3	68208
12.00	*1.00*	*13.00*				*0.82*	*1.00*	*1.00*		*24.5*	
9.30	2.70	12.00			1.66	2.14	2.60	2.29		30.3	68209
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*2.00*		*24.7*	
12.95	1.95	14.90			1.56	1.94	2.36			29.9	68210
12.00	*1.00*	*13.00*				*1.65*	*2.00*			*26.7*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Tennessee Chem. Co. (Armour owned) Louisville, Cincinnati, Nashville.	
69145	Ox 1-8-1 Fertilizer	J. S. Duke, Crab Orchard Guaranteed
68901 69396	†Ox 0-12-4 Fertilizer	W. F. Grainger, Franklin Young Hdw. Co., Hopkinsville Guaranteed
68902	†Ox Bone Meal	H. D. Jones, Glasgow Guaranteed
68903 69399 69400	Ox Raw Bone	Thomas Hinton Co., Bowling Green Young Hardware Co., Hopkinsville McChesney and Thompson, Trenton Guaranteed
68904 68905 69401 69402 69403	Ox 16% Acid Phosphate	H. D. Jones, Glasgow W. F. Grainger, Franklin Young Hardware Co., Hopkinsville J. S. Duke, Crab Orchard H. D. Jones, Glasgow Guaranteed
68906	†Ox 20% Superphosphate	H. D. Jones, Glasgow Guaranteed
69147 69405 69406	Ox 4-16-4 Fertilizer	J. A. Shaver, Greenville Young Hardware Co., Hopkinsville Cadiz Trading Co., Cadiz Guaranteed
68218	Ox 4-12-4 Fertilizer	Manufacturer Guaranteed
68219	Ox High Grade Tobacco Grower	Manufacturer Guaranteed
69148	†Ox Black Patch Special	Cadiz Trading Co., Cadiz Guaranteed
69149	†Ox Burley Tobacco Grower	J. S. Duke, Crab Orchard Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
7.70	0.80	8.50			0.48	0.80	0.97	1.63		19.1	69145
8.00						*0.82*	*1.00*	*1.00*		*18.1*	
13.25	2.40	15.65						4.20		28.3	68901
11.85	2.40	14.25						3.78		25.3	69396
12.00	*1.00*	*13.00*						*4.00*		*26.0*	
		27.70	70	30		2.56	3.11			35.0	68902
		27.00				*2.47*	*3.00*			*34.0*	
		23.65	100			4.07	4.94			39.3	68903
		23.55	100			4.06	4.93			39.1	69399
		23.30	100			4.05	4.92			38.9	69400
		22.00				*3.71*	*4.50*			*36.2*	
16.50	1.50	18.00								19.8	68904
18.20	1.30	19.50								21.8	68905
16.10	2.45	18.55								19.3	69401
16.25	0.95	17.20								19.5	69402
17.20	2.40	19.60								20.6	69403
16.00	*1.00*	*17.00*								*19.2*	
20.70	0.70	21.40								24.8	68906
20.00	*1.00*	*21.00*								*24.0*	
16.20	0.90	17.10			3.04	3.04	3.69	3.99		47.8	69147
15.90	1.40	17.30			3.12	3.12	3.79	3.89		47.8	69405
16.20	1.60	17.80			3.16	3.16	3.84	4.09		48.9	69406
16.00	*1.00*	*17.00*				*3.29*	*4.00*	*4.00*		*48.9*	
12.90	1.80	14.70			3.40	3.72	4.52	5.34		49.4	68218
12.00	*1.00*	*13.00*				*3.29*	*4.00*	*4.00*		*42.9*	
11.20	1.80	13.00			1.29	1.88	2.28	0.76	8.57	45.6	68219
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*10.00*	*43.7*	
7.80	3.50	11.30			1.33	2.43	2.95	0.60	5.47	37.4	69148
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
8.00	1.50	9.50			1.38	2.43	2.95	0.60	5.23	36.4	69149
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Tennessee Chem. Co. (Armour owned) Louisville, Cincinnati, Nashville.	
68222	Ox Potato Grower	Manufacturer Guaranteed
69150	Ox Special Tobacco Guano	T. J. Turley Co., Owensboro Guaranteed
68628	Ox Tobacco Fertilizer	* Guaranteed
68968	Ox 2-16-8 Fertilizer	* Guaranteed
	Tenn. Coal, Iron and R. R. Co., Birmingham, Ala.	
68909	Duplex Basic Phosphate	Farmers Union Supply Co., Glasgow
68910		Taylor County Supply Co., Campbellsville
69152		Cayce-Yost Co., Hopkinsville
69409		Farmers Union Supply Co., Glasgow
69410		Farm Bureau, Elizabethtown Guaranteed
	Tenn. Copper and Chemical Corporation, Lockland, Ohio.	
68911	16% Acid Phosphate	Hardin County Farm Bureau, Elizabethtown
69153		C. D. Hughes, Russellville
69154		Boone County Farm Bureau, Florence Guaranteed
69155	20% Acid Phosphate	Farmers Supply Co., Richmond Guaranteed
68912	†2-12-2 Fertilizer	Hardin County Farm Bureau, Elizabethtown Guaranteed
68914	2-12-6 Fertilizer	Hardin County Farm Bureau, Elizabethtown Guaranteed
68603	4-12-0 Fertilizer	Manufacturer Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
8.10	1.40	9.50			1.91	2.72	3.30	0.88	4.92	37.9	68222
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
10.15	3.15	13.30			1.19	1.78	2.16	0.88	1.41	30.4	69150
10.00	*1.00*	*11.00*				*1.65*	*2.00*		*2.00*	*27.7*	
8.00	*1.00*	*9.00*				*1.65*	*2.00*		*5.00*	*30.7*	68628
16.00	*1.00*	*17.00*				*1.65*	*2.00*	*8.00*		*48.7*	68968
		18.65								22.4	68909
		19.00								22.8	68910
		18.85								22.6	69152
		18.10								21.7	69409
		18.00								21.6	69410
		18.00								*21.6*	
19.25	1.15	20.40								23.1	68911
18.60	1.30	19.90								22.3	69153
18.20	1.70	19.90								21.8	69154
16.00	*0.20*	*16.20*								*19.2*	
20.85	0.90	21.75								25.0	69155
20.00	*0.20*	*20.20*								*24.0*	
12.55	1.60	14.15			1.46	1.68	2.04	2.79		33.5	68912
12.00	*0.20*	*12.20*				*1.65*	*2.00*	*2.00*		*30.3*	
12.45	1.65	14.10			1.35	1.73	2.10	6.27		40.5	68914
12.00	*0.20*	*12.20*				*1.65*	*2.00*	*6.00*		*38.3*	
12.40	0.85	13.25			2.37	3.11	3.78			34.5	68603
12.00	*0.20*	*12.20*				*3.29*	*4.00*			*34.5*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Tenn. Copper and Chemical Corporation, Lockland, Ohio.	
68915	Nitrate of Soda	Hardin County Farm Bureau, Elizabethtown Guaranteed
68605	Sulphate Ammonia	Manufacturer Guaranteed
68606	Muriate of Potash	Manufacturer Guaranteed
68607	Sulphate of Potash	Manufacturer Guaranteed
68630	3-10-3	Manufacturer Guaranteed
68631	2-12-0	Manufacturer Guaranteed
	Victor Guano Co., Nashville, Tenn.	
68050	High Grade Acid Phosphate	Manufacturer Guaranteed
68916 69164 69421 69434	Victor Acid Phosphate	E. C. Humble, Greasy Creek McClure and Durham, Mt. Vernon Kelly Bros., Bowling Green Lambert Gresham Hdw. Co., Henderson Guaranteed
68052	Bone and Potash	Manufacturer Guaranteed
68053	Ky. Home Guano	Manufacturer Guaranteed
68054	Ky. Soil Food	Manufacturer Guaranteed
68055	Standard Tobacco Grower	Manufacturer Guaranteed
68056	High Grade Tobacco and Truck Grower	Manufacturer Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
						15.28 *14.83*	18.54 *18.00*			76.4 *74.2*	68915
						20.40 *20.60*	24.76 *25.00*			102.0 *103.0*	68605
								51.80 *50.00*		103.6 *100.0*	68606
									50.88 *48.00*	101.8 *96.0*	68607
11.70 *10.00*	1.00 *0.20*	12.70 *10.20*			2.67	3.11 *2.47*	3.78 *3.00*	3.43 *3.00*		40.4 *33.4*	68630
12.10 *12.00*	0.80 *0.20*	12.90 *12.20*			1.37	1.99 *1.65*	2.42 *2.00*			28.4 *26.3*	68631
14.70 *14.00*	7.00 *4.00*	21.70 *18.00*								17.6 *16.8*	68050
17.05	4.55	21.60								20.5	68916
19.20	1.30	20.50								23.0	69164
18.10	3.60	21.70								21.7	69421
17.90 *16.00*	3.70 *2.00*	21.60 *18.00*								21.5 *19.2*	69434
12.60 *10.00*	9.50 *7.00*	22.10 *17.00*						2.13 *2.00*		23.2 *19.0*	68052
9.00 *8.00*	9.70 *6.00*	18.70 *14.00*			0.36	1.10 *0.82*	1.34 *1.00*	*1.00*	1.18	25.2 *20.5*	68053
9.40 *8.00*	6.80 *6.00*	16.20 *14.00*			0.34	0.56 *0.41*	0.68 *0.50*	4.61 *4.00*		28.8 *24.5*	68054
8.20 *8.00*	10.00 *5.00*	18.20 *13.00*			0.41	1.98 *1.65*	2.40 *2.00*		2.64 *2.00*	31.5 *26.3*	68055
10.00 *8.00*	3.60 *4.00*	13.60 *12.00*			0.61	2.11 *1.65*	2.56 *2.00*	0.68	3.80 *4.00*	36.0 *29.9*	68056

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	Available
	Victor Guano Co., Nashville, Tenn.		
68057	Premium Tobacco Grower	Manufacturer	7.80
		Guaranteed	*8.00*
68058	Ky. High Grade Tobacco Grower	Manufacturer	13.10
		Guaranteed	*12.00*
68059	Wheat, Oat and Corn Grower	Manufacturer	13.80
		Guaranteed	*11.00*
	Virginia-Carolina Chemical Co., Inc., Cincinnati, Nashville, Memphis.		
68917	V-C 16% Acid Phosphate	W. E. Pointer, Horse Cave	17.00
68918		Burton Bros. and Tabor Bros., Norfleet	17.45
68919		Farmers Union Supply Co., Glasgow	18.40
69411		Farmers Union Supply Co., Glasgow	17.70
69412		E. M. Ford and Son, Cave City	18.05
69413		C. A. Casteel, E. Bernstadt	17.00
69414		A. W. Tarter, Columbia	18.60
		Guaranteed	*16.00*
68920	V-C 20% Acid Phosphate	A. W. Tarter, Columbia	21.95
68921		Vernon Shuffett, Greensburg	21.40
		Guaranteed	*20.00*
68922	V-C 24% Acid Phosphate	Burton Bros. and Tabor Bros., Norfleet	31.55
68923		W. L. Ray, Somerset	27.30
69415		Farm Bureau, Monticello	26.80
		Guaranteed	*24.00*
68552	V-C Phospho Tobacco (300 lbs. Stems per ton)	Manufacturer	16.35
		Guaranteed	*16.00*
68924	V-C Capitol Phosphate and Potash	A. W. Tarter, Columbia	10.50
69416		A. W. Tarter, Columbia	10.10
		Guaranteed	*10.00*
69160	V-C Prolific Grain Grower	R. M. Bagby, Grayson	13.10
		Guaranteed	*12.00*
68555	V-C Sure Grain Producer	Manufacturer	16.20
		Guaranteed	*12.00*

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
7.80	5.60	13.40			0.47	2.90	3.52	1.08	6.14	42.9	68057
8.00	*3.00*	*11.00*				*2.47*	*3.00*		*6.00*	*37.6*	
13.10	4.50	17.60			1.13	2.10	2.55	2.60		37.2	68058
12.00	*3.00*	*15.00*				*1.65*	*2.00*	*2.00*		*31.5*	
13.80	3.60	17.40			0.31	0.51	0.62	1.26		27.2	68059
11.00	*5.00*	*16.00*				*0.41*	*0.50*	*1.00*		*22.6*	
17.00	5.05	22.05								20.4	68917
17.45	0.85	18.30								20.9	68918
18.40	2.00	20.40								22.1	68919
17.70	3.10	20.80								21.2	69411
18.05	2.70	20.75								21.7	69412
17.00	2.10	19.10								20.4	69413
18.60	0.90	19.50								22.3	69414
16.00	*1.50*	*17.50*								*19.2*	
21.95	0.25	22.20								26.3	68920
21.40	0.20	21.60								25.7	68921
20.00	*1.50*	*21.50*								*24.0*	
31.55	0.55	32.10								37.9	68922
27.30	0.70	28.00								32.8	68923
26.80	0.25	27.05								32.2	69415
24.00	*1.50*	*25.50*								*28.8*	
16.35	2.15	18.50								19.6	68552
16.00	*1.50*	*17.50*								*19.2*	
10.50	8.55	19.05						4.94		25.6	68924
10.10	0.80	10.90						5.86		26.9	69416
10.00	*1.50*	*11.50*						*5.00*		*25.0*	
13.10	1.30	14.40						2.16		24.0	69160
12.00	*1.50*	*13.50*						*2.00*		*22.0*	
16.20	0.55	16.75			1.74	2.43	2.95			36.7	68555
12.00	*1.50*	*13.50*				*1.65*	*2.00*			*26.9*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Virginia-Carolina Chemical Co., Inc., Cincinnati, Nashville, Memphis.	
68925	V-C Champion Corn and Wheat Grower	Burton Bros. and Tabor Bros., Norfleet
68926		Ky. Wholesale Co., Pikeville
69417		C. A. Casteel, E. Bernstadt
		Guaranteed
69418	V-C Farmers Friend	Taylor County Supply Co., Campbellsville
		Guaranteed
68927	V-C Beef, Blood and Bone, B. B. B	Ky. Wholesale Co., Pikeville
68928		Burton Bros. and Tabor Bros., Norfleet
69161		Ed. G. Scruggs, Adairville
69419		Taylor County Supply Co., Campbellsville
		Guaranteed
68929	V-C Springfall Fertilizer	Ky. Wholesale Co., Pikeville
68930		G. M. Garrison, Mt. Victory
		Guaranteed
68932	V-C 2-8-4 Tobacco Special (Potash from Sulphate)	Vernon Shuffett, Greensburg
68933		Lewis and Drye, Lebanon
68934		Farmers Union Supply Co., Glasgow
		Guaranteed
68935	V-C Tobacco and Truck Special	E. M. Ford and Son, Cave City
68936		Morrell Supply Co., Prestonsburg
68937		Burton Bros. and Tabor Bros., Norfleet
69162		T. H. O'Bryan, Dawson Springs
		Guaranteed
68563	V. C. Bone Meal and Phosphate	Manufacturer
		Guaranteed
68938	V-C Pure Bone Meal	Burton Bros. and Tabor Bros., Norfleet
		Guaranteed
68939	V-C Raw Bone Meal	Burton Bros. and Tabor Bros., Norfleet
69420		E. M. Ford and Son., Cave City
		Guaranteed

