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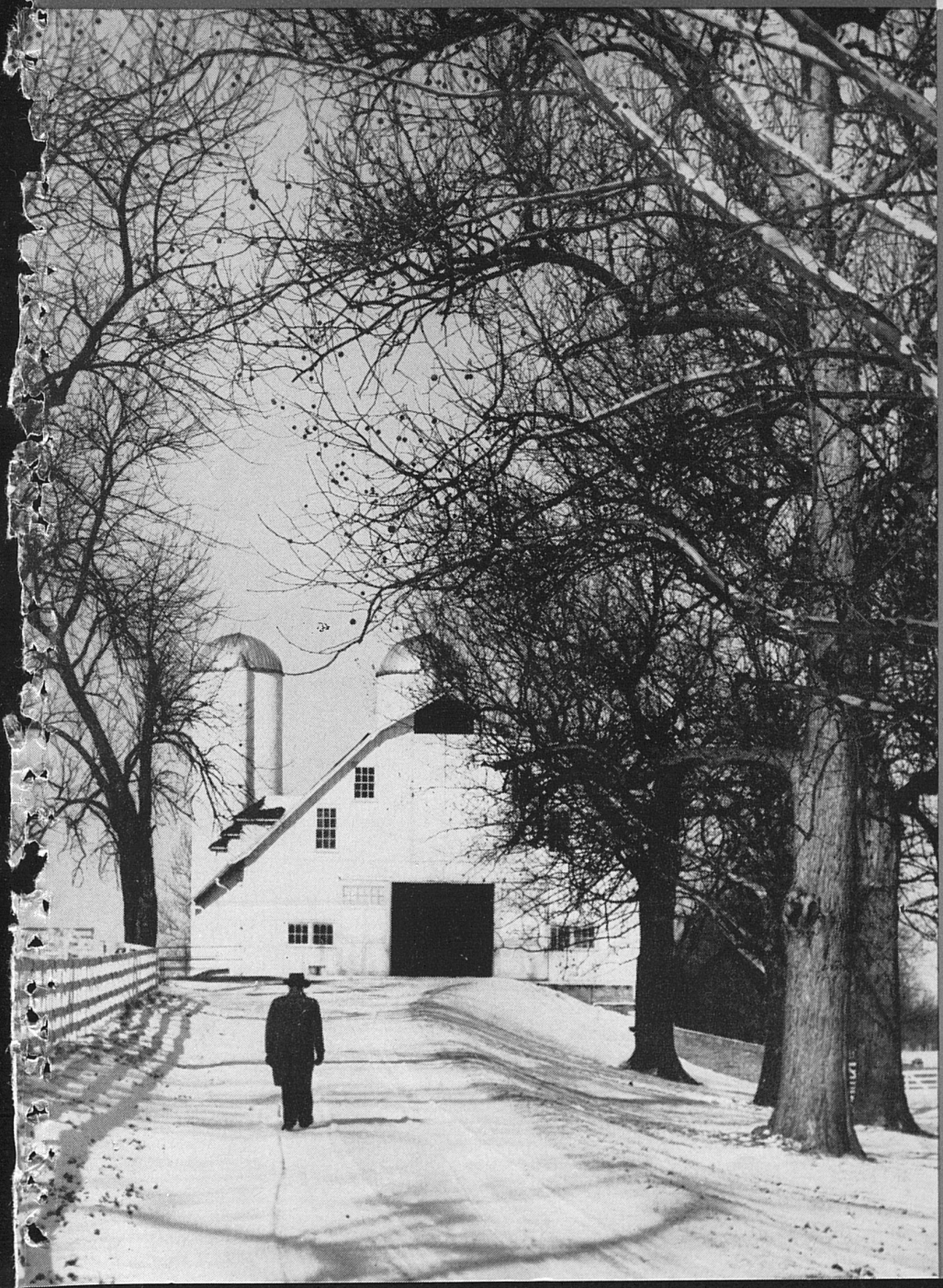

READ—

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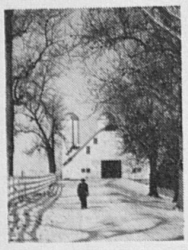

The Cover Reminiscent of New England is this winter scene at Coldstream Farm. For more pictures of the new U-K animal science research center, see pages 6-9.

Little Population Change In Kentucky

1956 Estimate reveals small increase; high birthrates offset by migration to nearby states

By NORMA BREAZEALE

Has recent industrial growth in Kentucky resulted in a substantial population growth? Or, is Kentucky continuing to furnish thousands yearly to the industrial areas of neighboring states? Are more Kentuckians moving from areas of small-scale agriculture into the cities and expanding metropolitan areas? The answers to these and similar questions relating to population trends are of great importance to the planners of Kentucky's future.

