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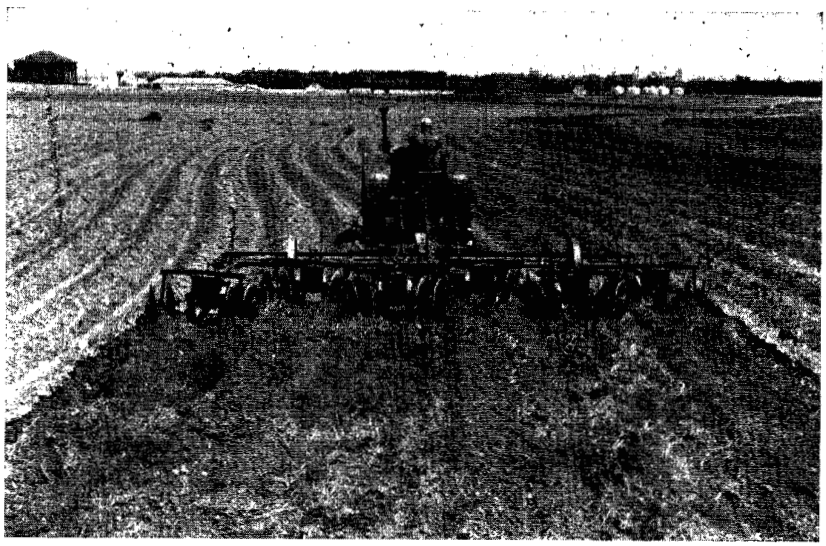

SPACIOUSNESS AT THE HAYS STATION IS IMPORTANT

KANSAS RURAL INSTITUTIONS:

I. THE FORT HAYS BRANCH EXPERIMENT STATION[1]

By F. D. FARRELL

The extent to which the welfare of the American people must depend upon the American countryside is so great that an improved popular understanding of our rural institutions is desirable. Collectively, these institutions are concerned with the conservation of the soil and other essential natural resources, with the production of foods and fibers, with the economic, social and spiritual interests of rural people and with the early and formative nurture of the human stocks from which the populations of our urban communities are continually replenished.

The present paper is the first of a projected series of reports to be based on the results of Kansas Agricultural Experiment

[1]Contribution No. 129, Department of Agricultural Economics.

Station Project 234, Case Studies of Kansas Rural Institutions, As the improvement of human welfare depends chiefly upon the discovery and use of truth and as truth is the major product of scientific research, it seems fitting that the first case studied should be that of a research institution. In the interest of brevity, the present report is limited chiefly to the past 25 years and only enough material is included to present the essentials of the results of the study.

RURAL INSTITUTIONS FOR RESEARCH

Agricultural experiment stations are rural institutions for research in subjects directly affecting agriculture and rural life. They are a comparatively new type of rural institution. The oldest agricultural experiment station in any English-speaking country is Rothamsted. Situated near the village of Harpenden, 25 miles north of London, England, it has been in continuous operation since 1843. In the United States there is an agricultural experiment station in each state. Most of these stations have been founded since the passage of the Hatch Act, approved by President Cleveland on March 2,1887, less than 60 years ago.

In most of the States, owing to intrastate variations in soil and climate, it has been found desirable to have branch experiment stations at which agricultural research appropriate to the local or regional conditions of soil and climate can be conducted. The usefulness of branch stations is suggested by the fact that more than 200 of them are maintained in 40 of the 48 states.* The number per state ranges from one to as many as 15 or 20. The average number is about five. Kansas has four. The relations of the branch stations to their local environments are often indicated by the stations' names: Delta Branch Station in Mississippi, Coastal Plain Branch Station in North Carolina, Tetonia High Altitude Substation in Idaho. In addition to the more than 200 branches of state agricultural experiment stations, numerous field stations for the conduct of agricultural research appropriate to regional conditions of soil and climate are maintained by the United States Department of Agriculture.

Most of the state agricultural experiment stations conduct much field research of local significance in addition to that conducted at the central stations and the branch stations. This field research, often in progress at scores or even hundreds of places in a state, frequently is conducted for short periods only. The sites used for this work are referred to variously as experiment fields, cooperative experiment plots or in other terms indicative of their small size and simple nature.

DESCRIPTION OF HAYS STATION

A branch station, on the other hand, usually is a permanent institution composed of land, buildings, equipment, a staff of

*For this information the author thanks Director J. T. Jardine of the Office of Experiment Stations, United States Department of Agriculture.

supervisory and technical personnel and a labor and clerical force. Such an institution is the Fort Hays Branch Experiment Station, a branch of the Agricultural Experiment Station of Kansas State College.