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
8.70	1.40	10.10			0.85	0.85	1.03	1.95		21.8	68925
8.30	1.75	10.05			0.50	0.82	1.00	2.09		21.4	68926
7.60	1.50	9.10			0.88	0.88	1.07	2.18		20.8	69417
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*2.00*		*20.7*	
8.65	6.85	15.50			0.61	0.96	1.17	3.20		26.9	69418
8.00	*1.50*	*9.50*				*0.82*	*1.00*	*3.00*		*22.7*	
9.15	2.05	11.20			1.20	1.72	2.09	2.04		27.2	68927
9.85	1.80	11.65			1.49	1.76	2.14	2.54		29.4	68928
9.05	11.80	20.85			1.34	1.73	2.10	2.32		31.6	69161
8.75	7.85	16.60			1.00	1.51	1.83	2.33		28.5	69419
8.00	*1.50*	*9.50*				*1.65*	*2.00*	*2.00*		*24.9*	
12.80	2.25	15.05			1.35	1.88	2.28	2.04		33.6	68929
13.05	1.60	14.65			1.26	1.72	2.09	2.05		32.9	68930
12.00	*1.50*	*13.50*				*1.65*	*2.00*	*2.00*		*30.9*	
9.00	11.25	20.25			1.29	1.64	1.99		4.15	34.5	68932
8.50	11.10	19.60			1.16	1.53	1.86	0.60	3.64	33.3	68933
9.00	11.10	20.10			1.16	1.64	1.99		3.91	34.0	68934
8.00	*1.50*	*9.50*				*1.65*	*2.00*		*4.00*	*28.9*	
8.50	9.80	18.30			1.91	2.39	2.90		5.93	40.5	68935
9.10	1.70	10.80			2.12	2.39	2.90		6.31	38.9	68936
9.30	1.60	10.90			2.05	2.29	2.78		6.13	38.3	68937
8.80	9.10	17.90			1.75	2.26	2.74		6.47	41.1	69162
8.00	*1.50*	*9.50*				*2.47*	*3.00*		*6.00*	*37.0*	
9.70	14.80	24.50				0.94	1.14			25.2	68563
10.00	*12.00*	*22.00*				*0.82*	*1.00*			*23.9*	
		25.60	83	17		3.03	3.68			35.6	68938
		22.00				*2.47*	*3.00*			*30.0*	
		22.80	100			3.91	4.75			37.8	68939
		23.00	100			4.02	4.88			38.5	69420
		20.00				*3.71*	*4.50*			*34.6*	

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Virginia-Carolina Chemical Co. Inc., Cincinnati, Nashville, Memphis.	
68566	V-C Plant Food for Vegetables, Lawns and Flowers	Manufacturer Guaranteed
68567	V-C Big Potato and Truck	Manufacturer Guaranteed
69163	V-C Super-Thirty Fertilizer	R. M. Bagby, Grayson Guaranteed
69175	V-C Pure Bone Meal (Steamed)	Manufacturer Guaranteed
	Wilson and Co., New Albany, Ind.	
69178	Red "W" Brand High Grade Tobacco and Truck Gr	* Guaranteed
69179	Red "W" Brand Tobacco Grower	* Guaranteed
69180	Red "W" Brand Two Twelve Six	* Guaranteed
69181	Red "W" Brand Two Twelve Two	* Guaranteed
69182	Red "W" Brand Two In One	* Guaranteed
69183	Red "W" Brand Ky. Tobacco Grower	* Guaranteed
69184	Red "W" Brand Potato and Tobacco Special	* Guaranteed
69185	Red "W" Brand Corn and Wheat Special	* Guaranteed
69186	Red "W" Brand Onion and Tobacco Grower	* Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.15	2.15	11.30			4.68	5.80	7.08	0.88	3.43	52.2	68566
8.00	*1.50*	*9.50*				*4.94*	*6.00*	*3.00*		*43.3*	
11.55	1.95	13.50			2.54	2.93	3.56	4.79		42.3	68567
10.00	*1.50*	*11.50*				*2.47*	*3.00*	*4.00*		*36.0*	
18.90	1.60	20.50			4.33	4.67	5.67	6.32		65.0	69163
18.00	*1.50*	*19.50*				*4.94*	*6.00*	*6.00*		*64.3*	
		29.10	70	30		1.42	1.72			30.4	69175
		27.00				*1.65*	*2.00*			*29.9*	
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*4.00*		*37.0*	69178
8.00	*4.00*	*12.00*				*2.47*	*3.00*	*6.00*		*38.0*	69179
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*6.00*		*39.9*	69180
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*31.9*	69181
16.00	*4.00*	*20.00*				*1.65*	*2.00*	*2.00*		*37.9*	69182
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*8.00*		*37.9*	69183
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*5.00*		*31.9*	69184
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	69185
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	69186

TABLE I.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Wilson and Co., New Albany, Ind.	
69187	Red "W" Brand Crop Grower	*
		Guaranteed
69188	Red "W" Brand Fifteen Seven and One-Half	*
		Guaranteed
69189	Red "W" Brand Twelve Twelve	*
		Guaranteed
69190	Red "W" Brand Ten Ten Hummer	*
		Guaranteed
69191	Red "W" Brand Half and Half	*
		Guaranteed
69422	Red "W" Brand Acid Phosphate 16%	Taylor County Supply Co., Campbellsville
		Guaranteed
69193	Red "W" Brand Acid Phosphate 20%	*
		Guaranteed
	Wood, Stubbs and Co., Inc., Louisville, Ky.	
68499	Acme Truckers Special	Manufacturer
		Guaranteed
68500	Acme High Grade Vegetable Grower	Manufacturer
		Guaranteed
68502	Acme Wheat and Corn Grower	Manufacturer
		Guaranteed
68504	Acme 2-8-3 Brand	Manufacturer
		Guaranteed

* The manufacturer failed to furnish sample as required by law.

TABLE I.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	69187
15.00	*4.00*	*19.00*						*7.50*		*37.5*	69188
12.00	*4.00*	*16.00*						*12.00*		*42.0*	69189
10.00	*4.00*	*14.00*						*10.00*		*35.0*	69190
6.00	*6.00*	*12.00*				*2.06*	*2.50*	*1.00*		*23.7*	69191
16.40	0.70	17.10								19.7	69422
16.00	*2.00*	*18.00*								*19.2*	
20.00	*2.00*	*22.00*								*24.0*	69193
12.10	2.00	14.10			0.98	1.50	1.82	0.60	3.05	33.8	68499
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*32.9*	
10.15	3.45	13.60			3.54	3.92	4.76			36.2	68500
10.00	*4.00*	*14.00*				*3.29*	*4.00*			*33.1*	
9.45	4.85	14.30			0.39	0.92	1.12	1.90		24.5	68502
10.00	*4.00*	*14.00*				*0.41*	*0.50*	*1.00*		*20.7*	
7.85	2.90	10.75			0.67	1.36	1.65	4.17		28.1	68504
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*3.00*	*27.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained	
	A. D. Adair and McCarty Bros., Inc., Atlanta, Ga., Chattanooga, Tenn.		
68009	A. and M. H. Gr. Tobacco Grower	Manufacturer Guaranteed	
	The American Ag. Chem. Co., Inc., Cincinnati, O.		
68655	A. A. C. High Potash Tobacco Grower	H. D. Jones, Glasgow Guaranteed	8 8
67924	A. A. C. Tobacco and Truck Fertilizer	Manufacturer Guaranteed	8 8
67932	Bowker's Harvest Queen	Manufacturer Guaranteed	8 8
67934	Bowker's Corn and Wheat Phosphate	Manufacturer Guaranteed	10 10
69221	†Bowker's Grain and Grass Grower	R. H. Mayhew Feed Co., Franklin Guaranteed	8 8
67936	Bowker's Tobacco and Truck Grower	Manufacturer Guaranteed	10 10
68671 68672	Bowker's High Potash Tobacco Grower	Gooch and Payne, Eubank John B. Riffe, Hustonville Guaranteed	8 8 8
67946	Bradley's Faultless Grain Grower	Manufacturer Guaranteed	8 8
67947	Bradley's Sure Crop	Manufacturer Guaranteed	8 8
67948	Bradley's Potato and Root Fertilizer	Manufacturer Guaranteed	8 8
67949	Bradley's Corn and Wheat Phosphate	Manufacturer Guaranteed	10 10
67950	Bradley's Grain and Grass Grower	Manufacturer Guaranteed	7 8
67951	Bradley's Tobacco and Truck Grower	Manufacturer Guaranteed	10 10

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
7.10 *8.00*	1.00	8.10			4.37	5.16 *2.47*	6.26 *3.00*	1.64	4.43 *5.00*	49.0 *34.4*	68009
8.90 *8.00*	1.50 *4.00*	10.40 *12.00*			1.39	1.73 *1.65*	2.10 *2.00*	**9.04** *10.00*		**40.7** *41.9*	68655
8.20 *8.00*	1.70 *4.00*	**9.90** *12.00*			1.21	1.67 *1.65*	2.03 *2.00*	4.24	1.01 *5.00*	31.8 *31.9*	67924
8.20 *8.00*	0.90 *4.00*	**9.10** *12.00*			0.56	0.80 *0.82*	0.97 *1.00*	1.97 *2.00*		**20.6** *21.7*	67932
10.30 *10.00*	1.30 *4.00*	**11.60** *14.00*			0.69	0.90 *0.82*	1.09 *1.00*	1.22 *1.00*		22.9 *22.7*	67934
8.00 *8.00*	1.60 *4.00*	**9.60** *12.00*			1.34	1.63 *1.65*	1.98 *2.00*	2.13 *2.00*		25.1 *25.9*	69221
10.10 *10.00*	1.70 *4.00*	**11.80** *14.00*			2.13	2.52 *2.47*	3.06 *3.00*	1.18 *1.00*		30.8 *31.0*	67936
8.45 8.70 *8.00*	1.00 1.10 *4.00*	**9.45** **9.80** *12.00*			1.49 1.51	1.74 1.78 *1.65*	2.10 2.16 *2.00*	9.80 9.97 *10.00*		41.4 42.3 *41.9*	68671 68672
8.10 *8.00*	1.10 *4.00*	**9.20** *12.00*			0.54	0.81 *0.82*	0.98 *1.00*	1.13 *1.00*		18.9 *19.7*	67946
8.20 *8.00*	0.90 *4.00*	**9.10** *12.00*			0.56	0.80 *0.82*	0.97 *1.00*	1.97 *2.00*		**20.6** *21.7*	67947
8.30 *8.00*	1.00 *4.00*	**9.30** *12.00*			0.64	0.86 *0.82*	1.04 *1.00*	3.25 *3.00*		23.7 *23.7*	67948
10.30 *10.00*	1.30 *4.00*	**11.60** *14.00*			0.69	0.90 *0.82*	1.09 *1.00*	1.22 *1.00*		22.9 *22.7*	67949
7.90 *8.00*	1.50 *4.00*	**9.40** *12.00*			1.35	1.63 *1.65*	1.98 *2.00*	2.11 *2.00*		**24.8** *25.9*	67950
10.10 *10.00*	1.70 *4.00*	**11.80** *14.00*			2.13	2.52 *2.47*	3.06 *3.00*	1.18 *1.00*		30.8 *31.0*	67951

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Ag. Chem. Co., Inc., Cincinnati, O.	
67956	Cleveland Dryer Works Faultless Grain Grower	Manufacturer Guaranteed
67957	Cleveland Dryer Works Sure Crop	Manufacturer Guaranteed
67958	Cleveland Dryer Works Potato and Tobacco Fertilizer	Manufacturer Guaranteed
67959	Cleveland Dryer Works Phospho Bone	Manufacturer Guaranteed
67960	Cleveland Dryer Works Grain and Grass Grower	Manufacturer Guaranteed
67961	Cleveland Dryer Works Tobacco and Truck Grower	Manufacturer Guaranteed
68676 69225	†Red Line Complete Manure	W. T. Nunn, Horse Cave Lindsey, Orr and Co., Elkton Guaranteed
69228	†Michigan Carbon Works Sure Crop	L. R. Chelf, Knifley Guaranteed
69231 69232 69233 69234	†Homestead A Bone Black Fertilizer	R. H. Mayhew Feed Co., Franklin Lebanon Carriage and Impl. Co., Lebanon Lindsey, Orr and Co., Elkton J. W. Schoolcraft, W. Somerset Guaranteed
69235	†Homestead Tobacco Grower	Skaggs and Carver, Horse Cave Guaranteed
68983	Homestead High Potash Tobacco Grower	Cayce-Yost Co., Hopkinsville Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
8.10	1.10	**9.20**			0.54	0.81	0.98	1.13		18.9	67956
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	
8.20	0.90	**9.10**			0.56	0.80	0.97	1.97		**20.6**	67957
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*21.7*	
8.30	1.00	**9.30**			0.64	0.86	1.04	3.25		23.7	67958
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
10.30	1.30	**11.60**			0.69	0.90	1.09	1.22		22.9	67959
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*22.7*	
7.90	1.50	**9.40**			1.35	1.63	1.98	2.11		**24.8**	67960
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
10.10	1.70	**11.80**			2.13	2.52	3.06	1.18		30.8	67961
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*31.0*	
7.60	1.60	**9.20**			0.70	0.91	1.10	0.96		**18.5**	68676
8.35	1.50	**9.85**			0.71	0.92	1.12	1.09		19.9	69225
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	
8.25	1.75	10.00			0.57	0.81	0.98	**1.61**		**20.4**	69228
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*21.7*	
7.90	1.40	**9.30**			1.78	2.10	2.55	1.47		25.9	69231
8.20	1.60	**9.80**			1.68	2.07	2.51	1.28		25.9	69232
7.95	1.30	**9.25**			1.72	2.09	2.54	1.84		26.6	69233
7.70	1.65	**9.35**			1.71	2.05	2.49	1.50		**25.5**	69234
8.00	*4.00*	*12.00*				*2.06*	*2.50*	*1.50*		*26.9*	
10.70	1.70	12.40			1.91	2.37	2.88	**1.00**	**1.60**	**33.8**	69235
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
8.80	2.30	11.10			1.40	1.86	2.26	**6.83**		**37.1**	68983
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*10.00*		*41.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Ag. Chem. Co., Inc., Cincinnati, Ohio.	
68986	†Homestead Potato and Tobacco Special	C. B. Carden and Co., Hartford Guaranteed
69237	N-W Horseshoe Br. Sure Crop	J. W. Schoolcraft, W. Somerset Guaranteed
67982	N-W Horseshoe Br. Potash Manure	Manufacturer Guaranteed
68695	†N-W Horseshoe Br. Corn and Wheat Phosphate	E. S. Ferrill and Sons, Buffalo
69238		Sam Terry, Big Clifty Guaranteed
69239	†N-W Horseshoe Br. Challenge Corn Grower	Sam Terry, Big Clifty Guaranteed
67985	N-W Horseshoe Br. Tobacco and Truck Grower	Manufacturer Guaranteed
67986	N-W Horseshoe Br. High Potash Tobacco Grower	Manufacturer Guaranteed
67989	N-W Horseshoe Br. Tobacco Grower	Manufacturer Guaranteed
67996	Packers Boar's Head Br. Faultless Grain Grower	Manufacturer Guaranteed
67997	Packers Boar's Head Br. Sure Crop	Manufacturer Guaranteed
67998	Packers Boar's Head Br. Sure Growth Potash Manure	Manufacturer Guaranteed
67999	Packers Boar's Head Br. Tobacco and Truck Grower	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
7.80	1.80	**9.60**			1.38	1.79	2.17	0.52	4.81	32.0	68986
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*31.9*	
7.75	1.75	**9.50**			0.63	0.85	1.03	1.83		**20.2**	69237
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*21.7*	
8.30	1.00	**9.30**			0.64	0.86	1.04	3.25		23.7	67982
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
10.20	1.50	**11.70**			0.68	0.90	1.09	1.23		22.9	68695
10.60	1.10	**11.70**			0.67	0.82	1.00	0.95		22.3	69238
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*22.7*	
7.50	2.00	**9.50**			1.21	1.50	1.82	2.04		**23.6**	69239
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
10.10	1.70	**11.80**			2.13	2.52	3.06	1.18		30.8	67985
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*31.0*	
8.70	0.90	**9.60**			1.64	1.64	1.99	10.31		42.2	67986
8.00	*6.00*	*14.00*				*1.65*	*2.00*	*10.00*		*42.7*	
8.20	1.70	**9.90**			1.21	1.67	2.03	4.24	1.01	31.8	67989
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*31.9*	
8.10	1.10	**9.20**			0.54	0.81	0.98	1.13		18.9	67996
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*1.00*		*19.7*	
8.20	0.90	**9.10**			0.56	0.80	0.97	1.97		**20.6**	67997
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*2.00*		*21.7*	
8.30	1.00	**9.30**			0.64	0.86	1.04	3.25		23.7	67998
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
10.10	1.70	**11.80**			2.13	2.52	3.06	1.18		30.8	67999
10.00	*4.00*	*14.00*				*2.47*	*3.00*	*1.00*		*31.0*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The American Ag. Chem. Co., Inc., Cincinnati, O.	
68000	Packers Boar's Head Br. Corn and Wheat Phosphate	Manufacturer Guaranteed
68001	Packers Boar's Head Br. Corn and Wheat Grower	Manufacturer Guaranteed
68004	Packers Boar's Head Br. High Grade Veg. Fertilizer	Manufacturer Guaranteed
	Armour Fertilizer Works, Louisville, Cincinnati, Nashville.	
68699	†Big Crop Burley Tobacco Grower	Barren County Grocery and Hdw. Co., Glasgow Guaranteed
68706	†Big Crop Dark Tobacco Grower	R. A. Cherry, Richardsville Guaranteed
68709 68994 68995 69248	†Big Crop Bone Meal	Bert Hodges, Munfordville Wilson, Winn and Co., Russellville Hudson and Farnau, Lancaster Cayce-Yost Co., Hopkinsville Guaranteed
68991 68996	Big Crop 0-12-4	Johnson and Wilson, Auburn Wilson, Winn and Co., Russellville Guaranteed
68999 69001 69256 69425	†Big Crop 4-16-4 Fertilizer	Sam Terry, Big Clifty Neal Humlong and Wheat, Germantown Grigsby and Co., Bardstown A. C. Griffin, Sebree Guaranteed
69006	†Big Crop 2-12-6 Fertilizer	Joiner Hardware Co., Princeton Guaranteed
69002 69003	Ideal High Grade Tobacco Grower	The T. J. Turley Co., Owensboro Johnson and Wilson, Auburn Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
10.30 *10.00*	1.30 *4.00*	**11.60** *14.00*			0.69	0.90 *0.82*	1.09 *1.00*	1.22 *1.00*		22.9 *22.7*	68000
7.90 *8.00*	1.50 *4.00*	**9.40** *12.00*			1.35	1.63 *1.65*	1.98 *2.00*	2.11 *2.00*		**24.8** *25.9*	68001
8.20 *8.00*	1.70 *4.00*	**9.90** *12.00*			1.21	1.67 *1.65*	2.03 *2.00*	4.24	1.01 *5.00*	31.8 *31.9*	68004
8.10 *8.00*	1.80 *1.00*	9.90 *9.00*			1.69	2.41 *2.47*	2.93 *3.00*	**0.68**	**3.26** *6.00*	**34.8** *36.8*	68699
9.00 *8.00*	2.70 *1.00*	11.70 *9.00*			1.27	1.83 *1.65*	2.22 *2.00*	**0.56**	**2.45** *4.00*	29.8 *28.7*	68706
		25.60 31.15 29.70 29.00 *27.00*	100 75 75 69	 25 25 31		3.14 **2.02** **1.61** **2.12** *2.47*	3.81 2.45 1.95 2.57 *3.00*			36.2 35.0 **31.8** 33.8 *34.0*	68709 68994 68995 69248
11.40 11.65 *12.00*	1.90 3.10 *1.00*	13.30 14.75 *13.00*						**3.30** **3.16** *4.00*		**23.7** 25.0 *26.0*	68991 68996
16.05 15.80 16.30 16.05 *16.00*	0.45 0.70 0.60 1.50 *1.00*	16.50 16.50 16.90 17.55 *17.00*			2.49 3.06 2.86 2.72	**2.49** 3.06 **2.86** **2.72** *3.29*	3.02 3.71 3.47 3.30 *4.00*	5.23 3.65 4.33 3.65 *4.00*		**47.2** **46.6** **47.7** **45.6** *48.9*	68999 69001 69256 69425
12.40 *12.00*	1.95 *1.00*	14.35 *13.00*			1.10	1.61 *1.65*	1.95 *2.00*	**0.92** *6.00*	**4.28**	37.8 *38.7*	69006
10.60 13.10 *10.00*	2.70 1.40 *1.00*	13.30 14.50 *11.00*			1.34 1.08	1.97 1.57 *1.65*	2.39 1.91 *2.00*	**1.60** **0.92**	**5.68** **7.50** *10.00*	**41.4** 44.9 *43.7*	69002 69003

