

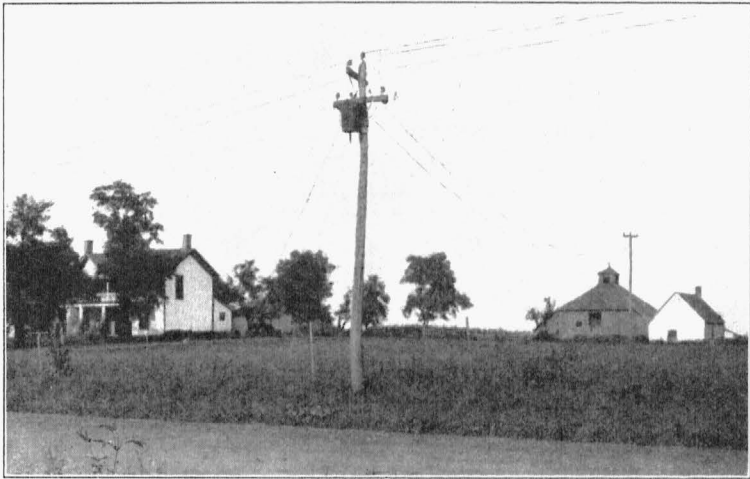
UNIVERSITY OF MISSOURI

COLLEGE OF AGRICULTURE

AGRICULTURAL EXPERIMENT STATION

CIRCULAR 165

The Relation of Electricity to Missouri Agriculture



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ELECTRICITY TO AGRICULTURE

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The Relation of Electricity to Missouri Agriculture

R. R. PARKS AND J. C. WOOLEY

SOME CONDITIONS AFFECTING MISSOURI AGRICULTURE

The Missouri farmer is experiencing the effect of unsteady markets, expensive machinery, seasonal field operations, and in most cases he does not have the modern living conditions which the man in the city considers necessary.

Many different organizations are attempting to solve these problems. "Farm Legislation" is being presented as a way out. Education of the farmer in the business of farming is another plan. Research, dealing with these problems in an effort to find better methods and practices, also offers a solution.

Agricultural Engineering is concerned with power, machinery, materials and labor, all of which affect the present-day problems. The power problem is of great importance because cheap and efficient power reduces hand labor, and may make less efficient machinery and more expensive materials usable. Economical power makes it feasible for the farmer and his family to have all the comforts which he could secure in the city.

Present Use of Electricity in Missouri.—According to the 1925 United States Census, there are 260,473 farms in the state of Missouri, of which only 67% are being operated by owners. According to the Missouri Committee on Public Utility Information, there are 1090 pole miles of rural lines in the state serving an average of 3.5 customers per mile and 2.2 customers per transformer. From these reports, 1.5% of our farm population is receiving electric service, yet the distribution lines are well scattered over the state. From numerous surveys, it is estimated that the

average energy consumption per customer is much below 30 kilowatt-hours per month, which figure makes it very difficult for any company to apply a satisfactory rate schedule.

A National Problem.—Electricity is the universal power for industry. It has made possible the marvelous development in manufacturing in this country. Agriculture uses power in all its processes. Can electricity be adapted to its needs and at a cost that will bring a profit to the producer of current and to the farmer who uses it? To determine the facts, a national committee was organized to study the relation of electricity to agriculture. This committee has encouraged organizations in each of the states to study their own local problems.

The Missouri Committee on the Relation of Electricity to Agriculture.—Realizing the importance of securing the facts in regard to the use of electricity in Missouri agriculture, Dean F. B. Mumford of the College of Agriculture called a meeting of representatives of the power and light companies, and of the departments concerned at the College to formulate ways and means of carrying on these studies. This group met on January 12, 1927, and agreed on the following:

1. That experimental data on the use of electricity in agriculture would be of great value to agriculture as well as to the utility companies,
2. That the proper place to make these studies is in the Experiment Station Organization of the State College of Agriculture,
3. That this work should be under the direction of the Agricultural Engineering Department,
4. That a full time man should be employed to carry on the work, and
5. That a large advisory committee representing all phases of the problem be selected, and that a working committee be selected from this group.

Experimental Line.—In accordance with standard practices in other state projects, it was considered advisable to form an experimental line near Columbia for the purpose of making studies relative to our problem. A line committee was appointed, two from the utilities and one from the College, to find a suitable location for carrying on our work. A proposed line near McCredie was selected as a desirable one. This line has not been constructed to date.

Electro-Test Farms.—After some five months delay on the test line, it was decided by the committee that we should establish test farms on different properties of the utility companies in the state for securing such data as we deemed necessary for our problem. These farms should be receiving electric service, be representative of the surrounding community, and be using electricity for some power purpose. It was thought that such a chain of farms would not only give the surrounding communities an opportunity to observe electricity in service, but would also give the power companies supplying them an opportunity to observe the farmers' needs and to make what adjustments they deem necessary in their service or method of charging for it.

No one can predict the success of electricity in Missouri agriculture until he has seen it on the farms of representative farmers in the state and has seen it in operation not only for lighting but for power purposes. That is the season for our Electro-Test farms in the state, and until they can show that electricity is a desirable type of power for the Missouri farmer, and that he can use it in sufficient quantities to make the business profitable to both himself and the company serving him, all opinions should be withheld.

Each of our Electro-Test farms is now doing some operation with electricity outside the farm home such as pumping water, milking cows, grinding feed, or using "chore" motors.