Some such institution is needed because of essential differences between the environment of the central station and that of large agricultural areas farther west in the state. Something of the nature and the extent of these differences is indicated below:

	Manhattan	Hays
Distance from central station, miles	0	170
Altitude, feet	1,002	2,000
Precipitation* (rain and melted snow) inches:		
Average annual	30.97	22.62
Greatest annual	50.82	35.40
Least annual	15.13	11.80
Average, six months, April to September	23.06	17.37
Wind movement*, six months, April to September, average per hour, miles	3.4	8.0
Length of growing season*, days:		
Average	172	168
Longest	208	198
Shortest	134	114
Dominant natural vegetation	Tall grass	Short grass

One impressive effect of the essential differences indicated above, in altitude, precipitation, wind movement and length of growing season, together with other differences not so readily indicated, is that each area has a dominant native vegetation quite different from that of the other. Just as Nature, through centuries of trial and error, produced a native vegetation well adapted to the natural conditions of each area, so man, with the help of science, gradually is developing for each area a type of agriculture that fits the environment.

SCOPE OF STATION'S WORK

Situated adjacent to the town of Hays in Ellis county, on the western edge of the central third of Kansas, the Hays station contains 3,263 acres of land. An additional 410 acres of land leased temporarily brought the total land used by the station in 1944 to 3,673 acres. Of the total, an area of 1,944 acres was in cultivation in 1944 and the remainder was in pasture and building sites. Of the 1,944 acres in cultivation in 1944, an area of 1,541 acres was devoted to commercial-scale production of pure seed for distribution to farmers, to the production of feed for livestock used in experimental work and to similar purposes. The remaining 403 acres of land in cultivation provided space for the conduct of field experiments in plots rang-

*From Kansas Agricultural Experiment Station bulletin 302, "Kansas Weather and Climate," published in September, 1942.

ing in size from one-hundredth acre or less to about one-tenth acre, and in nursery rows in the projects indicated below.

Projects	Number of	
	Plots	Nursery Rows
Dry land agriculture	580	.....
Cereal crops and diseases	302	1,564
Forage crops and diseases	488	706
Control of noxious weeds	990	.....
Total	2,360	2,270

In addition to the above, a tract of about five acres is used as a nursery for the production and testing of trees and shrubs and for testing vegetable crops.

On these plots and in these nursery rows there is a complex series of experiments with soils and plants. The experiments involve methods of soil and crop treatment, the control of weeds and plant diseases and pests, the creation, testing and improvement of plant varieties, and the reestablishment and improvement of the native pasture vegetation. In the conduct of these experiments the cooperation of the United States Department of Agriculture is an extremely valuable factor.

Paralleling the research work with soils and crops, the station carries on extensive feeding experiments with beef cattle and occasionally with hogs. Moreover, as with soils and crops, the experimental work with cattle is supplemented by commercial-scale production. This is carried on through the use of a high-class herd of Hereford cattle bred on the station and persistently improved throughout the past 20 years or more. Emphasis on beef cattle in the livestock work of the station is warranted by the fact that in the Hays territory, as represented by the nine counties of which Ellis county is approximately the center, there are more cattle than sheep and swine combined and many more beef cattle than dairy cattle.

In the 25 years ended with 1944, feeding experiments have been conducted with a total of 321 lots (usually 10 head to a lot) of beef cattle. The number of lots used varies from year to year but it seldom exceeds 16 or is less than 10. The feeding experiments involve calves, yearlings, cows and steers. They test not only the major locally-grown feeds in various combinations but also imported feed supplements and even different methods and machines used in feed preparation and preservation.

COST OF OPERATION

Not everybody recognizes that to be fully effective a branch experiment station must cost money. Scientific research in field or laboratory almost always costs more than it produces

immediately. In their efforts to find things and processes that succeed, research workers must try many things and processes that fail.

In the 25-year period ended June 30, 1944, the Hays station expenditures amounted to a total of $1,603,815, or an annual average of about $64,000. The figures do not include expenditures by the federal government in support of cooperative research at the Hays station, expenditures which probably would not exceed 10 to 20 percent of the state's outlay during the 25 years. Of the $1,603,815 expended, a total of $638,563 was appropriated by the state. The difference, $965,252, came from the receipts from the sale of plant and animal products of the station. Thus the station for the 25-year period depended on its own sales receipts for 60 percent of its revenues and on state appropriations for 40 percent.

Of the total of state appropriations of $638,563, the sum of $107,900 was for physical plant and $530,663 was for operation and maintenance.

The sums appropriated by the state are provided by the taxpayers, the people, of the state. During the 25-year period, the population of Kansas has been about 1,800,000. The $638,563 appropriated by the state amounts to 35 1/2 cents per capita for the 25 years, or to less than 1 1/2 cents per capita per annum. This slight per capita cost emphasizes one of the significant facts about cooperative enterprises. If the cost of the enterprise is widely distributed the burden of cost to each of the cooperating individuals is light.