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	The Buhner Fertilizer Co., Seymour, Ind.	
68460	Buhner's 3-8-6 (Sulfate)	Manufacturer Guaranteed
68721	Buhner's Crop Grower	J. S. McMurtry, Elizabethtown
68722		Farmers Supply Co., Loretto
68723		I. K. Miller and Sons, Campbellsville
69260		J. S. McMurtry, Elizabethtown Guaranteed
68727	†Buhner's Special Crop Grower	I. K. Miller and Sons, Campbellsville Guaranteed
68539	Buhner's 2-8-6 (Sulfate)	Manufacturer Guaranteed
	Calumet Fertilizer Co., New Albany, Ind.	
69268	†Calumet Br. Two-Twelve-Two	J. H. Jasper, W. Somerset Guaranteed
68733	†Calumet Br. Kentucky Tobacco Grower	A. W. Tarter, Columbia Guaranteed
69273	Calumet Br. Twelve-Twelve	J. H. Jasper, W. Somerset Guaranteed
69275	Calumet Br. Ten-Ten Hummer	J. H. Jasper, W. Somerset Guaranteed
	Consolidated Chemical Co., Louisville, Ky.	
68734	Camel Br. Corn and Wheat Special	G. B. Pruitt, Moreland
69015		L. R. Hart, Big Clifty Guaranteed
68113	Camel Br. Universal Crop Fertilizer	Manufacturer Guaranteed
69016	Camel Br. Vegetable, Potato and Tobacco Special	L. R. Hart, Big Clifty Guaranteed
68735	Camel Br. General Crop Fertilizer	J. F. Collings, Shepherdsville Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.35	3.50	12.85			1.53	2.26	2.74	**0.76**	**4.19**	36.6	68460
8.00	*2.00*	*10.00*				*2.47*	*3.00*		*6.00*	*37.2*	
6.95	5.55	12.50			0.59	1.38	1.68	2.40		24.4	68721
7.20	4.10	11.30			0.46	1.53	1.86	2.75		25.6	68722
6.70	4.25	10.95			0.50	1.71	2.08	1.71		23.7	68723
9.05	3.00	12.05			0.62	**1.28**	1.55	2.20		25.6	69260
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
7.10	4.10	11.20			0.50	1.69	2.05	**5.44**		**31.6**	68727
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*6.00*		*33.9*	
6.35	5.80	12.15			1.05	1.51	1.83	2.80	8.32	41.6	68539
8.00	*2.00*	*10.00*				*1.65*	*2.00*		*6.00*	*33.1*	
11.30	2.20	**13.50**			0.88	1.65	2.00	2.26		30.6	69268
12.00	*4.00*	*16.00*				*1.65*	*2.00*	*2.00*		*31.9*	
7.95	3.85	11.80			0.84	1.58	1.92	**7.04**		**35.5**	68733
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*8.00*		*37.9*	
12.45	1.15	**13.60**						12.62		43.9	69273
12.00	*4.00*	*16.00*						*12.00*		*42.0*	
10.65	1.05	**11.70**						10.46		36.9	69275
10.00	*4.00*	*14.00*						*10.00*		*35.0*	
10.25	1.75	**12.00**			0.72	0.96	1.17	1.79		24.5	68734
11.75	0.85	**12.60**			0.38	0.58	0.70	1.32		23.5	69015
11.00	*4.00*	*15.00*				*0.41*	*0.50*	*1.00*		*22.2*	
12.25	0.85	**13.10**			0.42	0.87	1.06	1.30		25.7	68113
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*1.00*		*25.7*	
9.00	1.50	**10.50**			0.45	0.90	1.09	3.03		**24.7**	69016
11.00	*4.00*	*15.00*				*0.82*	*1.00*	*3.00*		*28.2*	
10.15	1.35	**11.50**			0.59	1.05	1.27	1.68	0.56	25.5	68735
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*2.00*		*24.7*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Consolidated Chemical Co., Louisville, Ky.	
68117	Camel Br. One-Eight-Three Fertilizer	Manufacturer Guaranteed
68119	Camel Br. Blue Grass Tobacco Special	Manufacturer Guaranteed
68120	Camel Br. Blue Grass Tobacco Fertilizer	Manufacturer Guaranteed
68121	Camel Br. Extra High Grade Tobacco Fertilizer	Manufacturer Guaranteed
68122	Camel Br. High Grade Special	Manufacturer Guaranteed
69017	Camel Br. Superior Tobacco Fertilizer	L. R. Hart, Big Clifty Guaranteed
68124	Camel Br. Tobacco Fertilizer	Manufacturer Guaranteed
69018	Camel Br. Standard Grain Fertilizer	L. R. Hart, Big Clifty Guaranteed
69019 69277	Camel Br. Beef, Blood and Bone	L. R. Hart, Big Clifty Lonnie Jackson, Caneyville Guaranteed
68127	Camel Br. Extra Special Tobacco Fertilizer	Manufacturer Guaranteed
68128	Camel Br. 3-8-6 Tobacco Fertilizer	Manufacturer Guaranteed
69020	Camel Br. 3-8-6 Tobacco Grower	L. R. Hart, Big Clifty Guaranteed
68130	Camel Br. Truck and Tobacco Fertilizer	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
8.10	0.50	**8.60**			0.44	0.90	1.09	1.28	2.31	24.0	68117
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
8.30	0.40	**8.70**			0.87	1.31	1.59		4.34	27.8	68119
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*4.00*	*27.8*	
8.05	0.40	**8.45**			0.81	1.22	1.48	5.21		28.8	68120
8.00	*4.00*	*12.00*				*1.23*	*1.50*	*4.00*		*27.8*	
11.00	0.40	**11.40**			1.12	1.81	2.20	5.23		36.2	68121
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*4.00*		*32.9*	
10.90	0.40	**11.30**			1.22	1.89	2.29	2.54		31.0	68122
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*2.00*		*28.9*	
8.55	0.70	**9.25**			1.75	1.75	2.12	0.80	4.02	31.5	69017
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*5.00*	*31.9*	
8.70	0.40	**9.10**			1.11	1.80	2.19	0.52	1.42	26.5	68124
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*25.9*	
9.00	0.70	**9.70**			1.66	1.66	2.02	2.10		26.3	69018
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
8.00	1.90	**9.90**			1.34	2.11	2.56	2.27		27.9	69019
8.90	1.00	**9.90**			1.42	1.73	2.10	2.43		27.3	69277
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
10.50	0.80	**11.30**			1.88	2.74	3.33	0.88	2.62	36.8	68127
10.00	*4.00*	*14.00*				*2.47*	*3.00*		*3.00*	*35.0*	
8.65	0.45	**9.10**			1.88	2.71	3.29	0.96	5.98	40.6	68128
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
8.55	0.75	**9.30**			1.65	2.52	3.06	6.10		37.9	69020
8.00	*4.00*	*12.00*				*2.47*	*3.00*	*6.00*		*38.0*	
8.20	0.70	**8.90**			1.90	2.83	3.44	3.94		34.6	68130
8.00	*4.00*	*12.00*				*2.47*	*3.00*	*3.00*		*32.0*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Consolidated Chemical Co., Louisville, Ky.	
68131	Camel Br. High Grade Tobacco Bed Special	Manufacturer Guaranteed
68132	Camel Br. Potato and Tobacco Fertilizer	Manufacturer Guaranteed
68134	Camel Br. Corn, Wheat and Oats Grower	Manufacturer Guaranteed
68135	Camel Br. Potash Tobacco Fertilizer	Manufacturer Guaranteed
68136	Camel Br. Phosphate and Potash	Manufacturer Guaranteed
68140	Camel Br. Steamed Bone	Manufacturer Guaranteed
68141	Camel Br. Raw Bone	Manufacturer Guaranteed
	Duncan and Sherley, La Grange, Ky.	
68587	Tiger Br. Pure Bone Meal	Manufacturer Guaranteed
	The Evansville Packing Co., Evansville, Ind.	
69032	Dark Patch Special	R. T. Kirkman, Elkton Guaranteed
69196	Superb Farmers Choice	Manufacturer Guaranteed
69197	Superb Three "B"	Manufacturer Guaranteed
	Federal Chemical Co., Inc., Louisville, Ky.	
69283 69284	†Standard Corn and Wheat Grower	J. S. Noe, Rowland S. M. Hoover, Game Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
10.80 *10.00*	0.60 *4.00*	**11.40** *14.00*			2.40	3.59 *3.29*	4.36 *4.00*			34.4 *33.1*	68131
10.80 *10.00*	0.60 *4.00*	**11.40** *14.00*			2.40	3.59 *3.29*	4.36 *4.00*			34.4 *33.1*	68132
15.00 *14.00*	0.60 *4.00*	**15.60** *18.00*			0.26	0.46 *0.41*	0.56 *0.50*			25.0 *24.7*	68134
10.30 *10.00*	0.70 *4.00*	**11.00** *14.00*						6.39 *5.00*		28.2 *25.0*	68135
10.65 *10.00*	0.65 *4.00*	**11.30** *14.00*						2.52 *2.00*		21.0 *19.0*	68136
		32.40 *34.00*	95	5		0.86 *1.03*	1.03 *1.25*			**30.2** *32.4*	68140
		20.10 *26.00*	21	79		4.52 *3.71*	5.49 *4.50*			38.7 *39.4*	68141
		25.00 *27.00*	59	41		2.83 *2.47*	3.44 *3.00*			34.2 *34.0*	68587
8.80 *10.00*	5.20	14.00			1.50	2.60 *2.47*	3.16 *3.00*	2.99	*3.00*	34.3 *33.4*	69032
12.80 *12.00*	1.90	14.70			0.46	**1.20** *1.65*	1.46 *2.00*	1.69 *2.00*		29.3 *30.3*	69196
8.60 *8.00*	4.30	12.90			0.48	**0.89** *1.65*	1.08 *2.00*	2.14 *2.00*		23.4 *24.3*	69197
8.05 9.50 *8.00*	3.60 3.30 *2.00*	11.65 12.80 *10.00*			0.82 1.06	**1.27** 1.44 *1.65*	1.54 1.75 *2.00*	1.87 **1.42** *2.00*		**23.6** 25.6 *25.1*	69283 69284

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Federal Chemical Co., Inc., Louisville, Ky.	
68743	†Special Tobacco Maker	Lake Bros., Springfield Guaranteed
68745 69286	†Mid-West High Grade Mixture	Lessenberry and Jones, Glasgow J. S. Noe, Rowland Guaranteed
69287	†Plant Bed Special	Guenther Hardware Co., Owensboro Guaranteed
69042	†Ky. Tobacco and Potato Grower	Burris and Turner, Greensburg Guaranteed
69047	Potash Mixture	Farmers Supply Co., Williamsburg Guaranteed
68753	Extra Grade Phosphate	Burris and Turner, Greensburg Guaranteed
69048	†Pure Bone	Smith and Watkins, Adairville Guaranteed
68756	Muriate of Potash	H. D. Jones, Glasgow Guaranteed
69294	†Daybreak Wheat and Corn Special	G. P. Tabb, Upton Guaranteed
68765	Daybreak Special Manure	McKinley Bros., Russell Springs Guaranteed
69053	Daybreak Special Tobacco Grower	Bresler, Son and Co., Owensboro Guaranteed
69296	Daybreak Potash Mixture	A. W. Tarter, Columbia Guaranteed
69054	1st Prize Crop and Tobacco Grower	O. M. Embry, Tilford Guaranteed
68771	1st Prize High Grade Phosphate	Stewart and Co., Munfordville Guaranteed
69055	1st Prize Raw Bone	J. G. Henderson, Crofton Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.10 *10.00*	1.00 *2.00*	10.10 *12.00*			1.36	1.73 *1.65*	2.10 *2.00*	2.10 *2.00*		**26.9** *28.1*	68743
8.55 10.25 *10.00*	2.80 2.45 *2.00*	11.35 12.70 *12.00*			1.18 0.67	1.94 1.65 *1.65*	2.36 2.00 *2.00*	**1.56** **1.67**	**1.65** *4.00*	**30.1** **28.0** *32.1*	68745 69286
10.00 *10.00*	2.70 *2.00*	12.70 *12.00*			0.80	**1.56** *2.47*	1.89 *3.00*	2.81	*3.00*	**29.5** *34.2*	69287
8.90 *8.00*	3.00 *2.00*	11.90 *10.00*			1.04	**2.08** *2.47*	2.53 *3.00*	6.88 *6.00*		38.7 *37.2*	69042
10.45 *10.00*	1.20	11.65						**3.15** *4.00*		22.0 *23.0*	69047
16.95 *18.00*	2.20	19.15								**20.3** *21.6*	68753
		23.20 *30.00*	85	15		3.81 *1.03*	4.63 *1.25*			37.6 *29.2*	69048
								28.84 *50.00*	**18.16**	**94.0** *100.0*	68756
10.00 *11.00*	1.00 *2.00*	11.00 *13.00*				0.59 *0.41*	0.72 *0.50*	1.10 *1.00*		20.6 *21.4*	69294
9.40 *10.00*	3.85 *2.00*	13.25 *12.00*			0.34	0.72 *0.82*	0.87 *1.00*	**1.49** *2.00*		**22.2** *23.9*	68765
8.30 *8.00*	1.30 *2.00*	9.60 *10.00*			0.31	1.46 *1.23*	1.77 *1.50*		**4.75** *6.00*	**29.8** *31.0*	69053
10.75 *10.00*	3.50	14.25						**3.10** *4.00*		22.3 *23.0*	69296
7.85 *8.00*	4.65 *2.00*	12.50 *10.00*			0.34	0.85 *0.82*	1.03 *1.00*	**3.47**	*4.00*	24.8 *24.9*	69054
14.10 *16.00*	6.00	20.10								**16.9** *19.2*	68771
		18.45 *22.00*	70	30		4.00 *3.71*	4.86 *4.50*			**34.8** *36.2*	69055