A 1956 population estimate, recently published by the Kentucky Agricultural Experiment Station,[1] reveals a relatively slow rate of population growth for the state since the census of 1950. Kentucky's estimated population for 1956 is 2,968,000 as compared with 2,945,000 recorded in the 1950 census. This increase represents an annual growth rate of slightly more than one-tenth of 1 percent during the 6¼-year period.

A relatively high rate of natural increase—the difference between number of births and deaths—added approximately 50,000 new Kentuckians each year during this period. But even this high rate failed to raise the state population total appreciably because of the heavy migration of Kentucky residents to other states. It is estimated that some 41,000 civilian migrants leave the state each year, a loss generally attributed to the attraction of industrial job opportunities in the nearby states of Ohio, Indiana, and Illinois.

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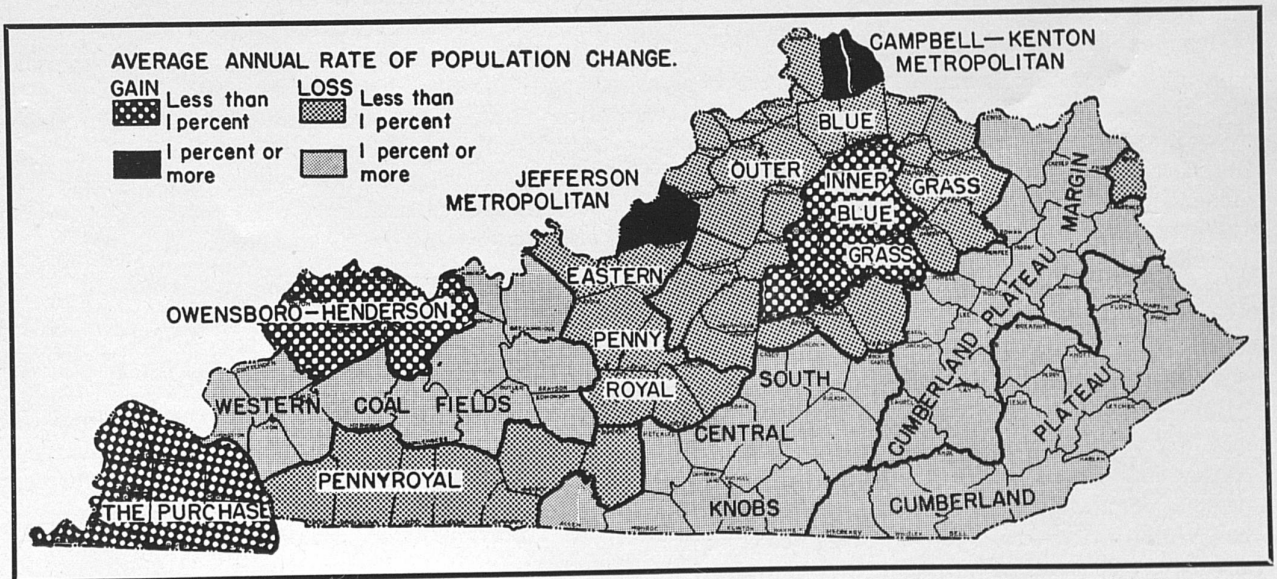
[1] Thomas R. Ford, *Population Estimates for Kentucky Counties and Economic Areas, July 1, 1956*, Ky. Agr. Expt. Sta. Prog. Rept. 42. 1956.



The average annual population change in Kentucky, by economic area, from April 1950 to July 1956. Many of the migrants from the farms and mining towns seem to be moving to the state's urban centers; others have migrated to Ohio, Indiana and Illinois.

Another tool in making better fertilizer and management recommendations used when

X-Rays Identify Soil Minerals

By T. B. HUTCHESON, JR.

Just as X-ray methods are used by medical men to detect early symptoms of human diseases in time for simple cure, X-ray studies of our soils may reveal properties that could lead to starvation and sickness of our crops, unless proper soil treatment is carried out. Such an analogy is somewhat unfair, however, since the X-ray studies of soils do not actually detect "sick" soils. It would be more correct to say that X-ray studies aid in finding out just what minerals are present in our soils, and with this knowledge better fertilizer and management practices may be recommended.

It has been known for a number of years that most minerals, even those that make up the fine clay fraction of the soil, are crystalline. The elements that make up crystalline minerals are arranged in an orderly manner which is characteristic of the particular mineral. This property makes possible the identification of clay minerals by X-ray measurements.