THE PROOF OF THE PUDDING

Notwithstanding the light per capita cost to the taxpayers of the state of equipping, maintaining and operating the Hays station, it is pertinent to inquire whether the station is worth its cost. As "the proof of the pudding is in the eating," some evidence bearing on this inquiry will be presented.

Most of the evidence is contained in four categories. These, in descending order of ease of concrete evaluation are: (1) Inventions and improvements of farm implements; (2) the distribution of seeds and plants; (3) the introduction, creation and improvement of new crops and crop varieties; and (4) the discovery and dissemination of facts of practical value in the conservation of the agricultural resources of the area represented by the station or in improving living conditions in that area.

Inventions and Improvements of Farm Implements. — It happens that the man who has served as superintendent of the Hays station since September, 1921, is an agricultural engineer as well as an agronomist and an animal husbandman. This extraordinary combination has been a fortunate one for the development of the station's work and particularly for keeping the station well forward in the making of adjustments between agricultural practice and the advancement of mechanization.

In the 18 years ending with 1944, about 30 machines, or parts of machines, have been devised, built and tested at the station. These include a basin lister, the use of which is now widely ef-

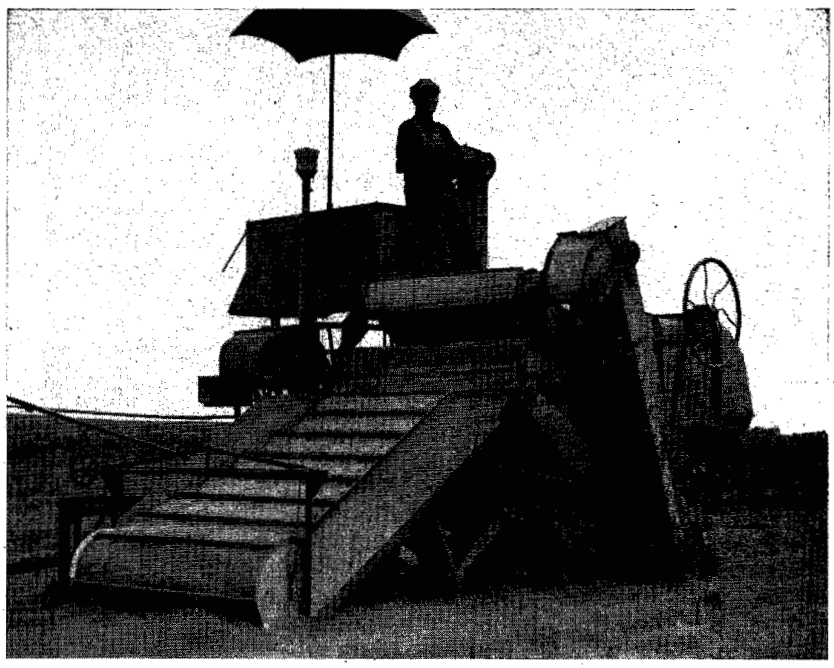

Fig. 1.—The Fort Hays experiment station grass combine with low-cutting attachment for harvesting buffalo grass seed.

fective in the conservation of moisture for the soil; a small-grain nursery combined harvester and thresher, used extensively in the conduct of experiments for the improvement of cereal grains; a machine for harvesting and threshing buffalo grass seed; a calf dehorning chute; an automatic field hay baler; a sweet clover seed scarifier; a motorized hay buck; a road roller; a motorized grasshopper dozer; an automatic seed-treating machine; a power posthole digger; and many others.

In the conduct of research work on new crops and new farm practices, the need for new or improved mechanical devices frequently arises. The presence of this need at the Hays station, together with a practically inventive superintendent and the opportunity to give adequate trials to new devices and improvements could hardly have failed to produce an imposing list of valuable mechanical innovations.

Distribution of Seeds and Plants. — Large scale production and wide distribution of seeds and plants of adapted species and varieties are important public services of the Hays station. In the

25 years ended in 1944, the distribution of pure seeds of crop plant varieties adapted to the conditions of the Central Great Plains included :

4,351,000 pounds of wheat
3,893,000 pounds of sorghum seed
353,000 pounds of barley
79,000 pounds of alfalfa seed
39,000 pounds of corn

A probably large, though unknown, proportion of these seeds served as sources of still larger supplies of good seed in the communities in which they were planted. In this way, the use of superior seed of improved crop varieties spreads quickly to hundreds of thousands, sometimes millions, of acres of farm land in Kansas and other Plains states.