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Fox Chem. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
69302	†Fox Wheat and Corn Manure	H. C. Clay, Waynesburg Guaranteed
68776	Fox Special Tobacco Grower	T. C. Leachman, Greensburg Guaranteed
68777	†Fox Bone Phosphate and Potash	Lessenberry and Jones, Glasgow Guaranteed
68779	†Fox High Grade Phosphate	Lessenberry and Jones, Glasgow Guaranteed
69062 69307	Fox Raw Bone	Smith and Watkins, Adairville Smith and Watkins, Adairville Guaranteed
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
69309	†Globe Blood, Bone Phosphate and Potash	I. K. Miller and Sons, Campbellsville Guaranteed
68782	†Progress Corn and Wheat Grower	Lucian Jones, Russell Springs Guaranteed
69310	†Braden Formula	Big Four Co., Franklin Guaranteed
68787 68788	†Universal Crop and Tobacco Grower	Big Four Co., Franklin I. K. Miller and Sons, Campbellsville Guaranteed
69065	†Big Four Tobacco Grower	Bresler, Son and Co., Owensboro Guaranteed
69068 69070	†Kentucky Standard Tobacco Grower	Planters Hardware Co., Hopkinsville A. L. Harmon and Son, Junction City Guaranteed
69314 69315	Globe Half and Half Meal Mixture	W. H. Lyon, Loretto Planters Hardware Co., Hopkinsville Guaranteed
69316	Globe Bone Phosphate and Potash	Planters Hardware Co., Hopkinsville Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN			POTASH			
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total	Equivalent to Ammonia	Muriate	Sulfate	Index of Relative Value	Station Number
9.75 *8.00*	1.95 *2.00*	11.70 *10.00*			0.87	**1.26** *1.65*	1.53 *2.00*	**1.57** *2.00*		24.9 *25.1*	69302
7.90 *8.00*	0.30 *2.00*	8.20 *10.00*			0.64	1.40 *1.65*	1.70 *2.00*	1.56	3.58 *5.00*	**29.3** *31.1*	68776
12.35 *10.00*	2.65	15.00						**3.40** *4.00*		25.3 *23.0*	68777
14.45 *16.00*	2.75	17.20								**17.3** *19.2*	68779
		18.30 **20.80** *22.00*	87 57	13 43		4.66 3.80 *3.71*	5.66 4.61 *4.50*			37.9 35.6 *36.2*	69062 69307
10.45 *11.00*	1.35 *2.00*	11.80 *13.00*				0.37 *0.41*	0.45 *0.50*	0.92 *1.00*		**19.9** *21.4*	69309
9.75 *10.00*	3.80 *2.00*	13.55 *12.00*			0.48	0.79 *0.82*	0.96 *1.00*	**1.38** *2.00*		22.9 *23.9*	68782
12.70 *11.00*	2.00 *2.00*	14.70 *13.00*				0.65 *0.82*	0.79 *1.00*	**2.25** *3.00*		27.6 *27.4*	69310
7.95 8.00 *8.00*	4.20 1.80 *2.00*	12.15 9.80 *10.00*			0.64 0.36	0.84 0.80 *0.82*	1.02 0.97 *1.00*	**3.40** **3.63**	 *4.00*	24.6 24.0 *24.9*	68787 68788
7.30 *8.00*	1.40 *2.00*	8.70 *10.00*			0.56	1.46 *1.65*	1.77 *2.00*	2.05 *2.00*		**22.9** *25.1*	69065
8.50 7.25 *8.00*	2.90 0.40 *2.00*	11.40 **7.65** *10.00*			0.57 0.95	1.71 1.55 *1.65*	2.08 1.88 *2.00*	**1.12**	**2.14** 6.31 *5.00*	**28.9** 31.4 *31.1*	69068 69070
10.40 10.95 *10.00*	7.40 3.00 *10.00*	**17.80** **13.95** *20.00*			0.36	1.62 1.64 *1.65*	1.97 1.99 *2.00*			26.7 **25.8** *27.3*	69314 69315
15.80 *10.00*	1.30	17.10						**3.19** *4.00*		30.1 *23.0*	69316

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Globe Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
68792	†Globe High Grade Phosphate	H. D. Jones, Glasgow Guaranteed
	Groves Fertilizer Works (The Joslin-Schmidt Co.), Cincinnati, O.	
69323	†Square Brand 2-12-2	G. M. Hedrick, Monticello Guaranteed
68796	†Square Brand 3-8-6	G. M. Hedrick, Monticello
68798		R. J. Smith and Co., Somerset
69324		Minges Hardware Co., Newport Guaranteed
68799	Square Brand 2-8-16	H. D. Jones, Glasgow
69325		H. D. Jones, Glasgow Guaranteed
68800	†Square Brand 1-8-4	I. K. Miller and Sons, Campbellsville Guaranteed
69327	Square Brand 0-14-4	H. D. Jones, Glasgow Guaranteed
69330	†16% Acid Phosphate	V. B. Nuckols, Elkton Guaranteed
69333	Bone and Potash Mixture	H. D. Jones, Glasgow
69334		Cayce-Yost Co., Hopkinsville Guaranteed
	Hopkins Fertilizer Co., New Albany, Ind.	
68299	Truck, Potato and Tobacco Grower	Manufacturer Guaranteed
68814	Pure Raw Bone	Emmett Shearer, Monticello Guaranteed
68961	Four-Ten-Four Potato Grower	Manufacturer Guaranteed
68962	Tankage and Phosphate Special	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
14.90 *16.00*	3.20	18.10								**17.9** *19.2*	68792
12.70 *12.00*	1.70 *1.00*	14.40 *13.00*			1.29	1.89 *1.65*	2.29 *2.00*	**1.43** *2.00*		32.0 *30.7*	69323
8.60	2.50	11.10			1.91	2.75	3.34	**0.80**	**4.26**	37.8	68796
8.40	2.70	11.10			1.85	2.80	3.40	**0.68**	**4.41**	37.9	68798
11.50	2.60	14.10			0.33	**1.37**	1.66	9.10		43.4	69324
8.00	*1.00*	*9.00*				*2.47*	*3.00*		*6.00*	*36.8*	
8.70	1.90	10.60			0.31	1.74	2.11	**14.06**		**50.6**	68799
8.20	1.20	9.40			0.49	**1.21**	1.47	15.87		**51.6**	69325
8.00	*1.00*	*9.00*				*1.65*	*2.00*	*16.00*		*52.7*	
7.05	4.35	11.40				0.77	0.93	4.64		25.5	68800
8.00	*1.00*	*9.00*				*0.82*	*1.00*	*4.00*		*24.5*	
14.90	2.10	17.00						**2.25**		**26.9**	69327
14.00	*1.00*	*15.00*						*4.00*		*29.0*	
15.05	2.40	17.45								**18.1**	69330
16.00	*1.00*	*17.00*								*19.2*	
8.80	11.30	20.10				0.82	1.00	4.89		**31.6**	69333
9.90	13.00	22.90				0.80	0.97	**3.48**		**31.0**	69334
10.00	*10.00*	*20.00*				*0.82*	*1.00*	*5.00*		*33.1*	
8.20	5.20	13.40			1.01	2.84	3.45	4.50		37.6	68299
10.00	*2.00*	*12.00*				*2.47*	*3.00*	*3.00*		*34.2*	
		17.30	69	31		**2.58**	3.13			**26.7**	68814
		21.50				*3.50*	*4.25*			*34.7*	
11.40	0.85	12.25			2.45	**2.83**	3.44	4.19		40.0	68961
10.00	*2.00*	*12.00*				*3.29*	*4.00*	*4.00*		*40.3*	
10.25	1.25	**11.50**			1.33	1.96	2.38			25.7	68962
12.00	*2.00*	*14.00*				*0.82*	*1.00*			*22.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	International Agr. Corp., Inc., Cincinnati, O.	
69078	I. A. C. Tobacco and Truck Grower	W. E. Ellis and Bro., Hartford Guaranteed
68819	I. A. C. Potato and Tobacco Grower	S. A. Montgomery, McKinney Guaranteed
68820	I. A. C. A-1 Tobacco Fertilizer	C. M. Langdon, Science Hill
69079		J. W. Bratcher, Berea Guaranteed
68821	I. A. C. Farmers Favorite Manure	S. A. Montgomery, McKinney Guaranteed
69080	I. A. C. Old Ky. Special	W. E. Ellis and Bro., Hartford Guaranteed
69428	I. A. C. Standard Potash Mixture	Sturgis Impl. and Hdw. Co., Sturgis Guaranteed
69081	Buffalo Tobacco and Potato Grower	B. F. Beard and Co., Hardinsburg Guaranteed
68823	Buffalo High Grade Tobacco Special	R. F. Emmons, Tollesboro
69082		W. E. Ellis and Bro., Hartford Guaranteed
69085	Buffalo Kentucky Standard	W. H. Lynch, Leitchfield Guaranteed
69086	Buffalo Complete Fertilizer	W. H. Lynch, Leitchfield
69087		J. W. Hardman, Mt. Carmel Guaranteed
68824	Buffalo Corn and Grain Grower	Coffee and Vanhook, Moreland
69341		Coffee and Vanhook, Moreland
69088		W. H. Lynch, Leitchfield Guaranteed
69089	Buffalo High Grade Plant Food	W. H. Lynch, Leitchfield Guaranteed
68531	Buffalo Potash Mixture	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
8.25	0.75	**9.00**			1.13	1.64	1.99	4.60	5.07	**40.2**	69078
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*10.00*	*41.9*	
8.90	0.50	**9.40**			1.59	2.39	2.90		6.19	37.9	68819
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
10.60	1.20	**11.80**			1.09	1.62	1.97	1.28	2.57	32.2	68820
10.30	1.00	**11.30**			1.13	1.78	2.16		4.25	33.3	69079
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*32.9*	
10.50	1.10	**11.60**			0.55	0.87	1.06	3.52		27.6	68821
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*3.00*		*27.1*	
9.05	0.55	**9.60**			0.55	0.84	1.02	2.10		22.2	69080
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*2.00*		*22.1*	
9.35	1.20	**10.55**						5.30		24.6	69428
10.00	*5.00*	*15.00*						*5.00*		*25.0*	
8.35	0.55	**8.90**			2.18	2.92	3.54	1.00	6.60	42.6	69081
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
10.55	0.95	**11.50**			1.04	1.49	1.81	0.56	3.46	**31.7**	68823
10.40	0.60	**11.00**			1.16	1.64	1.99		3.62	**31.3**	69082
10.00	*4.00*	*14.00*				*1.65*	*2.00*		*4.00*	*32.9*	
10.65	1.50	**12.15**			0.53	0.90	1.09	3.30		27.7	69085
10.00	*5.00*	*15.00*				*0.82*	*1.00*	*3.00*		*27.1*	
8.55	1.00	**9.55**			0.40	0.69	0.84	4.49		25.7	69086
8.20	1.00	**9.20**			0.55	0.89	1.08	4.33		25.8	69087
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*4.00*		*25.7*	
8.20	0.90	**9.10**			0.46	0.78	0.95	2.34		21.2	68824
8.60	0.85	**9.45**			0.60	0.88	1.07	1.85		21.3	69341
8.40	0.90	**9.30**			0.38	0.67	0.81	2.69		21.7	69088
8.00	*5.00*	*13.00*				*0.82*	*1.00*	*2.00*		*22.1*	
10.05	1.00	**11.05**			1.39	2.16	2.62			**26.3**	69089
10.00	*5.00*	*15.00*				*2.47*	*3.00*			*29.4*	
11.10	0.80	**11.90**						5.06		26.8	68531
10.00	*5.00*	*15.00*						*5.00*		*25.0*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	International Ag. Corp., Inc., Cincinnati, O.	
68965	Buffalo Bone Meal	Manufacturer Guaranteed
	Ky. Fert. Co., Br. Federal Chem. Co., Inc., Louisville, Ky.	
69092	O. K. Old Reliable	C. D. Miller, Buechel Guaranteed
68830	†O. K. High Grade Phosphate	Smith and Smith Co., Shepherdsville
68831		E. L. Freeman, Knoblick Guaranteed
	Knoxville Fertilizer Co., Knoxville, Tenn.	
67915	Knox High Grade Fertilizer	Manufacturer Guaranteed
68834	†Basic Ten-O-Four	W. W. Taylor, Somerset
69349		W. W. Taylor, Somerset Guaranteed
	Louisville Fert. Co. (owned and operated by Armour Fert. Works), Louisville, Cincinnati, Nashville.	
68842	†Louisville Burley Tobacco Grower	J. T. Richardson, Campbellsville Guaranteed
68843	Louisville Plant Bed Special	S. A. Browning, Vanceburg Guaranteed
68844	†Louisville Dark Tobacco Grower	J. T. Richardson, Campbellsville Guaranteed
69359	Louisville 4-16-4 Fertilizer	D. L. D. Sandefur, Beaver Dam Guaranteed
69100	Louisville High Grade Tobacco Grower	Elkins and Kimmel, Greenville Guaranteed
	Mt. Pleasant Fert. Co., Inc. (Subsidiary of Va.-Car. Chem Co.), Nashville, Memphis.	
69102	Mt. Pleasant 10-3-3	Cayce-Yost Co., Hopkinsville Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		26.90 *29.00*	76	24		1.84 *1.85*	2.23 *2.25*			**30.7** *32.5*	68965
11.30 *13.00*	1.80 *2.00*	13.10 *15.00*			0.24	0.72 *0.41*	0.87 *0.50*	1.49 *1.00*		24.3 *24.4*	69092
14.90 **13.85** *16.00*	0.80 6.50	15.70 20.35								**17.9** **16.6** *19.2*	68830 68831
12.20 *10.00*	1.60	13.80			1.03	**1.03** *1.65*	1.25 *2.00*	2.45 *2.00*		29.0 *27.3*	67915
9.20 9.50 *10.00*	3.20 3.30	12.40 12.80						4.09 3.75 *4.00*		22.0 **21.8** *23.0*	68834 69349
8.10 *8.00*	1.30 *1.00*	9.40 *9.00*			1.70	2.26 *2.47*	2.74 *3.00*	**0.64**	**4.46** *6.00*	**34.2** *36.8*	68842
9.20 *8.00*	1.70 *1.00*	10.90 *9.00*			1.88	**2.83** *3.29*	3.44 *4.00*	0.88	1.70 *3.00*	**33.8** *34.9*	68843
8.70 *8.00*	1.45 *1.00*	10.15 *9.00*			1.03	1.63 *1.65*	1.98 *2.00*	**0.88**	**2.52** *4.00*	28.6 *28.7*	68844
16.15 *16.00*	1.50 *1.00*	17.65 *17.00*			2.88	**2.88** *3.29*	3.50 *4.00*	4.62 *4.00*		48.5 *48.9*	69359
10.90 *10.00*	1.40 *1.00*	12.30 *11.00*			1.11	1.69 *1.65*	2.05 *2.00*	**0.96**	**7.78** *10.00*	42.8 *43.7*	69100
11.50 *10.00*	8.10 *2.00*	19.60 *12.00*			1.16	**1.60** *2.47*	1.94 *3.00*	0.88	1.64 *3.00*	33.5 *34.2*	69102

