SCIENCE

VOL. 87 FRIDAY, JUNE 17, 1938 No. 2268

SCIENCE: A Weekly Journal devoted to the Advancement of Science, edited by J. MCKEEN CATTELL and published every Friday by

THE SCIENCE PRESS

New York City: Grand Central Terminal

Lancaster, Pa. Garrison, N. Y.

Annual Subscription, $6.00 Single Copies, 15 Cts.

SCIENCE is the official organ of the American Association for the Advancement of Science. Information regarding membership in the Association may be secured from the office of the permanent secretary in the Smithsonian Institution Building, Washington, D. C.

A HALF-CENTURY OF ACHIEVEMENT BY THE ILLINOIS AGRICULTURAL EXPERIMENT STATION[1]

By the late Dr. H. W. MUMFORD

DEAN OF THE COLLEGE OF AGRICULTURE AND DIRECTOR OF THE AGRICULTURAL EXPERIMENT STATION

THE responsibility for evaluating the work of the Illinois Agricultural Experiment Station for the period of half a century is a task from which any thoughtful person might well shrink, not because it is an unpleasant duty, but because adequate treatment of the subject is obviously impossible. The findings of the station over this period have been reported in painstaking detail in some thousands of printed pages. The human record is found in changed practices on the farms of the state and in a higher level of living than would otherwise have been possible. All I can do is to choose examples that will illustrate something of the underlying objectives and policies of the station and that will be suggestive of the scope and significance of its work.

[1] Abstract of address at the fiftieth anniversary of the Illinois Agricultural Experiment Station, March 25, 1938. Dr. Mumford died on May 14.

Starting with the establishment of the Morrow plots in 1876 and the initiation of the Soil Survey in 1902, the station, through an unbroken program of research, has accumulated a wealth of knowledge concerning the soils of Illinois, on the basis of which land-use programs can be intelligently planned and the land resources conserved as a continuing source of wealth.

The oldest experimental plots of their kind in the United States, the Morrow plots have stood as incontrovertible evidence of the tragedy of faulty soil management and the promise that is held out to the future in intelligent soil management. From 44 bushels of corn an acre in the early years of these plots, good methods of soil management have advanced yields to 66 bushels. On adjacent land, depleted by continuous cropping to corn year after year, the yields are now only 24 bushels, and they are still declining.

But after all the Morrow plots cover less than an

acre on the campus of this university, while the farm lands of the state total some 35 million acres. What do we know about them? To this question our Soil Survey started thirty-six years ago and our system of outlying soil experiment fields provide the answer. Of fifty-odd fields established from time to time since 1896, approximately half are now in operation. The long records from these fields furnish detailed guides to long-time profitable methods of cropping and soil management.

One of the earliest and most far-reaching moves toward a permanent soil fertility was the launching, about 1905, of the sweet-clover program—the growing of sweet clover to be plowed under as a green-manure crop. Almost no one, at the time this program was undertaken, recognized sweet clover as a useful crop for soil building, for feed, or for anything else. On many of the soils of the state sweet clover would not grow at first, and its usefulness seemed limited—until the cause was discovered in the acidity of the soil, a condition remedied by the simple method of applying ground limestone. So well have Illinois farmers learned this lesson that they now apply to their soils more than a million tons of limestone a year—one sixth of all the agricultural limestone used in the United States.

It is obvious from what I have just said that one of the great objectives[2] of this station is the conservation of the land resources of the state. This is basic. What may be said to be the other major objectives? As I view them there are five others:

1. *To reduce production and marketing costs* through the development of better grains, fruits, vegetables, dairy products and live stock, through more efficient methods of production and marketing, and through more effective methods of disease and insect control.

2. *To improve the quality of farm products,* thus benefiting the public and under normal economic conditions making better profits possible for the farmer.

3. *To help farmers adjust their production to demand* through better balanced production and orderly marketing.

4. *To broaden the market outlet for farm products,* which is done not only by finding new crops with new uses, and new uses for old crops, but is done also by following two of the objectives just mentioned—lowering costs and improving quality, thus enabling farmers to get their products on the market at prices and in forms that will stimulate broader consumption.

5. *To discover facts that will enable homemakers* to know better how to feed their families; that will enable farm families to know better how to utilize home-grown foods and, through a study of living expenditures, to know better how to use their incomes.

And through all these ways, and other ways, to contribute to a more satisfying country life—a desirable thing in itself and a stabilizing influence in public welfare.