In the 25-year period the distribution of plants included:

3,409,000 seeding trees
265,000 trees
140,000 shrubs

These plants were sent out in response to 25,644 individual orders from citizens in all parts of Kansas (from 63 to 99 counties each year) and in other Plains states. No doubt their importance in the gradual improvement of the homesites and landscapes of the Central Great Plains is quite considerable. Used in windbreaks, shelter belts and landscaping, these plants have contributed significantly to the improvement of living conditions throughout a wide area.

New Crops and Varieties. — As the introduction of new crops and varieties and the creation of improved varieties and strains involve extensive cooperative activity it often is difficult to ascribe the credit definitely to a single individual or a single experiment station. The crops and varieties mentioned below include a few for which the Hays station is at least in part responsible insofar as their introduction into Kansas agriculture in concerned :

1. **Flynn Barley**. — A six-rowed, smooth-awned hybrid developed in the cooperative experiments of the United States Department of Agriculture and the Minnesota Agricultural Experiment Station and first tested at the Hays station in 1922. After a decade of testing, the variety was first distributed from Hays for planting in Kansas in 1933. Within ten years it became the leading variety of spring barley in the state.

2. **Early Sumac Sorghum**. — An early maturing Hays selection of Standard Sumac and first distributed to farmers in 1925. The earliness, uniformity, attractive appearance, and good yield and feeding value of this variety have made it the the most highly valued forage sorghum in western Kansas.

3. **Pink Kafir.** — A leading grain sorghum in central and south-central Kansas, Pink Kafir originated from a selection made

at the Hays station by C. C. Cunningham in 1909. Extensively tested at Hays for many years, including the 1920's, this variety is one of the most persistently popular of all grain sorghums.

4. **Club Kafir**. — A variety isolated at Hays in 1926 and, after years of testing, certified for distribution in 1939. Noted for its high resistance to chinch bug injury and its virtual immunity from Pythium disease, Club Kafir is well adapted to central and eastern Kansas.

5. **Cody**. — This grain sorghum is the result of a cross made at Hays between Club Kafir and Leoti in 1935. It is important chiefly because of its waxy endosperm from which a starch having the properties of tapioca starch may be obtained. As World War II stopped the importation of tapioca starch from the East Indies, and as that starch had been widely used in the United States in the manufacture of adhesives and of certain popular food products, the demand for Cody has been brisk. One large food manufacturing company contracted for virtually the entire production from the 20,000 acres planted in 1944. It may be that Cody will prove to be the basis of a Kansas industry for the manufacture of tapioca starch.

6. **Midland**. — A new, early grain sorghum produced at the Hays station and valuable for its sturdy short stems (38 to 45 inches) because of which it can be harvested with a combine, its resistance to milo disease and to lodging, its somewhat juicy stalks and its high yield of good quality grain.

7. **Norkan**. — A new sweet sorgo hybrid developed at the Hays station by crossing Atlas and Early Sumac. Fifteen years of testing have shown it to be well adapted to northern and northwestern Kansas where it matures seed in about 105 days after planting and where Atlas usually will not mature.

8. **Hays Golden Corn**. — Developed at Hays from a selection made in 1923. It is now widely used in western Kansas and in portions of the Panhandle region of Texas and Oklahoma. Its qualities and particularly its survival of the severe droughts of the 1930's make it popular in western Kansas both as an open-pollinated corn variety and for use as a parent line in the production of hybrid corn.

The above are only examples. Several additional similar contributions of the Hays station could be cited. The station is important as a testing ground for new plant introductions, such as Sudan grass and the Chinese elm, as well as a place where new crop varieties and strains are created, purified and tested.

Discovery and Dissemination of Facts. — The major duty of any research institution is to find the truth and to tell it. In the discharge of this duty the Hays station has been notably productive in the past 25 years. A few examples must suffice here. The following are listed without reference to their sup-

posed relative importance or to the time of their discovery or dissemination. Among other contributions the station has:

1–Determined which are the best available, varieties of wheat, barley, grain sorghums, forage sorghums and other field crops for the Hays region.

2–Determined practicable rates, dates and methods of seeding the various field crops grown in the Hays region.

3–Determined the relationship between the moisture content of the soil at seeding time and the yield of winter wheat, thus assisting farmers to decide wisely whether to seed winter wheat on land having a given moisture content at seeding time.

Fig. 2.—Selections of buffalo grass being tested at the Hays station.

4–Developed successful large-scale methods of harvesting, treating and planting buffalo grass seed, and seed of other indigenous short grasses, for the reestablishment of grass sod in the Central Great Plains.

5—Developed successful large-scale methods of planting, cultivating and harvesting grain sorghums and other important row crops.