X-ray Beam Pattern Recorded

X-ray examination is made by placing the mineral material in the path of an X-ray beam and then recording the pattern of the beam after it has encountered the material. The crystal structures of the minerals cause the X-rays to be bent or diffracted in different patterns that are just as characteristic of individual minerals as fingerprints are of individual persons. The patterns obtained are then compared with those of "known" minerals for identification.

The various crystal forms of minerals are associated with physical and chemical properties that are of importance in practical agriculture. The very tiny clay minerals are most important in this regard because of the tremendous amount of surface that they present upon which reactions may take place. Unbelieveable as it seems, a pound of clay possesses from about 5 to 90 acres of surface area when all of the small plates and edges are considered. Principal reactions of interest in crop production are the water-holding capacity and the retention of plant nutrient elements against leaching, but not against absorption by plant roots.

The *kaolin* group of clay minerals presents the smallest surface area, and its individual units are composed of one layer of silicon and oxygen atoms bound to another layer of aluminum, oxygen and hydrogen atoms.

The clay mineral group presenting the greatest surface area for reactions is the *montmorillonite* group whose members are made up of units composed of one aluminum-oxygen-hydrogen layer sandwiched between two silicon-oxygen layers. Units of this kind are ordinarily not bound tightly to each other and may readily expand or contract—sometimes trapping elements such as potassium that are needed by plants.

A third group of clay minerals, the *hydrous micas*, is intermediate in surface area and reactability between the two groups already mentioned. Units in that group are similar to those of the montmorillonite group except that slight differences in the composition of the layers are compensated for by the presence of potassium ions between the units. The attraction of the units for the potassium ion is quite strong, and this prevents much expansion from taking place. The hydrous micas apparently release small amounts of the interlayer potassium to plant roots under certain conditions.

Many Differences Among the Groups

Today many differences are known to exist among these clay mineral groups that are of agricultural importance and undoubtedly, other differences will be discovered in the future as the tools of research become more refined. The identification of these minerals and a knowledge of their properties are essential to a well-rounded agricultural program.

In a previous issue of *Kentucky Farm and Home Science*[1] Dr. H. H. Bailey described some work being

[1] H. H. Bailey, "Soil Characterization Program," Ky. Agr. Expt. Sta. Ky. Farm and Home Sci., 2 (1): 3. 1956.

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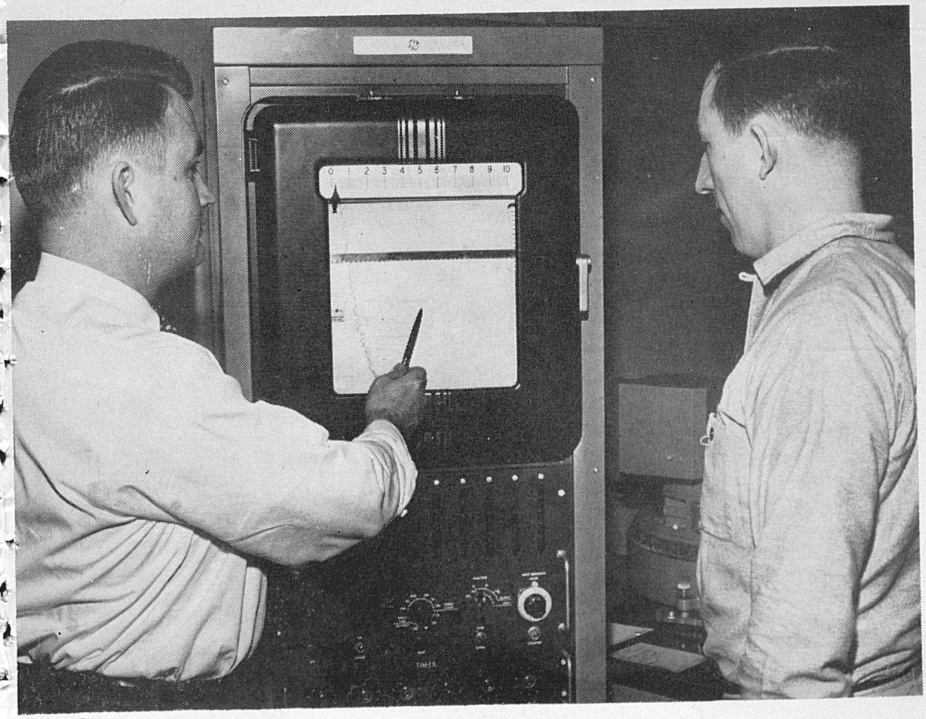


(Above) In making an X-ray examination of the mineral matter in a soil sample, a small portion is put on a glass slide which, in turn, is placed in the path of an X-ray beam. After the beam encounters the mineral matter the pattern is recorded by the equipment in the foreground. Behind and to right of the author is the X-ray generator.