Second only in importance to conserving land resources as a continuing source of wealth to the state is the first objective just listed:

Reducing the Costs of Production and Marketing

I believe it is true in farming, as Dr. Moulton, of the Brookings Institution, has pointed out that it is in industry, that "only by everlastingly improving technical processes and lowering the cost of production can we obtain higher standards of living. To try to accomplish this result in any other way simply means tugging in vain at our collective bootstraps."

The Illinois Station is pursuing investigations that should contribute to a better understanding of price shifts and changes and how to cope with them, but its major contribution has been—and I believe logically so—on the side of cost reduction, which benefits both farmers and consumers. Practices that assure good crop yields per unit of land, the intelligent selection and feeding of live stock, the selection of the right crop rotations, the control of destructive plant and animal diseases and insect pests, the economical use of machinery and men, soil-improvement practices—all are pointed toward keeping costs down.

Farm management studies have shown the sources of the leaks in the farm business, where the weak spots in the organization of a farm may be, and how to correct them. Fundamental studies in animal nutrition have shown how feeding standards can be altered so as to increase their effectiveness and reduce their cost.

Improving the Quality of Farm Products

To realize the progress that has been made in this field, we have only to remember the way in which the fluid milk supply and the great volume of milk products have been improved in quality and in safety in recent years, and of the increased availability of graded fruits, vegetables, meat and eggs. Notable among the investigations at this station that have contributed to the improvement of dairy products has been the work establishing the effectiveness of the pasteurizing process as a means of protecting consumers against undulant fever, diarrhea, bovine and avian tuberculosis, and other diseases that may be carried in milk and milk products.

More sanitary methods of feeding dairy cattle, the control of herd diseases, the proper cleansing of dairy utensils, and improved marketing methods have been

[2] This statement of objectives was first used in an exhibit of the Station's work prepared for the biennial visit of the Illinois General Assembly in May, 1933.

reflected in the vastly improved quality of the 5 million pounds of butter sold annually from Illinois farms and the 67 million pounds of creamery products.

The quality of Illinois' leading fruit crop—peaches—the value of which in some years reaches more than two million dollars, would be greatly improved, experiments show, by thinning the fruit later in the season than has been popularly supposed. An improved spray program for the control of codling moth, developed by the station in cooperation with the National History Survey, has not only greatly reduced the losses from this pest, estimated at a million dollars a year, but has greatly improved the quality of the crop marketed. Furthermore, these investigations are leading to the working out of an insecticide that will not leave an undesirable spray residue on the fruit, as may happen when arsenate of lead is used.

Swine-type studies extending over several years indicated the medium type of hog as most desirable. With Illinois farmers marketing more than fifty million dollars' worth of hogs annually, the significance of this information may be realized.

But what will it avail us to reduce costs and improve quality if the public does not want or can not buy our products? We come then to the problem of—

ADJUSTING PRODUCTION TO DEMAND

Some eleven years ago, in talking before a Farm and Home Week audience, I pointed to the urgent need to find some way of adjusting productive efficiency to the changing demand for agricultural products. In the face of dwindling demand for some of our major Midwest crops, we had increased the possibilities of production by developing new varieties, improving grains and live stock, finding better cultural methods, and learning better how to control diseases and insects. Surpluses were threatened which would depress prices to such an extent that production would no longer be profitable.

In order to work out ways and means of meeting this problem, a series of "agricultural adjustment conferences," one in each farming-type area of the state, was begun in October, 1928, by the College of Agriculture, through its Station and Extension Service, in cooperation with the farmers themselves. These conferences were continued annually until the inauguration of the federal adjustment program in 1933.

The Illinois plan was essentially a plan of education. It was clear, however, that education alone, and in a single state, would not then, nor will it now, solve the problem of adjusting agricultural production to demand. But the agitation of the question did more perhaps than anything else to impress upon farmers, and the general public as well, that some of the problems in agriculture could not be solved by individual farmers or even by individual states—adjustments on national and regional scales were obviously necessary.

So the station has been cooperating with the federal government and with neighboring states in efforts to determine desirable regional adjustments in agricultural production. Here in our own state we are fortunate in being able to draw upon the findings of the Soil Survey, on long-time farm-accounting studies, and on numerous other phases of our station work in bringing pertinent facts to bear on these adjustment problems. For agricultural adjustment is infinitely more than production control, which some have assumed it to be.

Although this station has always considered it one of its functions to explore the desirability of introducing new crops into our agricultural scheme to take the place of old-established crops for which demand has declined, the problem of finding and making such introductions was not brought into prominence until new conditions and new developments forced it into a major position. One result in Illinois has been a spectacular expansion of the soybean acreage and the development of the soybean industry.