6—Developed successful large-scale methods of eradicating field bindweed, the most important noxious weed in the Kansas wheat belt.

7—Proved that the seed of field bindweed may remain viable in the soil for at least 23 years.

8—Determined the effects, for periods ranging in length from 15 to 35 years, of many different methods of soil management for the conservation of soil nitrogen and water, the control of weeds, and the increase of yield and the improvement of quality of winter wheat and other field crops.

9—Devised feasible methods of safely storing wheat harvested in wet seasons and hence having an abnormal moisture content on entering storage.

10—Developed successful cropping and cultural methods for the control of soil blowing and wind erosion.

11–Demonstrated the feasibility in the Hays region of growing certain varieties of cherries and plums and of producing trees and shrubs found adapted in Hays tests.

12–Established the relative dependabilities and values of various field crops for the Hays region.

13–Determined the feeding values of hay and silage made from Russian thistles and used occasionally in wintering cattle.

14–Determined the relative values, per unit of weight and per acre, in wintering cattle of the various sorghums grown in the Hays region and of various methods, of preparing them for use.

15 — Determined the influences of ensiling upon the feeding values of corn and the sorghums grown in the Hays region.

TRIED AND FOUND WANTING

Not the least valuable of the services of agricultural research institutions is their testing of things — plants, animals, methods — which are alleged to be valuable but which on being tested are found not to be. Sometimes these thing are valuable under some conditions but not others; sometimes they are without value under all known conditions. A few of the things that have been tried and found wanting at the Hays station within the past 25 years are listed below:

1 — A salt mixture known as "fly salt" and widely sold throughout the Middle West in the 1920's as a fly repellent, has been found on careful test to be worthless as a fly repellent and less palatable to cattle than ordinary stock salt although its sale price was six times that of ordinary cattle salt.

2 — The use of common salt on agricultural land to eradicate bindweed has been shown to be undesirable for the reason that it reduced the productivity of the land as much as 97 percent even as long as 25 years after the salt was applied.

3 — Tests covering a period of 20 years have shown that at Hays the application to the land of barnyard manure has no beneficial effect on winter wheat and that all but very light applications actually reduce winter wheat yields.

4 — Tests covering a period of 25 years have shown that at Hays no significant effects are produced on winter wheat by the application to the land of such commercial fertilizers as superphosphate and 2-12-0 and 2-12-2.

5 — Tests covering periods of from 26 to 36 years have shown that at Hays no profitable gains in the yields of wheat, corn, oats, barley, kafir or milo are produced by deeper than ordinary tillage.

6 — That the conduct by the state or other public agency of a "model farm" is economically impracticable was clearly indicated by the attempted operation at the Hays station for a period of almost a decade of a dairy farm unit separated from the remainder of the station. The purpose, as stated by the station superintendent in his annual report for 1913, was "to demonstrate the desirability of introducing more work of this char-

acter (dairy farming) on the farms of western Kansas." The project failed economically, as publicly-owned "model farms" and "demonstration farms" usually do, for the reason that public ownership and operation of a farm unit inevitably introduce too many factors that are absent from a privately owned and operated farm and so invalidate direct comparisons.

7.—Through repeated tests, the station has demonstrated the ill-adaptation of flax, soybeans and spring wheat to conditions of the Hays region, and, compared to the sorghums, the ill-adaptation of corn.

FACTORS FOR SUCCESS

A study of the Hays station reveals a number of factors which have made for its success during the past quarter century. These include the following and possibly others:

1. **Suitable Situation**.–As indicated earlier in this report, natural conditions at the Hays station represent a fairly large region having distinctive geographic peculiarities. The station is situated alongside one transcontinental railroad, one transcontinental east-west highway and one interstate north-south highway, and so is readily accessible. The station land is predominantly upland, as is the land of the region, but it contains a small acreage of creek-bottom land of a kind that is widely distributed throughout the area represented. The situation is distinctly suitable and is an important factor for the station's success.

2. **Adequate Size**.—The spaciousness of the Hays station is one of its striking and important features. Because of this, it is possible to test on an ample scale the practical validity of the findings of the research work conducted on small plots or in nursery rows or feedlots. For example, when small-scale research indicated some practicable methods of reestablishing native short grasses on cultivated lands of the region, the methods were tried on a sufficient scale so that in 1944 the station contained 400 acres of successfully reestablished short grass sod. Similar values appear when it is desirable to make large-scale tests of farm machinery, to increase the supply of pure seed of a field crop or to apply some of the results of cattle feeding experiments to a beef herd of 100 to 200 head.