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Mt. Pleasant Fert. Co., Inc., Subsidiary of Va.-Car. Chem. Co., Nashville, Memphis, Tenn.	
69104	†Mt. Pleasant Superior Tobacco Grower	T. H. O'Bryan, Dawson Springs Guaranteed
69169	Mt. Pleasant Special Potato Grower	Manufacturer Guaranteed
	Price Chemical Co., Inc., Louisville, Ky.	
69364	†Special Corn and Wheat Fertilizer	Skidmore Hardware Co., Elizabethtown Guaranteed
68079	Universal Crop Fertilizer	Manufacturer Guaranteed
68855 69113	General Crop Fertilizer	R. E. Callis, Bedford Shelby Feed and Produce Co., Shelbyville Guaranteed
68082	One-Ten-One Fertilizer	Manufacturer Guaranteed
68856	One-Eight-Three Fertilizer	I. K. Miller and Sons, Campbellsville Guaranteed
68857	Ky. Blue Grass Tobacco Special	Skidmore Hardware Co., Elizabethtown Guaranteed
68858	Ky. Blue Grass Tobacco Fertilizer	I. K. Miller and Sons, Campbellsville Guaranteed
69114	Extra High Grade Tobacco Fertilizer	F. R. Dowell, Hardinsburg Guaranteed
68087	High Grade Special	Manufacturer Guaranteed
69365	Old Time Grain Fertilizer	W. L. Anderson and Son, Caneyville Guaranteed
68859	Old Time Tobacco Fertilizer	I. K. Miller and Sons, Campbellsville Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.60	14.50	24.10							**3.13**	20.7	69104
8.00	*2.00*	*10.00*							*4.00*	*20.0*	
11.25	3.85	15.10			1.62	**2.04**	2.48	3.55		35.7	69169
10.00	*2.00*	*12.00*				*2.47*	*3.00*	*4.00*		*36.2*	
11.80	1.10	**12.90**			0.62	0.62	0.75	1.38		24.0	69364
11.00	*4.00*	*15.00*				*0.41*	*0.50*	*1.00*		*22.2*	
12.60	0.65	**13.25**			0.45	0.87	1.06	1.19		25.9	68079
12.00	*4.00*	*16.00*				*0.82*	*1.00*	*1.00*		*25.7*	
10.30	1.30	**11.60**			0.82	1.00	1.21	2.60		26.2	68855
10.20	1.60	**11.80**			0.72	1.00	1.21	2.90		26.8	69113
10.00	*4.00*	*14.00*				0.82	*1.00*	*2.00*		*24.7*	
10.65	0.50	**11.15**			0.42	0.88	1.07	1.37		23.3	68082
10.00	*4.00*	*14.00*				*0.82*	*1.00*	*1.00*		*22.7*	
8.40	1.30	**9.70**			0.69	1.27	1.54	2.19		23.9	68856
8.00	*4.00*	*12.00*				*0.82*	*1.00*	*3.00*		*23.7*	
9.20	0.60	**9.80**			0.84	1.30	1.58		3.84	28.2	68857
8.00	*4.00*	*12.00*				*1.23*	*1.50*		*4.00*	*27.8*	
8.70	0.50	**9.20**			0.75	1.34	1.63	4.00		28.0	68858
8.00	*4.00*	*12.00*				*1.23*	*1.50*	*4.00*		*27.8*	
10.70	0.70	**11.40**			1.14	1.79	2.17	4.38		34.1	69114
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*4.00*		*32.9*	
11.10	0.50	**11.60**			1.13	1.86	2.26	2.47		31.0	68087
10.00	*4.00*	*14.00*				*1.65*	*2.00*	*2.00*		*28.9*	
9.70	1.10	10.80			1.08	**1.08**	1.31	2.68		25.8	69365
8.00	*4.00*	*12.00*				*1.65*	*2.00*	*2.00*		*25.9*	
7.90	1.40	**9.30**			1.01	1.68	2.04		1.97	**24.8**	68859
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*2.00*	*25.9*	

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Price Chemical Co., Inc., Louisville, Ky.	
68090	Superior Tobacco Fertilizer	Manufacturer Guaranteed
68860	Extra Special Tobacco Fertilizer	Skidmore Hardware Co., Elizabethtown Guaranteed
68092	Best Vegetable and Tobacco Fertilizer	Manufacturer Guaranteed
68861	Three-Eight-Six Tobacco Grower	Mayhew Feed Co., Franklin Guaranteed
69115	Three-Eight-Six Tobacco Fertilizer	Cogar Rumley Co., Midway Guaranteed
68095	Potato Grower	Manufacturer Guaranteed
68096	Truck and Tobacco Fertilizer	Manufacturer Guaranteed
68097	Special Trucker	Manufacturer Guaranteed
68098	High Grade Tobacco Bed Special	Manufacturer Guaranteed
68099	Potato and Tobacco Fertilizer	Manufacturer Guaranteed
68100	High Grade Vegetable Fertilizer	Manufacturer Guaranteed
68101	High Grade Fertilizer	Manufacturer Guaranteed
68102	Victory Grain Special	Manufacturer Guaranteed
68104	Potash Tobacco Grower	Manufacturer Guaranteed
68105	Phosphate and Potash Fertilizer	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
8.55 *8.00*	0.45 *4.00*	**9.00** *12.00*			1.14	1.83 *1.65*	2.22 *2.00*	0.84	4.50 *5.00*	32.8 *31.9*	68090
10.60 *10.00*	1.00 *4.00*	**11.60** *14.00*			1.97	2.74 *2.47*	3.33 *3.00*	0.64	2.82 *3.00*	36.9 *35.0*	68860
9.05 *8.00*	0.30 *4.00*	**9.35** *12.00*			1.84	2.77 *2.47*	3.36 *3.00*	1.64	8.27 *10.00*	47.4 *46.0*	68092
8.60 *8.00*	0.90 *4.00*	**9.50** *12.00*			1.79	2.60 *2.47*	3.16 *3.00*	6.50 *6.00*		39.3 *38.0*	68861
8.70 *8.00*	0.60 *4.00*	**9.30** *12.00*			1.77	2.47 *2.47*	3.00 *3.00*	0.56	5.57 *6.00*	37.9 *38.0*	69115
8.45 *8.00*	0.35 *4.00*	**8.80** *12.00*			2.12	2.99 *2.47*	3.63 *3.00*	1.24	5.01 *6.00*	40.3 *38.0*	68095
8.55 8.00	0.35 4.00	**8.90** 12.00			1.81	2.71 2.47	3.29 3.00	3.90 3.00		34.3 32.0	68096
10.80 *10.00*	0.30 *4.00*	**11.10** *14.00*			1.19	1.86 *1.65*	2.26 *2.00*	5.35 *4.00*		36.3 *32.9*	68097
10.75 *10.00*	0.25 *4.00*	**11.00** *14.00*			2.59	3.56 *3.29*	4.32 *4.00*			34.0 *33.1*	68098
10.75 *10.00*	0.25 *4.00*	**11.00** *14.00*			2.59	3.56 *3.29*	4.32 *4.00*			34.0 *33.1*	68099
10.75 *10.00*	0.25 *4.00*	**11.00** *14.00*			2.59	3.56 *3.29*	4.32 *4.00*			34.0 *33.1*	68100
10.70 *10.00*	0.35 *4.00*	**11.05** *14.00*			0.95	1.83 *1.65*	2.22 *2.00*			25.3 *24.9*	68101
15.30 *14.00*	0.45 *4.00*	**15.75** *18.00*			0.29	0.50 *0.41*	0.61 *0.50*			25.6 *24.7*	68102
10.75 *10.00*	0.25 *4.00*	**11.00** *14.00*							5.03 *5.00*	26.2 *25.0*	68104
10.30 *10.00*	0.25 *4.00*	**10.55** *14.00*						2.58 *2.00*		20.6 *19.0*	68105

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Price Chemical Co., Inc., Louisville, Ky.	
68109	Steamed Bone	Manufacturer Guaranteed
68110	Raw Bone	Manufacturer Guaranteed
	Rasin-Monumental Co. (Subsidiary of Va.-Car. Chem. Co.), Cincinnati, Nashville, Memphis.	
69367	†Rasin's 16% Acid Phosphate	H. A. Spradlin, Monticello Guaranteed
	Read Phosphate Co., Nashville, Tenn.	
69374	†Blood and Bone No. 1	J. H. Jasper, West Somerset Guaranteed
68880	†High Grade Truck and Tobacco Special	Hollingsworth-Young Hdw. Co., Bowling Green
68881		U. L. Antle, Columbia
68882		Barren County Grocery and Hdw. Co., Glasgow
69377		Hollingsworth-Young Hdw. Co., Bowling Green
69125		I. K. Miller and Sons, Campbellsville Guaranteed
68885	†Prize Tobacco Grower	Willis Blake, Crocus
69128		Young Hardware Co., Hopkinsville Guaranteed
	Swift and Co., Inc., National Stock Yards, Ill.	
68484	Swift's Red Steer 2-8-1	Manufacturer Guaranteed
68486	Swift's Red Steer 3-12-4	Manufacturer Guaranteed
69138	†Swift's Red Steer 3-8-6	G. H. Nunnelley and Co., Georgetown
69139		G. P. Harris, Cloverport
69442		Yopp Seed Co., Paducah Guaranteed
68493	Swift's Red Steer 2-10-2	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
		32.90 *34.00*	93	7		0.86 *1.03*	1.04 *1.25*			**30.6** *32.4*	68109
		21.10 *26.00*	18	82		4.64 *3.71*	5.63 *4.50*			40.1 *39.4*	68110
15.20 *16.00*	1.10 *1.50*	16.30 *17.50*								18.2 *19.2*	69367
12.80 *8.00*	8.70 *5.00*	21.50 *13.00*				**0.37** *1.65*	0.45 *2.00*	2.87 *2.00*		30.3 *26.3*	69374
8.10 7.90	5.40 4.00	13.50 11.90			0.83 1.11	1.73 1.73	2.10 2.10	**5.80** **4.72**	**1.42** **2.02**	37.4 **35.6**	68880 68881
8.85	5.65	14.50			1.13	1.64	1.99	**1.76**	**5.23**	37.7	68882
11.10 9.20 *8.00*	3.80 4.50 *4.00*	14.90 13.70 *12.00*			1.24 0.98	1.76 1.74 *1.65*	2.14 2.11 *2.00*	**3.72** **3.64**	**1.95** **2.55** *8.00*	38.3 **36.7** *37.9*	69377 69125
13.10 **8.95** *10.00*	3.10 2.50 *3.00*	16.20 11.45 *13.00*			1.40 1.92	**1.91** 2.72 *2.47*	2.32 3.30 *3.00*	**2.19** 3.51 *3.00*		34.8 35.1 *34.6*	68885 69128
7.25 *8.00*	1.00 *1.00*	8.25 *9.00*			1.21	1.53 *1.65*	1.86 *2.00*	1.00 *1.00*		**20.9** *22.7*	68484
8.75 *12.00*	4.75 *1.00*	13.50 *13.00*			2.46	2.46 *2.47*	2.99 *3.00*	4.50 *4.00*		**36.3** *38.8*	68486
8.65 8.60 8.40 *8.00*	0.85 0.70 0.60 *1.00*	9.50 9.30 9.00 *9.00*			 1.82 1.89	**1.96** 2.31 2.42 *2.47*	2.40 2.80 2.94 *3.00*	2.91 **3.16** **3.12** *6.00*	5.96 **2.14** **1.73**	37.2 **35.3** **34.6** *36.8*	69138 69139 69442
9.50 *10.00*	0.90 *1.00*	10.40 *11.00*			1.23	1.55 *1.65*	1.88 *2.00*	1.99 *2.00*		**26.3** *27.7*	68493

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Tennessee Chemical Co. (Armour owned) Louisville, Cincinnati, Nashville.	
69395	†Ox Dark Tobacco Grower	J. S. Duke, Crab Orchard Guaranteed
68206	Ox 2-12-2 Fertilizer	Manufacturer Guaranteed
69146	†Ox 0-12-4 Fertilizer	McChesney and Thompson, Trenton Guaranteed
69397 69398	†Ox Bone Meal	Young Hardware Co., Hopkinsville H. D. Jones, Glasgow Guaranteed
69404	†Ox 20% Superphosphate	H. D. Jones, Glasgow Guaranteed
68907	†Ox Black Patch Special	Thomas Hinton Co., Bowling Green Guaranteed
69407	†Ox Burley Tobacco Grower	J. S. Duke, Crab Orchard Guaranteed
69408	Ox Plant Bed Special	J. S. Duke, Crab Orchard Guaranteed
	Tenn. Copper and Chemical Corporation, Lockland, O.	
69156	†2-12-2 Fertilizer	Boone County Farm Bureau, Florence Guaranteed
68913 69157 69158	3-8-6 Fertilizer	Hardin County Farm Bureau, Elizabethtown C. D. Hughes, Russellville Boone County Farm Bureau, Florence Guaranteed
69159	3-8-6 Fertilizer	Farmers Supply Co., Richmond Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
15.60 *8.00*	0.70 *1.00*	16.30 *9.00*			1.04	1.24 *1.65*	1.51 *2.00*	**1.96**	*4.00*	33.8 *28.7*	69395
11.15 *12.00*	2.00 *1.00*	13.15 *13.00*			1.71	2.08 *1.65*	2.53 *2.00*	4.52 *2.00*		37.0 *30.7*	68206
10.00 *12.00*	3.10 *1.00*	13.10 *13.00*						1.28 *4.00*	2.43	**22.4** *26.0*	69146
		25.80 29.50 *27.00*	55 76	45 24		2.54 **1.79** *2.47*	3.08 2.17 *3.00*			33.3 **32.6** *34.0*	69397 69398
19.20 *20.00*	1.65 *1.00*	20.85 *21.00*								23.0 24.0	69404
8.45 *8.00*	3.00 *1.00*	11.45 *9.00*			1.38	2.42 *2.47*	2.94 *3.00*	**0.60**	**4.13** *6.00*	**35.6** *36.8*	68907
10.70 *8.00*	1.50 *1.00*	12.20 *9.00*			1.37	2.51 *2.47*	3.05 *3.00*	**0.88**	**4.32** *6.00*	39.6 *36.8*	69407
10.95 *8.00*	0.85 *1.00*	11.80 *9.00*			1.72	**2.93** *3.29*	3.56 *4.00*	0.64	2.60 *3.00*	37.9 *34.9*	69408
10.50 *12.00*	1.40 *0.20*	11.90 *12.20*			1.06	1.37 *1.65*	1.66 *2.00*	5.23 *2.00*		33.6 *30.3*	69156
9.00 10.05 9.20 *8.00*	1.25 1.40 1.20 *0.20*	10.25 11.45 10.40 *8.20*			1.79 1.61 0.94	**2.10** **1.90** **1.22** 2.47	2.55 2.31 1.48 3.00	5.85 6.05 6.98 6.00		36.2 37.2 **34.3** 36.4	68913 69157 69158
8.75 *8.00*	1.05 *0.20*	9.80 *8.20*			1.75	**2.03** *2.47*	2.46 *3.00*	5.97	*6.00*	35.6 *36.4*	69159

TABLE II.

Station Number	Name and Address of Manufacturer and Name of Brand	From Whom Obtained
	Virginia-Carolina Chemical Co., Inc., Cincinnati, Nashville, Memphis.	
68931	V-C Tobacco Plant Food	Farmers Union Supply Co., Falmouth Guaranteed
	Wood, Stubbs and Co., Inc., Louisville, Ky.	
68501	Acme Potato Grower	Manufacturer Guaranteed
68503	Acme 2-8-6 Brand	Manufacturer Guaranteed

TABLE II.