(Left) Here the author is discussing with his assistant, Russell J. Lewis, the beam pattern recorded during the X-ray examination of a soil mineral sample.

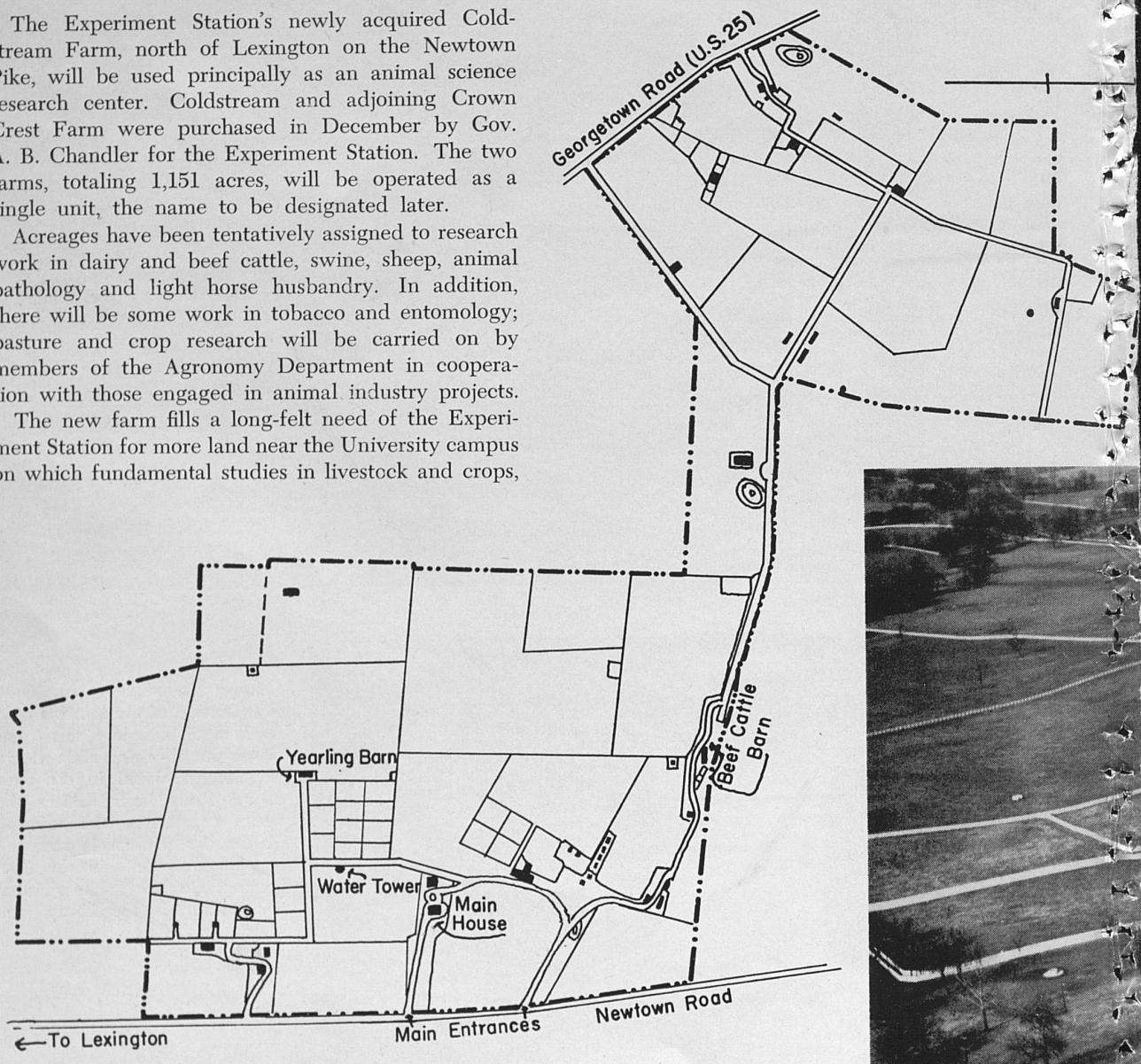
STATE PURCHASES TWO LARGE FARMS FOR

New U-K Animal Science Research Cente

The Experiment Station's newly acquired Coldstream Farm, north of Lexington on the Newtown Pike, will be used principally as an animal science research center. Coldstream and adjoining Crown Crest Farm were purchased in December by Gov. A. B. Chandler for the Experiment Station. The two farms, totaling 1,151 acres, will be operated as a single unit, the name to be designated later.