3. **Coordination with Other Research Agencies**.—The Hays station does not operate in a vacuum. First of all, it is under the general supervision of the Agricultural Experiment Station of Kansas State College. This relation helps to keep the work at Hays well coordinated with that of the central station, of other branch stations in the state and with the work of the college as a whole. Through the supervision just mentioned and by which technical personnel from the United States Department of Agriculture are stationed at Hays, the work of the Hays station is coordinated with that of the department in the

Hays region. For example, the Hays station frequently is one of several branch stations in the Great Plains used as a site for conducting tests which at the same time are in progress at other Kansas branch stations and at branch stations in other states from Texas to Montana. This close coordination of the work at Hays through its direction from the central station is a potent factor in strengthening the work at the Hays station itself and in extending the usefulness of that station beyond the immediate region into adjacent Plains states. Without such coordination the work of the station inevitably would be relatively inefficient and ineffective.

4. **Adequate Equipment**. — Thanks to the skill and ingenuity of the present superintendent, the generosity and cooperation of some of the manufacturers of farm machinery, and an occasional windfall in the form of large receipts from the sale of station products, the Hays station during the past quarter-century has been reasonably adequately equipped with machinery and tools. This has been particularly true since machinery operated by internal combustion engines or by electricity reached a high state of efficiency and ready availability.

5. **Competence and Continuity of Key Personnel**. — In the first 19 years of the operation of the Hays station — from 1902 to 1921 —there were seven superintendents[2] whose tenure ranged from 15 months to four years. Their average tenure was less than three years. Doubtless these seven men varied widely in competence. Even if they had all been highly competent, they were denied by short tenure an adequate opportunity to establish sound and stable policies of management. Some important contributions were made by the station during these 19 years, but in spite of frequent changes of management and largely because there was some stability of tenure among technical personnel. The station has made its best contributions since 1921, when the present highly competent management took charge and was enabled to establish stable policies.

The station has been fortunate in both the competence and the long tenure of some of its technical personnel. Outstanding among these are C. C. Cunningham in cereal crops work; R. E. Getty, D. A. Savage and L. E. Wenger in forage crops work: A. L. Hallsted in tillage and crop rotation work; A. F. Swanson in cereal crops work; and F. L. Timmons in weed control work. Most of these technical men were detailed to the Hays station by the United States Bureau of Plant Industry as a part of the cooperative arrangements between that bureau and Kansas State College. Of the men named, Mr. A. L. Hallsted has the longest tenure. He has been employed continuously since 1909, a period of 35 years, and is still employed. He is

[2]According to Dr. J. T. Willard, Historian of Kansas State College, these were J. G. Haney, O. H. Elling, C. K. McClelland, A. M. Ten Eyck, G. K. Helder, C. R. Weeks and H. L. Kent.

followed by Mr. Swanson, who has served for 25 years and is still serving.

Mr. L. C. Aicher, superintendent since September, 1921, combines long tenure with both technical and managerial competence of a high order. In the past quarter-century fortunate combinations of high competence and long tenure of key personnel have been the rule at the Hays station and the public served by the station has benefited accordingly.

6. **Persistence of Research Projects**. — One of the major requirements for effective research, particularly in the open field with soils and crops, is that the research projects be carried on without essential change throughout long periods of years. Only so can the effects of vagaries of the weather be adequately taken into account and conclusions from the results of the field experiments acquire high validity and dependability. For example, if in 1914 the application of six tons of manure per acre of winter wheat had been followed by a decrease in yield there would have been grounds for suspicion that that unexpected result was due to some unusual and undisclosed factor. But when, as at the Hays station, the results of 30 years of repetition of the test, from 1914 to 1943, show an average reduction of 1.8 bushels an acre from the application to each crop of six tons of manure per acre, the results must be respected. In general, field research projects increase in value as their age increases. Long persistence of such research' projects is an important factor for the success of the Hays station. A large number of the field experiments have been in progress for 25 years or longer.

7. **Extensive Use of Regional Resources**.–Some of the most effective work of the Hays station has resulted from extensive use by the station of the natural resources of the Hays region. One example is the conduct of numerous cattle feeding experiments emphasizing feed crops produced in the region. Another involves grasses for use in restoring the grass sod on millions of acres of land in the central and western Great Plains. For a time special emphasis was given to the testing of exotic grasses from various parts of the world where natural conditions are similar to those of the Hays region.

But the most valuable results were obtained not by introducing new grasses but by devising new methods of seed harvesting and seed treatment for native short grasses. Machinery devised at the station makes it practicable to harvest the short-grass seed on a large scale at comparatively low cost. Seed treatment known as "vernalization" and involving soaking in a chemical solution and subsequent storage under temperature control increases the germination of native (buffalo) grass seed from 10 percent or less to 80 percent or more. These two, seed harvesting and seed treatment, have made the reestablishment of native grass sod entirely practicable.