Detailed cost account studies begun in 1912 and farm financial records and enterprise cost records started soon thereafter have furnished a wealth of data making possible a more intelligent analysis of the farm business from the standpoint both of the individual farm and the status of agriculture as a whole. Illinois is perhaps the only state that has carried on detailed cost records continuously for a quarter of a century.

Another significant step toward helping farmers put production on a better business basis was taken in 1925, with the inauguration of the Farm Bureau Farm Management Service. By 1930 approximately 800 farmers were enrolled in this service, all paying fees that largely financed the work. The accounts kept by these farmers, besides being of direct and immediate value to those enrolled, have furnished the basis for one of the best types of farm-management investigations yet undertaken.

To the extent that agricultural research agencies make significant contributions in the field of agricultural adjustment will they establish themselves more firmly in the confidence of farmers and the general public.

BROADENING MARKET OUTLETS

Discovering new uses for established crops or developing new crops with new uses is obviously a way to broaden market outlets for farm products, but outlets can also be broadened by lowering prices to consumers and processors and other users through the lowering of costs of production and by improving the quality of farm products and the way in which they are

marketed. The station must continue to devote its efforts to all these methods. The increasing of export trade and the buying power of the public at large are of course vital factors in this problem, but they must be dealt with by other agencies.

Enlarged research directed toward discovering new uses for farm products and by-products is the purpose for which the liberally financed regional laboratories provided for in the Agricultural Adjustment Act of 1938 will be established. The Federal Soybean Laboratory already located at this station is equipped to make notable contributions in this field, as will other laboratories in other fields and in other locations. The public must be patient, however, for the results of such research are slow in materializing, and it may be years before these efforts will result in substantial outlets for our major agricultural commodities. It is unfortunate perhaps that this is not the kind of quick-acting farm relief that stimulates public enthusiasm and sustained support.

Discovering Facts of Value to Homemakers

Research in the Department of Home Economics at Illinois was started early in its history. Expansion was made possible in 1925 with the passage of the Purnell Act. Recent investigations have been concerned with the vitamin value of certain foods, and with nutritional problems resulting from a lack of certain of these elements. The combined extension-station project for the development of home accounting and the determining of the levels of living enjoyed by farm families has attracted wide attention. A study just completed has resulted in the identification of 17 varieties of soybeans having superior qualities for table use.

Studies in rural architecture, in the electrification of the farm home, and in home equipment have not only stimulated the interest of farm people in the possibilities of adding attractiveness and convenience to their farm homes, but also have demonstrated with what economy this can be done.

Conclusion

In this brief sketch I have had to omit mention of lines of work and accomplishments just as comprehensive, just as significant, just as well done as those that I have cited for illustrative purposes. When I remind you that the last annual report of the station carried results from some 300 organized projects, you can see why only a bare outline can be given at a time like this.

I have not mentioned the names of my colleagues who have helped guide this work nor of the men and women who have produced these results. I can only say that the opportunity accorded me to help mold the situations in which members of this great research staff could do their work has been an honor and a privilege. Through the years, the staff has increased in experience and in academic maturity. There has developed a closer integration of departments and divisions for concerted attack on different phases of complicated problems. In late years a whole new group of workers has been organized into what is now known as the Department of Agricultural Economics.

I have said nothing of the excellent working relations established between farm people and the Experiment Station through the Extension Service, which is organized to carry the results of the station's research directly to rural people. I have said nothing of the vision of the state and national legislative bodies that have provided the funds making the work of this station possible.

I have refrained from anticipating the future of this organization. I have done this because I am confident that what the future is to be may safely be left to those whose responsibility it will be to guide its destinies. But of one thing we may be sure—with the growing complexities of agriculture the need for research will increase rather than diminish in the years ahead.

EARLY DAYS OF THE ILLINOIS AGRICULTURAL EXPERIMENT STATION[1]

By Dr. EUGENE DAVENPORT
DEAN EMERITUS OF THE COLLEGE OF AGRICULTURE

It is my privilege to speak of the early days of the Illinois Agricultural Experiment Station; others will speak of its achievements.

When I first knew the station it had been in existence but seven years and was operating on a budget of $15,000, all federal money. It had bought out the College of Agriculture; that is to say, all the agricultural equipment of the university belonged to the station, instruction had been abandoned except for a "winter school," and the main farm was rented. Last year's budget for research in agriculture amounted to something over a half million dollars alongside a third

[1] Abstract of an address by Dr. Eugene Davenport, dean emeritus, College of Agriculture, University of Illinois, at the fiftieth anniversary of the Illinois Agricultural Experiment Station, March 25, 1938.