Acreages have been tentatively assigned to research work in dairy and beef cattle, swine, sheep, animal pathology and light horse husbandry. In addition, there will be some work in tobacco and entomology; pasture and crop research will be carried on by members of the Agronomy Department in cooperation with those engaged in animal industry projects.

The new farm fills a long-felt need of the Experiment Station for more land near the University campus on which fundamental studies in livestock and crops,



(Above) Fronting on the Newtown Pike, Coldstream Farm has long been one of the showplaces of the Bluegrass. This map shows the layout of the principal fields, paddocks, some of the buildings, and how the 750-acre Coldstream tract (below) is connected to the 372-acre tract of Crown Crest Farm (upper right). The latter faces on the Georgetown Road.

including insects and diseases, can be carried on. Heretofore, because of the lack of sufficient land near the campus, the Station has been able to do very little research on the selective breeding of cattle, sheep, and swine, nor on pasture utilization, including the effects of stilbestrol, androgenic sub-

(Right) One of the first projects underway on Coldstream Farm is a detailed soil survey and the making of a land capability map. Here is shown Dr. H. H. Bailey, UK agronomist (right), collecting data with Dan Isgrig, area soil scientist, U.S.D.A. Soil Conservation Service. This photograph indicates the rolling nature of much of the land which makes the farm more suitable for animal science research than for field crops and other phases of agronomy.

(Below) This aerial photograph shows an area of Coldstream Farm near the Newtown Pike. In the foreground are the large house and landscaped grounds; in the background (center) is a large horse barn, built originally for livestock. Paddocks for horses are behind the barn. In the top background are several employees' residences.

(Louisville Courier-Journal aerial photo by Charles Fentress, Jr.)

Pictures on this page show the large horse barn (upper, left) and some other buildings on the Coldstream Farm. The buildings and fences are all in good repair.

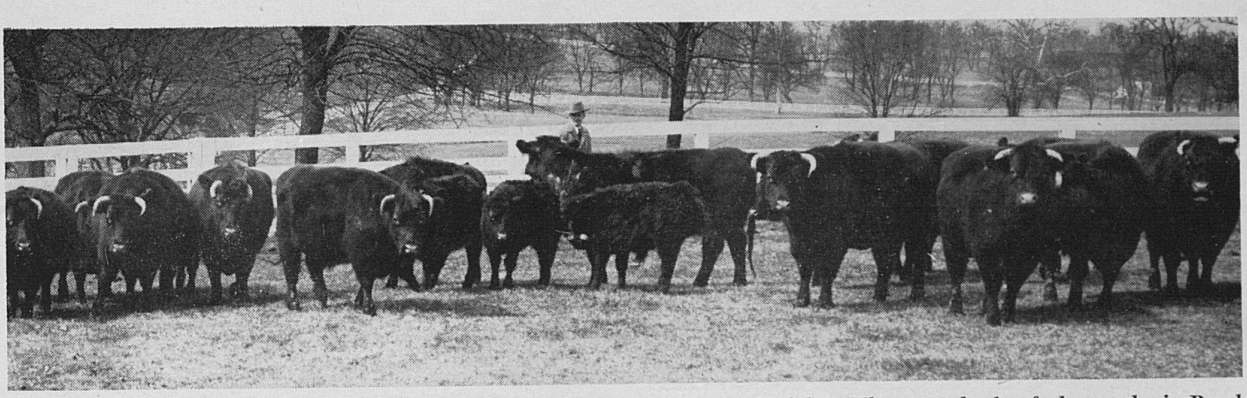
stitutes, antibiotics, and such, on forage utilization, and the correlation between drylot performance and pasture performance by beef cattle, systems of management for greatest profit, and many other related subjects. Sufficient land has been lacking for adequate studies of such matters as gastro-intestinal parasitism in cattle and sheep, the effects of foliage and root-feeding insects on forage production and pasture stands, the effects of wide-spread spraying not only on the insects but on residue build-ups and such. Such work, to be done effectively, needs to be done on acreages not far removed from campus laboratories, offices, and classrooms.

The farms were purchased from Henry H. Knight and Hugh A. Grant for $1,851,300. The University now has physical possession of 780 acres of the tract, and will gain possession of the remainder on June 1.

Much color and romance of Bluegrass horse and general livestock history are in the background of Coldstream Farm. On a tract which is now a part of the farm was McGrathiana, owned by Price McGrath who in 1875 won the first Kentucky Derby with his colt Aristides. Another horse of McGrath's, Leonard, finished second in the third Derby.

After the death of McGrath, the farm became the property of the horseman, Col. Milton Young. He transformed McGrathiana Stud into one of the most famous breeding establishments in America. Among the sires was the great thoroughbred Hanover.