8. **Wide Use by Educational Agencies**. — The effectiveness of the Hays station has been increased substantially by the wide use made of results of station research by various agencies of education. Kansas State College and some other land-grant colleges make extensive use of these results in class instruction and in extension education. Considerable numbers of extension specialists and county agricultural agents visit the station, some of them frequently, and take back to their communities a wealth of reliable information of practical significance in agricultural practice. Newspapers and farm journals frequently send representatives to the station to obtain material for publication. All these and other similar factors have helped to get the results of Hays station research into practical application throughout a wide area and to improve popular understanding of the usefulness of the station.

MAKING THE RESULTS KNOWN

To inform the public regarding the results of research at the Hays station several methods are followed, some regularly and some occasionally. In the past 25 years about 50 formal reports in the form of bulletins, circulars or technical papers have been printed and distributed. Of the total, 25 present results of winter feeding experiments with cattle. The others relate to forage crops, weed control, cereal crops, trees and shrubs, winter wheat pasturing, soil moisture conservation, improvement and reestablishment of native grasses, new farm implements, and other subjects included in the work of the station. These publications are distributed not only to individuals but also to many newspapers, farm journals, agricultural extension workers, and agricultural teachers in high schools and so are redistributed, wholly or in part, to many thousands of citizens. Moreover a large but unrecorded number of popular news articles are contributed to the press each year by the technical staff of the station.

A second method of making the results known is to invite the public to visit the station, see what is going on there, and view demonstrations and receive oral reports on the work of the station. The most regular feature of this method is the annual round-up, held at the station each year, usually the last Saturday in April. This event places special emphasis on winter feeding of cattle but it is also used extensively to inform those in attendance about the crops and soils work of the station. Annual attendance at the round-up during the past 25 years has ranged from fewer than 100, when the weather was unfavorable, to as many as 1,500, the average being about 600. Visitors come to the round-up each year from about half the counties of Kansas and from several adjacent states. Also at the time of the annual round-up a livestock judging contest for high school students and members of 4-H clubs is held at the station. In the past 23 years, this contest has attracted each year from 50 to

more than 1,030 students, the average number being 450. While these students are concerned chiefly with the judging contest and so learn little about the work of the station, they nevertheless learn to feel at home on the station and so doubtless are prospective adult visitors and patrons.

From time to time there are "field days" at the station. On each of these occasions a group of visitors concentrate their attention on some phase of the station's work which is active at the time. In the past 25 years there have been 14 Wheat

Fig. 3.—A group of citizens at a Field Day at the Hays station.

Growers Field Days, 13 Sorghum Growers Field Days, 4 Soil Conservation Field Days, 5 field days of a miscellaneous nature and several training schools for county weed supervisors and others interested officially in weed eradication. The attendance at these events has ranged from 30 to 400 each.

In addition to the above there are large numbers of visitors who come individually or in small groups led by county agricultural agents, high school teachers of agriculture, or other specially interested persons.

The combination of these methods of making the results known has been reasonably effective. But it must be conceded that the Hays station and its work are less widely known than they deserve to be and that the results of the station's work are less extensively applied than public and private interest would warrant. The same of course is true of many, probably most, research institutions.

INCREASING THE STATION'S USEFULNESS

To bring about a substantial increase in the usefulness of the Hays station it is not likely that anything particularly new is required. Rather, it seems that strengthening here and there

the factors, which have brought the station's already considerable success will suffice. These factors fall into two classes: those which enable the station to do better work and those which result in better popular understanding and wider use of the results of the station's work. Some of these factors are discussed briefly below:

1. **More Use of Sabbatical Leave by Specialists on the Station Staff.**—The Board of Regents wisely maintains a policy whereby any teacher or research worker employed by the College, including its branch experiment stations, may be granted leave at part pay for as much as one year in seven for the purpose of pursuing advanced study or for other specified activities which would increase the staff member's usefulness. There is every reason to believe that more extensive use of such leave by specialists at the Hays station would contribute substantially to the improvement of the station's work. The value to research institutions of leave for professional improvement by various methods has been so clearly demonstrated, at the Hays station as well as elsewhere, that it is no longer open to question.

2. **A Moderate Increase in the State Appropriation.**—For the past 25 years, as already pointed out, the station has been dependent on receipts from the sale of its products for 60 percent of its operating revenue. This degree of dependence would be less objectionable if the income were stable so that the policies and work of the station could safely be adjusted to it. But it is the reverse of stable. Income from sales fluctuates widely and from causes beyond the station's control, such as hail storms, severe drought, wide fluctuations in the prices for farm products.