PHOSPHORIC ACID			Percentage Of Fineness		NITROGEN		Equivalent to Ammonia	POTASH		Index of Relative Value	Station Number
Available	Insoluble	Total	Fine Bone	Medium Bone	Water Soluble	Total		Muriate	Sulfate		
9.00	1.55	10.55			1.57	**1.79**	2.17			**23.1**	68931
9.00	*1.50*	*10.50*				*2.47*	*3.00*			*26.5*	
10.50	2.70	13.20			1.35	**2.01**	2.44		5.37	37.6	68501
8.00	*4.00*	*12.00*				*2.47*	*3.00*		*6.00*	*38.0*	
7.90	2.70	10.60			0.53	1.48	1.80	6.03		**32.4**	68503
8.00	*4.00*	*12.00*				*1.65*	*2.00*		*6.00*	*33.9*	

Kentucky
Agricultural Experiment Station

University of Kentucky

BEEKEEPING FOR BEGINNERS

CIRCULAR NO. 35

Lexington, Ky.

March, 1925.

CIRCULAR NO. 35

Beekeeping for Beginners

By H. GARMAN

Beekeeping has been practised for not less than 3,000 years, but it is remarkable how little is known about the art at the present time by the majority of civilized and more or less educated people. A great deal of information about bees has been gathered in books during these years, and in the hands of specialists and commercial beekeepers the art has been developed to an exactness and nicety not surpassed by any other branch of agriculture, using the word in its broad sense. During the past fifty years, perhaps, more progress has been made in the art in this country than during all the preceding centuries of our history. This has been the result largely of the invention by Langstroth in 1851 of a hive with movable frames. Previous to his time hives had been made of plank, when they were known as box hives, or of sections of hollowed-out trees, the so-called bee gums of the early settlers. These box hives and bee gums have persisted in many parts of Kentucky until the present time, and now constitute our most serious handicap to successful beekeeping. If we could get rid of them all tomorrow, the bees being transferred to Langstroth hives, beekeeping would be immeasurably advanced in the State both as a business and as an avocation or diversion. Bees kept in boxes or gums are no longer profitable in many parts of the State even as a means of supplying the table of the owner with honey. The reason is that with the spread of bee diseases, unknown here when the country was settled, it has become impossible to protect the bees or to disinfect them when once disease invades such hives; and the bees when not destroyed outright, contaminate all others of a neighborhood. Moreover, the comb and brood cannot be inspected, so that the owner never knows its condition, whether the colony has

stores sufficient for its needs or not; whether or not it has a queen. In a new country, with the hives of each farmer some miles away from those of his neighbors, and with no foul brood or other dangerous disease about, gum and box hives served the very moderate needs of a family. Present conditions make necessary watchfulness and care on the part of the beekeeper, and his only refuge from absolute failure in most situations is the adoption of modern practices, together with the movable-frame hive and other up-to-date devices that go with it.

The first step, therefore, for the beginner is to provide himself with a movable-frame or Langstroth hive. These hives are not "patent hives," as sometimes supposed, and are so simple as to be easily made by any carpenter, or by the beekeeper himself if he has some knack for carpentry. For most people it is best to buy of a reliable manufacturer of beekeeping supplies. The making of hives and their parts is so systematized by them, and the parts and joints are so exactly made that the manufactured hive goes together nicely and everything about it fits snugly.

THE MOVABLE-FRAME HIVE

What is a movable-frame hive? It is a box with a removable top and bottom, of such dimensions that it will receive 8 or 10 movable frames (8 by 17 inches inside), placed in it side by side so close together that the bees must put their combs in them and yet leave a little room between. To encourage building the combs true and parallel some artificial foundation made of wax is secured in each frame. It will be seen that combs in such frames can be removed when desired and the honey extracted, or a frame or two can be taken from a strong colony and given to a weak one or, again, half of the combs, brood, bees and honey, may be taken from a colony and two colonies be made of it. There are thus many conveniences in handling bees resulting from the use of movable frames; others will occur to any beekeeper as he acquires experience with them.

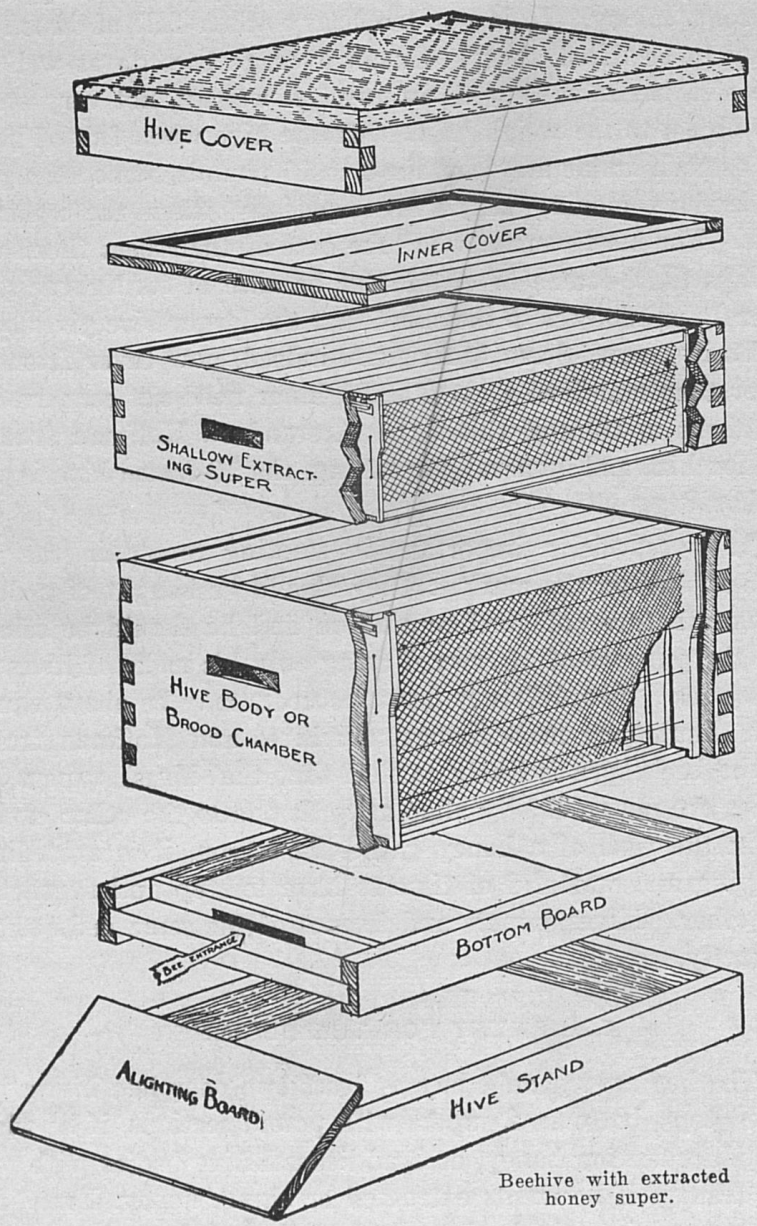
A 10-frame hive is one in which ten frames exactly alike fit snugly in it without waste space. This number of frames

is about right for most beekeepers. It provides enough space for brood rearing and the storage of honey for the support of a strong colony. It is not too heavy when full of brood and honey to be lifted about. On an average bees do as well in a hive of this size as they do in any. A woman, not very strong, may object to the weight of a 10-frame hive when full of honey, and as each frame may contain 8 to 10 pounds, some strength is required in moving the hives, especially when the apiary is large. For most women who take care of their bees themselves, perhaps the 8-frame hive is better because of its lightness, but general testimony is to the effect that the larger hive gives better results in honey. Some beekeepers, indeed, now favor frames of larger than standard size. The beginner need not concern himself about matters of this sort. A standard Hoffman frame is best for him and, generally speaking, the 10-frame hive is what he should get.

It is especially important in starting to obtain the very best supplies on the market. They should be bought of a dealer or manufacturer of good reputation and he should be selected with the purpose of afterward using only his make of hives and accessories. Two different manufacturers may be about equally good. Both may make Langstroth hives and Hoffman frames, yet the beekeeper is likely to find that the hives, supers and frames are not so closely alike as to fit one to the other exactly, and in the rush of a honey gathering season, it is exceedingly annoying and wasteful of time to have to stop and fit parts to each other. Hives, supers and frames of the same make should fit exactly.

EQUIPMENT FOR THE BEGINNER

The beginner should buy at least two complete hives, with frames, tops, bottoms, 2 supers with pound sections, if he wishes to produce section honey, or 2 additional hive bodies with ordinary frames, if he wants extracted or chunk honey. Even if he expects to go into the business eventually it is best to start with a few bees, not more than a half dozen colonies, two or three preferably, and extend his apiary as he learns how to manage it.



Beehive with extracted honey super.

Fig. 1.—A dissected hive. (By courtesy of the A. I. Root Company).

He is more likely to fail and become discouraged if he goes into the business too deeply and with all his resources at the start. Beekeeping, like any other business, requires some knowledge and experience, and both can be acquired quicker and to better purpose on a few colonies than on a large number. The following equipment should be on hand, the hives and frames put together and ready for use before getting the bees. This equipment should be bought "in flat," that is not put together, the fitting and nailing to be done by the beekeeper.

1. 3 hive bodies, 10-frame size.
2. 30 Hoffman frames.
3. 3 metal, telescoping hive tops.
4. 3 hive bottoms.
5. 60 two bee-way sections with solid divisions boards, or plain sections with fences.
6. Full sheets of vertically wired foundation for each frame.
7. Light foundation for sections.
8. 1 board with bee escape.
9. 2 or 3 wooden inner covers.
10. 2 hive stands—these can easily be made by the beekeeper, but perhaps it will be best at first to get the ready-made, as they are neater, and will save time.
11. 1 bee veil.
12. 1 smoker.
13. 1 drone or queen catcher.
14. 1 spool piano wire, No. 30.
15. A hive tool for separating frames. A cheap screwdriver will answer the purpose.

This material or its equivalent should be on hand ready for use when the bees are received, or when they are ready to be transferred if they have already been obtained in box hives.

BUYING BEES

When supplied with the right sort of hives the bees to put in them may be bought, if they are not already on hand. Colonies in box hives may be obtained cheaply in many localities. Most

of them will prove to be black bees or mixtures of these and Italians. They should be requeened as rapidly as possible with Italians. In some neighborhoods most of the bees are now crosses. They are good bees for honey gathering, but not the best, and it is well to get them only as a start. One should be

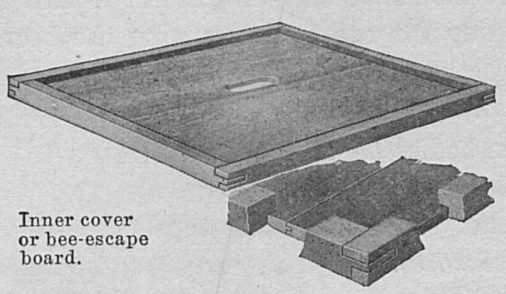


Fig. 2.—The wooden inner cover, with hole in the center for a "bee escape." (Courtesy of the A. I. Root Company.)

exceedingly careful not to buy bees of any sort that are affected with foul-brood. For the beginner diseased colonies are not cheap at any price, since he is not capable of dealing with the disease until he has had some experience in the ordinary operations of beekeeping. To attempt to learn the art with diseased bees is very likely to lead to complete discouragement and failure. It is well to lift the hives offered for sale to see if they have any stores. If very light and few bees are present they should not be purchased. There is always a possibility that they have no queens. This should be looked into. Colonies should never be bought without careful inspection. Spring is the best time to buy.

TRANSFERRING BEES FROM BOX TO MOVABLE-FRAME HIVES

An old practice is about as follows: Take the box hive, with the bees to be transferred, a little distance from other hives and place a movable-frame hive containing full sheets of wired foundation on the old stand. If old combs in movable frames are on hand some of them may be used in the new hive with the foundation. After puffing smoke into the box hive so that the bees will fill themselves with honey, turn it bottom side up and place an empty box over the upturned bottom, then drum reg-

ularly and continuously for about ten minutes on the sides of the box hive with a couple of rather heavy sticks or clubs, so as to drive the bees up into the box. When the greater part of the bees have gone into the box they may be shaken out before the movable-frame hive, when they will go in at the entrance. If the queen is seen at this time her wings may be clipped, or she can be removed and a better queen be substituted. It is important to have a queen of some sort with the bees, otherwise they may come out of the new hive. By this time the workers will be in such a disturbed condition that they will receive a new queen readily. The combs can now be cut out, after prying off one side of the box, and either be fitted in movable frames or else the honey and wax may be rendered and used. If they are empty, very old, and black, it is just as well to get rid of them at this time, but if they contain much brood or honey they should be put into movable frames.

TRANSFERRING WHEN A SWARM ISSUES

A good time to transfer bees is when a swarm comes from the box hive. When indications of swarming are observed place a queen catcher over the entrance and as the swarm comes out the queen will be captured by the cage. When the bees are in the air place a movable-frame hive in place of the box hive, setting the latter aside and turning its entrance in another direction. The swarm will return to the new hive in the old location as soon as it is apparent that the queen is not with the bees. In the meantime the queen should be taken from the queen cage, her wings be clipped, and, after putting her into an introducing cage, she may for a short time be placed in the entrance of the new hive. When most of the bees have returned and gone in she should be released in such a way that she will enter, by opening the introducing cage quickly and thrusting the open end into the entrance.

The old box hive may now be given attention. It is probably well filled with brood and honey, with some young bees. After puffing smoke into it, one side may be pried off and the combs be cut out and fitted into frames to go into the modern

hive, or they may be given to other colonies, but all queen cells found about the frames must be cut out unless it is desired that they should provide new queens to the hives receiving them.

After transferring a swarm and removing combs from a box hive it is well to clear away all bits of comb that may have been dropped and the hive itself should be taken away and burned, so as to leave nothing for the attraction of robber bees or bee moth.

TRANSFERRING COMBS TO FRAMES

Several frames should have thin strips of wood tacked lengthwise on one side and be placed, strips down, on a table or bench. The best combs from the box hive may now be placed on the frames and cut so that they will go in snugly, after which they should be secured with twine, and the frames, with strips and twine attached, be put with a colony of bees, either the transferred bees, or others. In a few days the old combs will have been secured in the frames with wax, by the bees, when strips and twine can be removed. The combs are valuable for strengthening colonies, if full of brood or honey and otherwise in good shape.

VARIETIES OF BEES

The honey bee is not a native of America. We have no member of the genus to which it belongs in this country. It was brought here by the early settlers, when it was unknown to the Indians except as the "White Man's Fly."

The first bees brought across the Atlantic were black or German bees, little bees that make a good white comb honey, but not as much of it as some more recently imported varieties. The bee is cross, too, and not very easy to handle, and is especially liable to the attacks of the bee moth. Some of the bees now taken from bee trees in this country are of this variety.

A yellow bee brought from Italy and known as the Italian has largely supplanted the black in the apiaries of commercial and expert beekeepers. It is a gentle bee that gathers large quantities of honey, does not swarm too much and, on the whole,

has proved the best general purpose bee we have. It defends its hive against the bee moth and is less subject to disease than the black. Mixtures of Italians and black are very common in the better beekeeping sections of the State.

A third variety known as the Carniolan because brought from Carniola, Austria, is gray in general color and in this respect somewhat resembles the black, especially when old and the down is rubbed off. It is very gentle and easily handled, and defends its hive as well as the Italian. It produces a beautiful white comb honey and keeps its colonies strong at all times. Its defect is a disposition to swarm too frequently. Expert beekeepers know how to control this in some degree, but the beginner is sure to be kept busy if he gets this variety. Next to the Italian it is, however, our most desirable sort.

Several other varieties have been introduced at one time or another, but the Italian still holds its own as the best bee for the beginner and for the commercial beekeeper as well.