Before coming to McGrathiana in the 1880's, Hanover had made an illustrious name for himself and much money for his owners. At the time of his retirement from the track, when he was acquired by Col. Young, Hanover had a record of 32 wins in



(Above) Some of the excellent-quality Shorthorn cattle presented to the University of Kentucky by Mr. and Mrs. Henry H. Knight. The man back of the cattle is Beryl McClain, herdsman for the Knight farms.

50 starts and was America's leading money winner ($118,887). He lived until 1899, to sire many well known runners of that era. His skeleton is on exhibit in a biological laboratory at the University of Kentucky.

In 1908 during the so-called horse depression, Col. Young disposed of McGrathiana and his stable. At this sale some 450 of the finest-bred Thoroughbreds in America were sold for only $80,000. The Beasley Brothers who acquired McGrathiana were mainly interested in the raising of cattle. Later, in 1915, ownership passed to a Chicago oilman, C. B. Shaffer, who purchased additional land and changed the name of the farm to Coldstream.

Shaffer's son sold Coldstream to Mr. and Mrs. Henry Knight in 1951, who operated it with their other Bluegrass farms until its purchase for the University.

As a start toward stocking the newly-acquired Experiment Station Farm with excellent-quality livestock, Mr. and Mrs. Knight recently presented to the University 35 purebred Shorthorn animals consisting of 14 cows with calves, 6 heifers and 6 bulls. These animals were appraised by herdsmen selected by the Shorthorn World Magazine as being worth a total value of $33,000.

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(Above) A University committee is considering proposals as to what use should be made of the 20-room, 3-story residence on the Coldstream tract. Included on the spacious grounds around the house are a tennis court and a swimming pool. Whatever the use decided upon for the residence and immediately surrounding grounds, it will be of a non-agricultural nature and will be operated by the University separately from the Experiment Station farm.

(Below) Coldstream Farm's picturesque stone fence parallels the Newtown Pike. In the background is the large horse barn.

(Photo: Boyd Keenan)

The importance of proper fertilization is shown in

Western Kentucky Pasture Trials

By E. C. DOLL

Of the nearly 20 million acres in Kentucky farms, the 1954 agricultural census figures indicate that more than 8 million acres were used solely for pasture. While more than half of this pastured land (58 percent) was suitable for cropping, more acres of croplands were used only for pasture than for harvested crops. Results obtained at the soil testing laboratories throughout the state indicate that many Kentucky pastures need additional limestone, phosphorus, and potash for an efficient level of production.

The importance of proper fertilization in establishing a pasture was shown in an experiment in Simpson county. A mixture consisting of orchardgrass, tall fescue, and Ladino clover was seeded in late August, 1955, on a soil which tested low in both phosphorus and potash. A very poor stand was obtained where no fertilizer was applied (Fig. 1). Yield results (Table 1) further illustrate the relative effectiveness of proper fertilization at the time of seeding.

Table 1.— Relative effectiveness of fertilizer applied either at the August seeding or as a spring topdressing on the yield of pasture in Simpson county, Kentucky.

Fertilizer applied per acre, lb (N-P_2O_5-K_2O)		Yield per acre, lb
August 1955	March 1956	
None	None	1170
20-120-60	None	5050
20-20-0	0-120-60	3270

Adequate phosphorus and potash must be available if a thick, vigorous stand is to be obtained. In the foregoing experiment, phosphorus and potash were more effective at the time of seeding than when applied the following spring, even when a light "starter" application was used. Results from other experiments throughout the state also indicate that an adequate supply of readily available phosphorus is particularly important in establishing a good stand and that the available phosphorus in the soil should be maintained by frequent topdressings.

An ample supply of potassium not only is needed for high production but is absolutely essential if a desirable proportion of legumes is to be maintained. Figure 2 shows the effects of increasing the rates of potash fertilization on the yield of herbage and on the removal of potassium. This work was done in Muhlenberg county on a soil naturally very deficient in potassium. The pasture is a mixture of orchardgrass, tall fescue, and Ladino clover. Yield increases were obtained for as much as 100 pounds per acre of potash (K_2O), but no additional increases were obtained when 200 pounds per acre was applied. However, part of the additional potash was removed by the crop. This is graphically illustrated in Fig. 2. Since more potassium may be removed by the crop than is actually required for optimum yields and since potassium may at times be subject to loss through leaching, annual topdressings seem to be the most practical and economical method of supplying the needed potassium.

In pasture mixtures, the legume component is capable of fixing considerable amounts of atmospheric nitrogen. When a pasture is composed mostly of grasses or non-legumes, applications of nitrogen will usually result in increased production. However, applications of nitrogen may have very little effect on yields from a pasture in which a considerable portion of the herbage is composed of legumes (Table 2). In this experiment, nitrogen fertilization had practically no effect upon either the yield or nitrogen content of the herbage.