In the past 25 years annual income from sales has ranged from $75,605, in 1943, to $23,148, in 1924. Within this 25-year range of more than 200 percent, there have been wide fluctuations in shorter periods; for example:

Fiscal year ended June 30	Income from sales
1921	$53,558
1922	28,771
1924	23,148
1925	56,930
1931	46,755
1932	27,964
1941	24,770
1943	75,605

These comparisons are sufficient to indicate the instability of the income from sales. Such instability impairs the station's fitness to carry on a program of research. For full effectiveness, long-time research projects require adequate, stable and dependable financial support. In the past 25 years at Hays, lack of such support has made it impracticable to employ a full-time animal husbandman to care for important research work, some in progress and some urgently needed, with livestock. In sev-

eral instances it has forced the temporary suspension of important research work and so has destroyed the continuity without which research work of the kind conducted at Hays cannot be fully effective. In at least one instance it has made it necessary to sell a part of the beef cattle breeding herd.

To help correct this important defect, the state appropriation should be increased sufficiently to cover the cost of a full-time animal husbandman and to reduce the degree of dependence on income from sales from 60 percent to 40 percent or less.

3. **Authorization to Accumulate a Larger Surplus for Use in Emergencies**. — The fund resulting from the sale of farm products is known as the fee fund. The state wisely permits the station to use the fee fund in the support of station work. The fund is extremely valuable for the reason that it may be used to supplement the appropriated funds. It provides a flexibility that is often necessary in coping with financial contingencies.

In two ways the state prevents the station management from exercising all the financial prudence that is desirable: (1) A state law (Chapter 273 of the Laws of 1935) provides that funds appropriated for operating expenses may not be drawn upon so long as the unexpended balance in the fee fund exceeds 25 percent of the total fee receipts of the preceding fiscal year. This enforces depletion of the flexible fee fund in favor of the relatively inflexible appropriated fund. (2) If despite the limitation just mentioned a fortunate combination of high production and high prices results in an enlarged fee fund, the subsequent appropriations are likely to be correspondingly reduced.

It would seem to be prudent for the station management to carry regularly for emergency use a fee fund reserve of not less than the 60 percent of the average annual expenditures of the past 25 years, or about $40,000, and for the state to authorize and encourage such action.

4. **Further Emphasis on Regional Problems**. — Even though the dominant emphasis at the Hays station is on problems of the Hays region, there is opportunity and need for increased emphasis on these problems. Two of the regional conditions that should have additional emphasis in the work of the station are: (1) The need for returning to grass approximately three million acres of land in central and western Kansas. As already indicated, the station has made great progress in its attack on this condition. But there is still much to be done in simplifying the latest methods and in reducing their cost. (2) The need for improved methods for the conservation, the wise use, of the short grass range. The development of such methods by the Hays station will require at least one livestock and grazing specialist on the station staff and an adequate fund to support his work.

5. **Accelerated Popularization of the Results of the Station's Work. —** It was authoritatively and conservatively reported[3] in 1922 that if all the farmers of Ellis county would apply in their wheat growing the methods found most desirable at the Hays station, the average acre yield of wheat in the county could be increased as much as 50 percent. Comparable improvements doubtless could be brought about by comparable action in the production of other important crops adapted to the region and of livestock, not only in Ellis county but also in perhaps 100 counties in Kansas and some of the adjacent states. Increases in productive efficiency, as exemplified by increased acre yields of crops, would reduce the costs of production per unit of product. Reduced costs of production would advantage producers when agriculture again is obliged to adjust itself to lower prices and to keen competition for markets.

There is reason to believe that accelerated popularization of the results of the station's work would increase the promptness with which and the extent to which these results are placed into use and that it could be brought about by some such means as the following: (1) The attachment to the station staff of at least a part-time specialist in public relations to work under the Supervision of the superintendent and in cooperation with the central station and the extension service. This specialist would devise and supervise or carry on various activities, including (2) an increased press service, for both the farm journals and the newspaper press, particularly country weeklies; (3) an increased number of "tours" to the station by farmers, particularly extension project leaders, and extension workers; (4) an increased number of "tours" by bankers, merchants, editors, and other business and professional groups; and (5) special efforts to interest rural church pastors and rural school teachers in the work of the station and its relation to the livelihood and the lives of rural people in the central Great Plains.

AN EXCELLENT INVESTMENT

It is impossible to study the work of the Hays station and to observe the practical results of that work without being convinced that the station is an excellent investment for the public by which it is supported. Compared to the benefits it provides, its cost is negligible. In its more than 40 years of operation, it has vindicated certain simple but inexorable principles which must be adhered to if research work of the kind represented at the station is to produce reliable, practical results. It has shown clearly that when these principles govern, branch experiment stations are fully warranted rural institutions.

[3]Cole and Hallsted: U. S. Department of Agriculture bulletin 1094.