THE FORMS OF BEES IN COLONY

If bees are examined in the fall or early spring, only two sorts of individuals will be found in the hive, namely, (1) many small, active bees with stings, which they will use promptly on provocation, and (2) a single, larger individual with lengthened body, also provided with a sting, but which is never used on the beekeeper even when the bee is picked up in the fingers. The small, active stinging bee is the worker, so-called. It does all the work both in the hive and out. It is a female bee, not developed to the point of laying eggs. The large individual is the only perfect female, the so-called, queen, who does nothing but lay eggs. (3) About swarming time a third form is produced in some numbers, namely a thick-bodied, large-eyed, male bee, without sting, commonly known as the drone, and so named by the ancient Romans and Greeks because they took the queen for a King and did not recognize the drones as the male bees. Seneca wrote during the early part of the first century, A. D.:

"Nature herself has conceived the idea of a King, as you may learn from various animals, and especially from bees, among whom the King's cell is the roomiest, and is placed in the most central and safest part of the hive; moreover, he does no work, but always employs himself in keeping others up to their work."

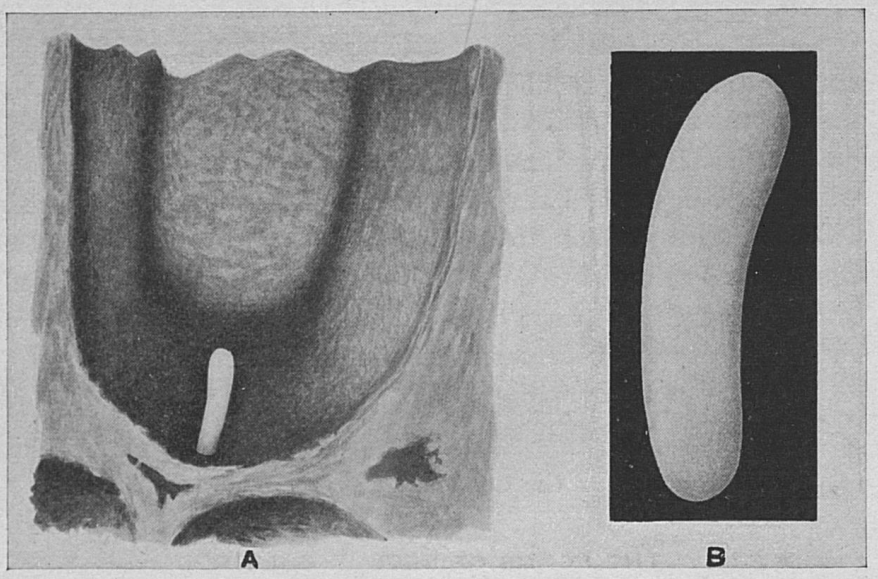


Fig. 3.—A, The egg of the Honey Bee as it appears in the bottom of a cell when the side is cut away; B, an egg more highly magnified.

THE LIFE-HISTORY OF THE HONEY BEE

An outline of the life-history of the three forms of bees in a hive is as follows:

The *queen* is produced in a large cell placed on the side or bottom of a comb. She emerges at the end of 16 days after the egg is laid, the egg stage lasting thru 3 of the 16 days. When queen cells containing grubs are observed in a hive, therefore, the beekeeper may know that a young queen will be out in less than 13 days and the bees will then swarm.

The *worker* is produced in small, ordinary cells, such as are used largely for storing honey. She emerges at the end of 21 days.

The *drone* is produced in large cells, in shape like worker cells, built near swarming time in odd corners, wherever the

workers can find room for them. The drone emerges at the end of 24 days from the laying of the egg.

LOCATION OF THE APIARY

Some judgment is necessary in locating an apiary, as will be understood by experienced beekeepers. It should be within sight of the residence of the owner if this is practicable. It must be in a place where it is least exposed to driving storms, particularly in winter. A hedge or grove of trees on the north and west is a desirable protection. A close fence or buildings may often be made to serve. An open grove of trees, or an orchard is a suitable place for the hives, when one is available. The apiary should not be placed near a hitching post nor close to a lot where stock is confined. The site should be well drained ground, never subject to overflow. The hives ought to be placed with the entrance south, southeast or east, in most localities. They should not be put on benches, or shelves, for the reason that they are not so easily lifted and examined as when close to the ground. But it is best to have something under the hives, brick, stone, or wooden frames, the latter home-made or manufactured, as may be preferred. A square, made by tacking strong six-inch fencing together makes a good support, or pieces of two-by-four studding can be used. The bottoms should be kept approximately level.

THE USE OF FOUNDATION

The sheets of wax foundation now used in hives are made of melted beeswax, and by the use of machinery impressions very much like the bottoms of cells are made on them, the impressions serving as a guide for the bees in making their cells. A full sheet of this foundation in a frame results in a very uniform comb all made of the small size worker cells and thus suitable either for brood or storing honey. In the brood chamber it is desirable that the comb be firmly secured so that in handling hives, especially in shipping them, combs will not break down. It is customary to use for these combs a heavy foundation that

Fig. 4.—The Queen bee. A, her grub or larva; B, her pupa; C, the adult queen (Carniolan). Magnified.

Fig. 5.—The Worker bee. A, the grub; B, the pupa; C, the adult worker (Italian). Magnified.

would not be suitable for section and chunk honey, but is well adapted to brood rearing and for extracted honey. To further strengthen it the beekeeper is accustomed to run fine piano wire back and forth from side to side in the frames. More recently a better way of wiring, crosswise from top to bottom of the sheets, has been devised by manufacturers, so that the combs are kept very true in the frames and when completed are very strong. Some details with reference to putting the sheets in the frames may be obtained of dealers in supplies. Beginners are strongly advised to make use of these improvements in the production of combs, especially for brood rearing and extracted honey production. When any but full sheets of foundation are used the bees may not fill the lower corners of frames well and are then likely to build too many drone cells in these open spaces.

The foundation used in sections is not wired and is very thin. It is well to use it in order to get the combs made true in the sections and to encourage building out the corners. Sections so made are more attractive in appearance and sell better.

INTRODUCING QUEENS

The average beekeeper does not care to rear his own queens, tho commercial beekeepers sometimes find this worth while. But it is a simple matter to remove sealed queen cells found in hives and, putting them in guards of spiral wire such as are furnished by dealers, transfer them to hives without queens or to nuclei, so that the young queen can emerge and mate. The importance of having young and vigorous queens in colonies leads many bee men to get rid of the old ones at the end of two years, or sooner, and this requires the frequent introducing of new queens, a matter calling for some care, else the bees will destroy the strangers. When bees have been without a queen for forty-eight hours, however, they are generally ready to accept one if the matter of introducing her is handled properly. This may be done by puffing a little smoke in the entrance and narrowing the opening, then taking off the top and puffing a little more over the frames, when the queen in an in-

troducing cage is placed between two of the middle frames of the hive body. Some candy in one end of the cage supplies her with food in case the bees do not feed her, and they will after a time eat out this candy until she is released, but if not out at the end of 24 hours and the workers show a disposition to accept her she can be released by the beekeeper and allowed to run down between the frames.

THE ADVANTAGE OF CLIPPED QUEENS

It is a great convenience to have the wings of the queen bee clipped as soon as she has mated, so that she can be caught easily in case a swarm comes forth unexpectedly, for the old queen leads out the swarm, normally. When a clipped queen is present it is only necessary to set the old hive aside, put the new one in its place, then put the queen in the entrance, and when the bees have returned, move the new hive to another location, returning the old hive to its stand again. After a young queen is known to be laying actively, therefore, she should be taken from the hive and carried indoors, where the beekeeper's veil may be removed, and with fine, sharp scissors two-thirds of the wings of one side are cut off, care being exercised not to cut off a leg at the same time. She is then allowed to run down in the hive between the frames, after taking off the cover for a minute. An experienced beekeeper can clip the wings without taking off his veil and may do it at once after the queen is found. She will generally be discovered on one of the combs near the middle of the hive.

SWARMING

Bees swarm whenever the hive is full of brood and honey and there is a prospect for securing plenty of nectar. At such times they collect in masses on the outside of the hive, in the evening especially, and on a bright day about 10 o'clock or a little later the swarm comes out, workers rushing out of the entrance and circling about in the air until the queen comes also, when they rise and move from the hive a short distance to

settle in a dense cluster on the branch of a shrub or tree. After settling in this manner they remain for some time, generally for an hour or more, when if not hived they take the air again and move off in a direct course to the new home that has been

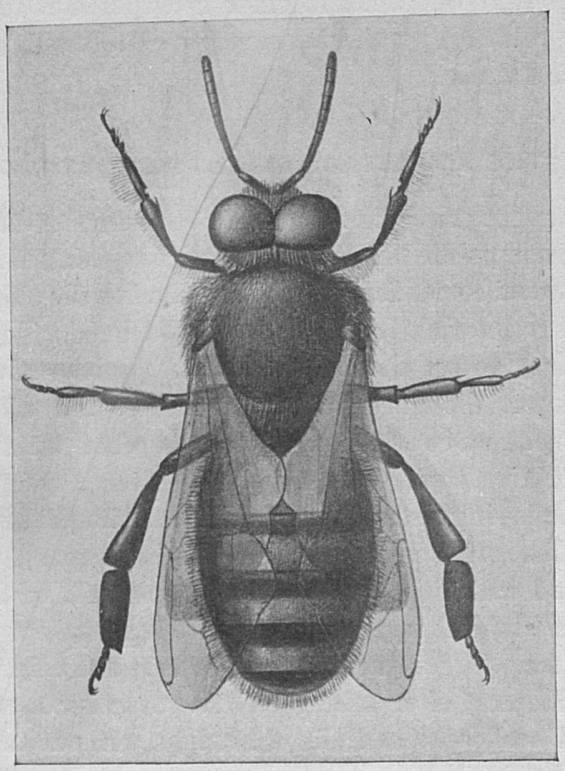


Fig. 6.—The Drone or Male Bee. Magnified.

selected by scouts, sent out in some numbers days in advance. It is hardly worth while to follow them after they have taken to the air the second time.

The thing to do is to get the cluster down and hive the swarm immediately after it has settled. A hive full of frames with full sheets of foundation should be at hand ready for the swarm. It is only necessary to cut off the branch with pruning shears, and shake the bees in front of the hive. If the queen is detected among the bees she may be caged and placed for a time in the entrance until the bees are largely inside, when she can be re-

leased. If it is desired to keep her at the head of the colony, her wings may be clipped before she is allowed to go in. If she is not worth preserving she may be destroyed and a better one introduced.

THE PREVENTION OF SWARMING

Frequent swarming may be made a means of increasing the size of the apiary, but it is generally permitted at some loss of honey. The more the bees swarm the less surplus honey they will produce. This will be understood when it is remembered that the swarm that leaves must make comb for the storing of honey and the rearing of brood, and the wax used in building combs is produced at the expense of time and a consumption by the bees of a good deal of food. Then the old hive is left with only a few foraging bees, some young bees and a good deal of brood, all of which may require food. Besides, the young queen may not come from her cell for several days and afterward may not mate and begin laying for a week or more (3 to 10 days). The old colony is thus at a standstill so far as relates to gathering honey, at a season of the year when most of the surplus honey is generally collected. Hence experienced beekeepers try to prevent swarming during the honey gathering season and depend upon other means than natural swarming for increasing the number of their colonies.

Cutting out all queen cells when bees are getting ready to swarm has sometimes been suggested as a means of keeping a swarm from coming off, but is not a satisfactory practice by itself. Bees often build new queen cells as fast as they are cut out, if the colony is a strong one, and once the swarming fever takes possession of a colony it is generally best to allow it to swarm so as to avoid loss of time due to the bees hanging about the hives and doing nothing, as they certainly will after they make arrangements to leave. Before the bees get the notion they should be given more room in the hive for rearing brood and storing honey. Frames of honey or brood may be removed and given to weaker colonies, or new colonies be started with them. Frames with empty comb or full sheets of foundation

may be used in place of those taken out. Supers with foundation should be placed on the hive. When these things are attended to in season, swarming may generally be avoided and the bees be kept busy when their work is of most benefit to the beekeeper. The 10-frame hives here show to advantage, since they do not allow the colony to become crowded as quickly as does the 8-frame hive.

Some varieties, such as the Carniolan, swarm more often than others and are more difficult to handle on this account by the beginner. The Italians are much less disposed to swarm; and are consequently more easily handled by people with little experience in beekeeping.

FEEDING BEES

Bees like other domestic animals require feeding at times. As long as there is plenty of pasturage they can take care of themselves, and when it is abundant will demonstrate their capacity to provide even for the future, which cannot be said of any other animal man has adopted. There are times, however, when flowers become scarce, as when we have an excessively dry spell of weather, and bees may suffer for food if we have taken all their surplus from the hive. August is most likely to be such a period in Kentucky. In September, when the prevailing temperature becomes lower and fall flowers appear, strong colonies quickly recover and lay up all the food they need, even providing the beekeeper some surplus from the white aster, but if expected to do this they must not be robbed too closely. They may at times need all they can gather from fall flowers for their own use during the late fall and early spring months. If the body of a 10-frame hive is filled, however, at this season, what they put into a super may safely be taken by the beekeeper.

There are several ways of feeding bees without inciting them to rob one another. It should be done within the hive, always. The "Miller feeder" has served well at the Experiment Station when it was desired to give a colony all it needed quickly. It consists of a box that fits within a super, and has a slot along the bottom up which the bees may come from the frames, so

as to reach the sirup. The fluid is poured into the feeder toward evening, the super then being covered, and the bees, if in strong colonies and the weather is not too cold, take the sirup down in a night, while the bees of other colonies are not aware of what is going on. A second and better method consists in placing a bee escape board over the frames, the metal part being removed so as to leave only an oblong opening. A super is placed on the board over the hive and after filling two-thirds full of sirup a friction-top can with small holes made in the lid, it is inverted over the opening in the board. The hive top is placed over the super and the bees soon carry the sirup down and store it in the combs. The latter is a good way to stimulate the bees in spring when they are a little short of stores just before fruit bloom is open. It has been used by us also in feeding small colonies when preparing them for queen rearing. A ten-pound can of this sort inverted on the frames, within a super, is a satisfactory means of feeding in the fall, in place of the Miller feeder.

Quite often feeding is best done by simply putting in a hive several frames of honey, taken from colonies that have more than they need. It is perhaps the best of all ways to help a weak colony.

WHAT TO FEED

Equal bulks of granulated sugar and water make a satisfactory sirup for much of the feeding called for. Two quarts of water are put into a kettle and brought to the boiling point, then the kettle should be moved from the fire and the two quarts of sugar be stirred slowly into it. Perhaps it may be necessary to return it to the fire again if the sugar does not dissolve completely, but it must not be scorched, and should be kept stirred with a stick or glass rod until it is ready. After cooling, but while still a little warm, the sirup may be given to the bees. A thicker sirup is sometimes used, but the equal-bulk preparation will answer for most of the feeding to be done.

Feed only when the weather is mild enough to make the bees active; if it becomes cold they will not take the sirup quickly.

WINTERING BEES

At the north bees keep well when stored in cellars, but in Kentucky where the winters are not steadily cold they may become active in January and February and must be so kept that they can at times get out of the hives. Most of our beekeepers leave the hives on the summer stands, and this can be safely done provided the situation is not completely exposed to cold winds, and some packing is put about the hives. Commonly it is only necessary to leave a shallow super on the hive body,

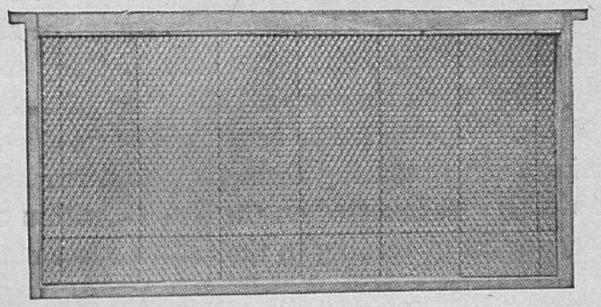


Fig. 7.—Wax foundation vertically wired, with one longitudinal wire near the bottom. (Courtesy of Dadant and Sons.)

filling it with chaff, fine excelsior, or crumpled paper, placing, of course, the metal top over this. When further protection is desired, a wooden winter cover may be used. This can be bought of dealers, and consists of a side piece that goes about the hive body leaving a little space between to be filled with dry packing, and a telescope cover that comes well down over the side piece leaving some room between it and the top and sides of the hive for packing. Protection beneath the hive is not ordinarily considered necessary, tho some experienced beekeepers insist that all sides of the hive should be covered in some fashion to prevent loss of heat.

The entrance of the hive should be contracted greatly as cold weather comes on in the fall, and generally during the winter an opening four or five inches wide by about a half inch deep should be left.