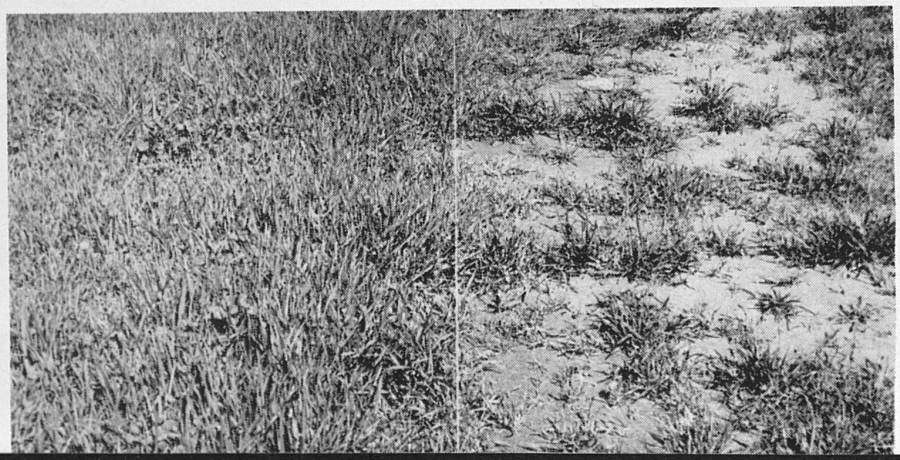

Fig. 1— Effect of fertilization on the establishment of pasture in Simpson County, Kentucky. The plot on the left received 20 pounds per acre of nitrogen, 120 pounds of phosphoric acid, and 60 pounds of potash. The plot on right was not fertilized.

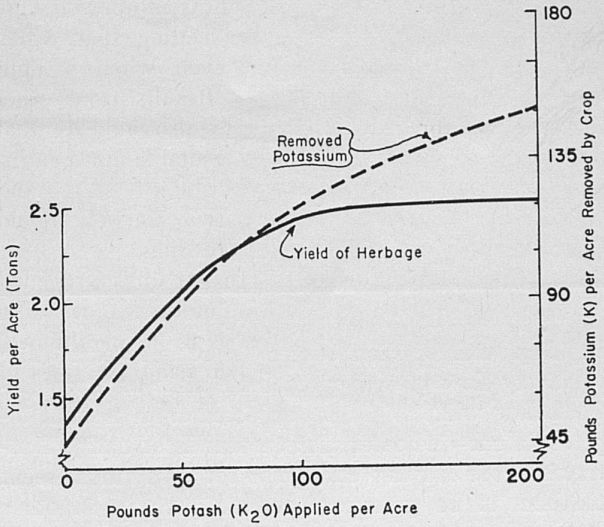

Fig. 2.— The yield of the pasture and the amount of potassium removed by cropping on plots in Muhlenberg County, Kentucky, 1955.

In total yields for the season, differences obtained at the various cutting dates may be obscured. Nitrogen applications made in the spring tend to result in increased production early in the season when pasture is plentiful and in decreased production later when it is needed more. In general, nitrogen fertilization of pastures in which a substantial portion of the herbage is composed of legumes does not appear to be practical. Pastures composed mostly of grasses will, of course, respond to nitrogen applications.

Table 2.— Effects of nitrogen fertilization on yield and nitrogen content of a grass-legume pasture, in Muhlenberg county, Kentucky, in 1955.

Nitrogen per acre, lb March	June	Acre Yield, lb	Nitrogen Removed per acre, lb
0	0	5000	140
100	0	5100	130
0	100	5100	145

When a pasture is to be established, a soil sample should be tested to determine the correct amount of limestone and the proper kind and amount of fertilizer to be applied. If the pH value is less than 6.3, additional limestone will be needed for optimum yields, the most efficient use of applied fertilizers, and the maintenance of legumes in the mixture. As much as 120 pounds per acre of phosphoric acid (P_2O_5) and 80 pounds of potash (K_2O) may be needed if the soil is low in these elements. From 30 to 40 pounds of nitrogen should be applied to aid in establishing a vigorous stand. On established pastures, 30 pounds of phosphoric acid and 60 pounds of potash per acre should be applied by topdressing annually. When legumes comprise a considerable portion of the herbage, no supplemental nitrogen will be needed; when the herbage is mainly grass, from 30 to 100 pounds per acre of nitrogen may be profitable.

Little Population Change

(Continued from Page 3)

The map shows a classification of Kentucky counties into two major groups: those that gained and those that lost population during the 1950-56 period. Each of the two major groups has been sub-classified according to whether the gain or loss averaged more or less than 1 percent per year.

The four fastest growing counties in Kentucky during the 1950-56 period were Boone, Bullitt, Jefferson, and McCracken, listed in order of their growth rates. These were the only counties showing an increase of more than 3 percent, while five counties—Taylor, Marshall, Kenton, Daviess, and Ballard—grew at rates averaging 2 to 3 percent per year. Counties with average gains of more than 1,000 residents per year were Jefferson, Kenton, Fayette, McCracken, Campbell, and Daviess. All these counties either contain large urban centers or are near expanding metropolitan regions, demonstrating the observed trend toward urban concentration of Kentucky's population. For example, the counties showing the highest area population gains—Jefferson, Kenton, and Campbell—were those most directly influenced by the economic growth of the cities of Louisville and Cincinnati.

The gains in Ballard, Marshall, and McCracken counties are caused in part by migration to the area as a result of the construction of the Atomic Energy Commission plant near Paducah. However, comparison of the 1956 estimates with those of earlier years shows a heavy outflow of migrants after plant construction was completed.

In contrast to only 4 counties that gained population at an average annual rate of 3 percent or more, 13 counties had averaged loss rates greater than 3 percent per year. Since most of these counties had relatively small populations, high loss rates did not necessarily mean heavy numerical losses of population. Only five counties, all in the Cumberland Plateau mining area—Harlan, Bell, Pike, Letcher, and Floyd—had net losses averaging more than 1,000 residents annually during the period.

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Kentucky Agricultural Experiment Station
University of Kentucky
Lexington, Ky.

Frank J. Welch
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Animal Science Research Center

(Continued from Page 9)

Recognition of the presentation was made at a meeting at the farm in March. Present were Gov. A. B. Chandler, Dr. Frank G. Dickey, president of the University of Kentucky, Dean and Director Frank J. Welch, of the College of Agriculture and Home Economics and the Experiment Station, Dr. W. P. Garrigus, associate director of the Station and head of the Animal Industries Department, and other state and University officials.

In accepting the gift, Dean Welch pointed out that the new farm presents to the Experiment Station and Kentucky agriculture a fine opportunity, but the extent to which the Station will be able to develop this opportunity will depend on the degree to which the farm can be stocked with the kind of livestock needed and provided with the buildings and equipment to do a first class job of research. This gift of excellent quality Shorthorns, the Dean said, is a long step in the right direction.

Little Population Change

(Continued from Page 11)

Heavy population loss in the Cumberland Plateau area is closely associated with the economic conditions of the area's coal mining industry. No doubt the decline in mining employment can partly explain the fact that migration from the Cumberland Plateau during the 1950-56 period was by far the heaviest in the state.

Although a few exceptions may be noted, the estimates for 1956 bear out the long-time trend of population change within Kentucky. Coal mining regions and areas of small-scale agriculture, both in eastern and western Kentucky, are losing population rapidly—despite the high rates of natural increase characteristic of these areas. Many of the migrants from the farms and mining towns appear to be moving to urban centers within the state, to judge from the rapid growth of such centers in recent years. The relatively slow growth rate of the state as a whole—far below what might be expected from natural increase alone—indicates that thousands of native Kentuckians are leaving each year for what must seem to them to be greener economic pastures in other states.

X-Rays Identify Soil Minerals

(Continued from Page 4)

done to expand our knowledge of Kentucky's soil resources. It consists of the study and characterization of the principal agricultural soils of the state by the Kentucky Agricultural Experiment Station and progressive soil surveys of counties by the U. S. Department of Agriculture Soil Conservation Service.

Briefly, the overall program works this way. Typical areas of soils of agricultural importance are located throughout the state, and samples are collected for laboratory and greenhouse study. In the laboratory chemical tests are made which indicate the general fertility level at the time the soils were sampled and also the potential supplying power of the soils for the so-called "minor elements" such as boron, copper, manganese, zinc and molybdenum. The amounts of sand, silt and clay are determined, and the various minerals present are identified by their appearance under the microscope, reactions when heated as measured by differential thermal analysis, and by examination using X-ray methods and chemical tests.

Plant response to treatment of these soils with different fertilizer materials is measured under greenhouse conditions as a supplement to the large-scale field trials conducted on the soil experiment fields located in the major areas of the state. Results obtained from these diverse methods of study are fitted together like a jigsaw puzzle for these soils, and a clearer picture of proper management develops. Finally, the locations of the soils on a state-wide basis are obtained from the soil survey information, and recommendations are ready to be made.