The packing should be put on the hives after the bees are inspected and found provided with enough stores to carry them

thru the winter. Late September or early October when the weather is good is the time to feed and make everything snug. The hives will not require further attention after this until the bees begin to get nectar in the spring, when they should be inspected again to see if they need feeding and have good queens.

Where large store boxes can be obtained cheaply they can be made to cover several hives placed close together and covered with excelsior, dry leaves, straw or other packing. A piano box has been used for the purpose, three hives being placed side by side in a box, then covered with dry leaves, the front of the box being secured so as to leave a place for the bees to come out in case of warm winter weather.

PACKING HIVES IN TARRED PAPER COVERS

The cost of winter covers and packing cases has led recently to the use of double-ply tar-paper, which is made in rolls three feet wide.

A wooden frame of strips two inches wide is first placed about the bottom of the hive, the side pieces being four inches longer than the length of the hive, the cross pieces measuring four inches more than the width. The front strip rests on the side pieces of the bottom board, leaving open beneath it a way to the hive entrance. The pieces are secured to each other with single nails at their ends, the front and hind pieces being above the others. When this frame is in place the telescoping cover of the hive is removed, leaving the wooden inner cover on the frames and a piece of tarred paper is cut, long enough to go about the hive and frame of strips and to overlap at one side, where it is secured with nails. When the hive is thus enclosed the paper extends some inches above the top. The lower edge of the paper is now secured to the frame of strips by pieces of lath tacked on the outside and the space between paper and the walls of the hive is filled with sawdust, shavings, dry leaves, or crumpled paper, until it reaches a depth on the cover of eight or nine inches. The upper edge of the tarred paper may now be folded over the packing and secured, after which a second piece of paper is cut, long enough to fold over the whole, to be

held in place by nails and by placing the telescope cover on top of it. Brick or stones on the cover will keep it from being blown off during the winter. An opening must be cut opposite the hive entrance to furnish some air and to permit the bees to come out during spells of mild weather. Such tarred paper covers may be made to last several seasons if they are removed, straightened out and put away, in the spring of the year. In large apiaries

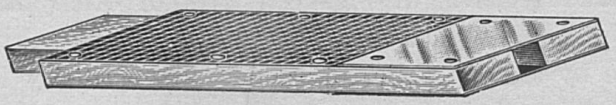


Fig. 8.—A Miller queen introducing cage. (Courtesy of the G. B. Lewis Company.)

it is customary to avoid labor by placing two, or four, hives close together and covering them with the tarred paper.

Bottom packing is not commonly used, and is not desirable unless precautions are taken to keep it from absorbing moisture from the soil.

Winter covers need not be removed until after the bees have been out gathering pollen from maples, elms and willows. But they are in the way when it becomes necessary to get into the hives to look for the queen, and may be removed after the weather becomes steadily warm. The covers should then be stored in a dry place for use the following winter.

ROBBING

When provisions in hives run low and there is no outside source from which the bees can get more, strong colonies are likely to invade the hives of weak ones and carry away the little the latter have. Small colonies may at such times be utterly destroyed by robbers, unless the beekeeper takes a hand and by some means puts a stop to the robbing. It is difficult to control when well under way and knowing this the wise bee man takes every precaution he knows to keep his bees well supplied with food during trying times so that they will be strong enough to defend their stores and not be tempted to rob neighboring colonies. Good beekeepers are careful, also, about leaving bits

of honeycomb lying about the hives, and when feeding is necessary, see to it that the sirup does not drip about the entrance or run down on the bottom board. Any exposure of sweets at such times is likely to attract hungry bees and get them in the notion of stealing. Opening hives is to be avoided when there is a scarcity of nectar, for the same reason. When there is an abundance of flowers about, the hives may be opened and the bees and brood be inspected without danger.

If when examining a colony, robbing begins, as it may very suddenly, the hive should be closed at once and grass or hay be thrown over the entrance and left there for several hours. By the end of that time the excitement will generally have subsided.

Sometimes robbing starts quietly without the knowledge of the beekeeper. When it is detected, the hive from which the robbers come may be traced by dusting flour on the bees going in and out of the hive being robbed. When the robbers have been traced the two hives may be exchanged, the hive of the robbers being placed on the stand of the weak colony, the weak one being given the place of the robbers.

On the whole, robbing is best controlled by looking after all colonies in advance, and strengthening them so that they will neither rob nor submit to being robbed. Nowadays it is often more dangerous to rob than it is to be robbed, because many weak colonies are affected with foul brood, and robbing is certain to carry this disease to the very strongest of colonies.

BEE DISEASES

Two diseases of bee brood are greatly to be feared. They are known as American and European Foul Brood, respectively, both bacterial diseases.

American Foul Brood affects the bee grubs in the cells and attacks queen, worker and drone grubs, but sometimes also the pupae. The grubs, in health, are glistening, white, plump bodies, all looking alike except in size. When this disease attacks the grub, as a result of being fed tainted honey, perhaps brought by robbing bees from a diseased colony, its color changes to yellow,

later to brown, and it lies extended in the bottom of the cell. When a toothpick or splinter of wood is thrust into one of these dead grubs it comes away with a gluey thread attached, the substance of the insect having been converted into a sticky slime, sometimes of a disagreeable odor. This characteristic odor is to be detected in badly diseased colonies as soon as the hive is opened, but it is not safe to depend on it for the recognition of the disease. Colonies are in a condition to convey the disease to others long before the odor is recognized, so that its detection must be by sight, and it requires good eyes to find the few diseased grubs sometimes present.

European Foul Brood. This disease is not regarded with as much dread as the American Foul Brood, but may become very persistent and troublesome unless looked after. It is believed to be caused by a different micro-organism. The young grubs are attacked before the cells are capped and the caps become sunken finally. The grubs are slightly transparent in the first stages of the disease, later becoming gray or yellow. When dead the tissues of the body do not become viscid, and a bit of wood thrust into a grub does not bring away a thread of slime. The odor is not commonly offensive. It attacks the grubs of queens, workers and drones.

Treatment for Foul Brood. Treatment should be attempted only when there is plenty of nectar about, so that robbing may not be encouraged. An old practice consists in setting the hive aside and brushing all bees from the combs in front of a hive with narrow strips of foundation in the frames. The old combs are then taken away and burned with everything in them. At the end of 4 days the bees will have built out the strips of foundation and have used all of the honey they took from the old hive, and may then be given full sheets of foundation and a new queen. A little feeding within the hive may be desirable at this time to help them along until they get well started again. Such colonies will frequently fill their brood chamber before fall and show no trace of the disease. It may return, however, in case diseased colonies are in the neighborhood, and the fact that it does return must not in all cases be ascribed to ineffective-

ness in the treatment. The old hive ought to be scraped out and the inside be burned over with a blast lamp or else be thoroly saturated with about two per cent of formalin in water. This fluid may be sprayed over both the inside and outside of the hive, the cover and bottom board included, which should then be closed and set away until it gradually dries out.

The Hutzelman method recently recommended and claimed to be very effective consists in immersing the infected combs for some hours in a twenty-per-cent solution of formalin in alcohol.



Fig. 9.—An apiary belonging to Mr. John Reese, of Winchester, Ky.



Fig. 10.—The apiary represented in Fig. 9, with hives packed in wrappers of tarred paper.

Tanks holding the fluid are employed, so that the disinfectant can be drained from the combs and be used more than once. The alcohol is more likely to penetrate all crevices of the comb than is a watery fluid, an advantage claimed for this preparation by those selling it.

When colonies have been long neglected and are very badly affected with either disease they may sometimes be burned with everything in them. This applies especially to box hives and bee gums. If one hopes to succeed with bees at the present time he cannot afford to spend time experimenting with anything but movable-frame hives.

BEES AS POLLINATORS OF FRUITS AND VEGETABLES

The important part taken by the honey bee in conveying the pollen of blossoms from one plant to another is coming to be appreciated more and more as we learn about the necessity for the crossing of many kinds in order to get good crops. Varieties are often more or less self-sterile, and may thus fail to set crops almost completely if there is no opportunity for insects to get to their blossoms. When apples and other fruits bloom during cool rainy weather, when the bees and other insects fly but little, the crop of fruit is likely to be light as a result of imperfect pollination. Hence a few colonies of bees about an orchard are a great help to the fruit grower, even if he has little use for the honey they make. In fact, he cannot afford to be without them unless he has beekeeping neighbors.

BEEKEEPING AS A VOCATION OR AVOCATION FOR WOMEN

A good living can be made in some parts of Kentucky by keeping bees for honey. Women can conduct such a business as well as men if they can get help during the time of greatest rush, in May and June. The lifting of many heavy hives at such times may be too much for some of them, but with help, then, an apiary is entirely within their capacity, and becomes a healthful occupation and recreation besides. Queen rearing as a business for women is even better than honey production because

it calls for nice work in transferring the grubs to wax cups, and the like, which because of their smaller hands and experience in using them for delicate work, women are likely to do with more skill than men. The inexperienced are advised, however, to begin moderately, with a few colonies, and work into apiculture gradually, only letting other things go completely when sure of themselves.

KENTUCKY BEE PLANTS

The experienced beekeeper knows that it is not worth while to attempt beekeeping for profit in a region not provided with an abundance of nectar-producing flowers. One of the first questions asked by people thinking of coming to Kentucky to engage in the business is, what bee forage is there in Kentucky? We have about everything of value occurring in the Eastern United States, as the list given below will show. It is important for the beekeeper to know when to expect the important flowers and the list has been made in four groups covering the important periods of honey gathering during the season. The beekeeper watches the flowers closely and has his supers ready to put on the hives at a day's notice, for the bees can, when in good condition, fill a super provided with comb in three or four days, and will fill one provided with full sheets of foundation in a week or ten days. But the brood chamber must be full of brood and honey in the first place. If kept strong the bees will attend to this during the period when fruit (peach, plum, apple and cherry) is in blossom, and at any rate should finish it during the locust blooming period in May. When the fruit blossoms are very plentiful and the weather good, the colonies may fill the brood chamber from them and lay up some fine surplus honey from black locust blossoms which come a little later. At latest they should be able to gather surplus for supers when the white clover season arrives. This is our most important honey-producing plant, and in our extensive pastures it is often very abundant. If the beekeeper fails to get surplus during this early part of the season his chance is generally gone until September and October, when the goldenrods and asters bloom. But if the

bees have been robbed closely, or the early season has been especially unfavorable, the colonies may need all they gather in the fall. If they have enough stores of their own from spring and summer gathering, very good honey for the market may be gathered after the first of September. Most of the plants mentioned below are common in Kentucky. The names of important species are printed in *italics*. The periods of blooming range somewhat with the season, and in some cases the same plant is repeated in two groups because of this range.

GROUP 1.—MARCH AND APRIL

The plants of Group 1 are much more important than we are likely to think. They furnish pollen in quantities when the bees first leave the hives in the spring. This food is necessary for brood rearing and an abundance of it is always a good omen for a successful season. The soft and red maples are the first in bloom, sometimes beginning in the middle of February. The elms furnish quantities of pollen from about the middle of March to the middle of April. Pussy willows are in bloom in the latter part of March, when the bees go wild over the catkins. None of our early pollen-producing flowers seem to be liked so well. If the combs are examined during these months they are likely to show numbers of cells packed with pollen, whitish, yellow and bright red, as if there was disposition to deposit the pollen of each flower species by itself. The plants of this period are the following:

Soft maple, red maple, *elms, willows,* sugar maple, *peach,* Japanese plums, strawberry, *pear, hawthorns, blackberry,* redbud, *dandelion,* Carolina poplar, many wild flowers.

GROUP 2.—MAY AND JUNE

The spring surplus is gathered from flowers blooming during May and June, generally, most of it from black locust, white clover, yellow sweet clover, basswood, or from sourwood.

Apple, plum, pear, cherry, wild black cherry, blackberry, raspberry, hawthorns, strawberry, *tulip poplar,* willows, elder,

black locust, white clover, yellow sweet clover, alfalfa, crimson clover, vetches, basswood, *sourwood,* shad-bush, dandelion.

GROUP 3.—JULY AND AUGUST

This may prove a trying period, since August is often hot and dry, conditions leading to a lack of nectar in such plants as are in bloom during this month.

White clover, yellow sweet clover, *white sweet clover, alsike clover,* cucumbers and cantaloup, smartweeds, *buckwheat,* milkweeds, Indian currant (*Symphoricarpos orbiculatus*), mints, teasel, partridge pea, soy-bean, sumachs, button-bush, Spanish needles, thistles, iron weed, bonesets, Jo-pye weed, sunflowers.

GROUP 4—SEPTEMBER AND OCTOBER

We frequently have a long fall season, extending at times to December, during which the bees may gather a good deal of surplus honey from the white aster (*Aster ericoides*) and from Spanish needles in some localities. The plants available for surplus honey are *golden rods, asters,* sunflowers, *Spanish needles.*

KENTUCKY WEATHER

The synopsis of Kentucky weather following is based upon records covering a period of about 40 years. Its study will explain the reasons for the schedule of practice suggested. For example, the beekeeper cannot expect to do much with his hives out-of-doors during January, when the mean temperature may be 27° F., and the mercury may go as low as —14° F. In February the average conditions are much as in January. March weather is better, but still, on an average, unfavorable to work out-of-doors, and it is best most seasons to wait until April before beginning active handling of the colonies. December is another unfavorable month, as a rule. So the practical man will do well to count only on the months April to November, inclusive, for work with his bees out-of-doors. Of course many things can be done indoors during the more inclement months in

getting hives, supers, and other appliances, in good shape, and in extracting and marketing the crop of honey.

KENTUCKY TEMPERATURE BY MONTHS

For About 40 Years—U. S. Weather Bureau Records

MONTH	Range of Mean Temperature, Degrees, Fahrenheit	Minimum, Degrees, Fahrenheit	Maximum, Degrees, Fahrenheit
January	27—44	—14	72
February	23—45	—20	75
March	36—54	—1	85
April	45—62	15	88
May	58—71	30	93
June	69—77	40	99
July	73—80	51	102
August	70—80	46	100
September	64—73	32	98
October	50—65	21	89
November	38—53	2	78
December	25—45	—9	71

A SCHEDULE FOR THE BEE SEASON IN KENTUCKY

March

If the weather is unfavorable to opening hives, let them alone. Some feeding can be done during forward seasons.

April

Inspect for queens and stores. Clip queens when not already done. Feed colonies, if with too little stores.

May

Remove packing. Give water in pans or troughs set about hives.

June

Place supers on hives. Cut out queen cells and place in nuclei for reserve queens.

July

Remove supers full of honey. Clean sections and put away in cases. Extract honey. Requeen colonies if they have old or undesirable queens.

August

Feed where necessary. Finish requeening. Prevent robbing.

September

Place supers on hives for fall flow of honey.

October

Remove supers. Inspect and feed when necessary. Narrow entrances to hives. Pack for the coming winter.

November

Packing can be done during this month if it has been neglected in October.

Books on Beekeeping

The Honey Bee, Langstroth. Published by Dadant and Sons, Hamilton, Illinois.

The A B C and X Y Z of Bee Culture. Published by the A. I. Root Company of Medina, Ohio.

Beekeeping, by Dr. E. F. Phillips. Published by the Macmillan Company, New York City.

Queen Rearing Simplified, by Jay Smith. Published by the A. I. Root Company, Medina, Ohio.

Journals on Beekeeping

Gleanings. Published by the A. I. Root Company, Medina, Ohio.

The American Bee Journal. Published by Dadant and Sons, Hamilton, Illinois.

Manufacturers and Dealers in Beekeeping Supplies

The A. I. Root Company, Medina, Ohio.

C. H. W. Weber and Company, Cincinnati, Ohio.

Wilson and Wilson, 206 E. Market Street, Louisville, Kentucky.

G. B. Lewis Company, Watertown, Wisconsin.

Dadant and Sons, Hamilton, Illinois.

The Carter Supply Company, 267 W. Short Street, Lexington, Kentucky.

Dealers in Queens

J. P. Moore, Morgan, Kentucky.

A. I. Root Company, Medina, Ohio.



Fig. 11.—Queen rearing nuclei in the apiary of J. P. Moore of Morgan, Ky.

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