Cooperating Farmers

J. C. Hardesty, Weston
Joseph Flashpohler, Glasgow
Aubrey Fellows, Salisbury
W. H. Wehrs, Sweet Springs

W. H. Huston, Burlington Junction

Edwin Jones, St. Joseph
O. R. Jennings, Trenton
H. V. Carson, Boonville
W. H. Weneir, St. Charles
August Finck, St. Charles
Emil Finck, St. Charles
Mrs. Wm. Nolle, St. Charles
David Peterin, Hematite

W. W. Riggs, Columbia
J. E. Bedford, Columbia
George Hudson, Columbia

Servicing Companies

Missouri Gas & Electric Service
Kansas City Power & Light
Maryville Electric Light & Power
United Utilities
Trenton Gas & Electric
Missouri Power & Light
Union Electric Light & Power
Columbia (Municipal) Water and Light

Facts Are Needed.—However desirable rural electrification may seem to the dreamer, the farmer wants facts and demon-

strations of the uses of electricity in his business. He wants to know what it can do, and what it cannot do; what it will cost him; what equipment will be necessary; and, under good management, what return on his money he can reasonably expect. The thoughtful farmer clearly realizes that facts are necessary if he is to save expense and time. The individual cannot afford to experiment, yet reliable information is needed.

Here are a few of the questions presenting themselves to the Missouri farmer wishing to use his electric service for other than lighting:

What will it cost to pump water with electricity? What size motor should I get? What system is good?

I want to grind ear corn: should I buy a 10 or 15 H. P. motor? Can the power company reduce its service charge?

Can I grind at home as cheaply as I can get it done at the mill? What system should I use?

Is lighting poultry for winter egg production a paying practice? Who is doing it?

Can electricity be used to heat water? Is it practical?

What about milking machines for a herd of 15 cows? What will it cost to operate one? Will they save me any time? Do they increase milk flow?

I have too much of a crew around at silo filling time, can my cutter be handled with a 5 H. P. motor like they say it can?

Will electricity permit me to rearrange my work so I can get along with less man labor?

The farmer who does not have electric service asks: If I am to get electric service at a reasonable cost and a profit to my business, what use must I make of it? Will it save my family any work about home? Will it make the boys any more contented on the farm?

RURAL ELECTRIFICATION RESEARCH IN MISSOURI

There is need for the study of many problems in connection with rural electric service in Missouri. A large amount of research is being done at other state institutions in the United States. It is not the intention of our committee to duplicate experiments being carried on at other institutions except to check their results for Missouri conditions. It is our intention to be able to supply in-

formation of a general nature on our subject at all times and to work to conclusive ends on a few selected problems.

Outline of Work

- Project No. 1. The Milking Machine on the Dairy Farm.
- Project No. 2. Methods and Costs of Grinding Feed.
- Project No. 3. Farm Household Refrigeration.
- Project No. 4. Farm Home Cooking.*
- Project No. 5. Electricity as Related to Plant Growth.
- Project No. 6. Electric Service from Small Gas-Electric Plants.
- Project No. 7. Field Applications of Electric Power.
- Project No. 8. Farm Elevators and Hoists.
- Project No. 9. Poultry House Lighting for Winter Egg Production.
- Project No. 10. Special Uses of Electricity in Agriculture.
- Project No. 11. The Economic Effect of Electricity in Agriculture.*

RURAL ELECTRIC SERVICE A PROBLEM

Electric service companies in Missouri are beginning to handle a very perplexing problem. Rural service lines are not essentially different in construction from urban lines; any central station man can estimate the cost of servicing a rural line without difficulty. It is only when a rate schedule is applied that any difficulty is experienced. In servicing rural customers, it is necessary to build and maintain more miles of pole line than for the urban customer. Consequently, if it is attempted to place a city rate schedule on a farmer, the power company supplying him cannot secure enough revenue to make the business profitable.

There are three plans now being used to cover the added expense which the service company assumes in continuing its rural business:

1. Making the unit charge higher than that in the town;
2. Making a service charge, or excess charge, to cover the carrying cost of the excess investment, then a low energy charge in one or more steps; or
3. Making a high minimum bill, or a monthly guarantee.

In order to make rural electrification a success, one or a combination of these methods must be employed. A contract which is

*Not under way to date.

not profitable for all parties concerned is certainly undesirable and should not exist. In order for the power company to profit from its rural business, it must sell small quantities at a high unit charge, or large quantities at a low unit charge. For present conditions, the rest is left to the rural customer. Can he make sufficient use of electricity in his business to make it profitable for a power company to build a "High Line" to his farm?

A favorite example of the writer's is: "If I were servicing John Doe, two miles out of town, with electric energy, I could make more profit out of selling him 100 kilowatt-hours at 8c a KWH than I could by selling him 25 kilowatt-hours at 20c a KWH."

The following figures are estimates for average farming conditions and represent the averages of electric energy used each month in the various operations. Keeping in mind the illustrations just given, check down the list and see the relation of "Electric Service" to "Lights."

Monthly Averages:

1. Lighting the house and using small appliances....	20	KWH
2. Lighting the barn	8	"
3. Milking 15 cows	45	"
4. Pumping 5000 gal. water	8	"
5. Shelling and grinding 3000 lbs. corn	25	"
6. Operating a refrigerator	50	"
7. Operating a range	150	"
8. Poultry lighting, cream separating, grinding tools, etc.	10	"

316 KWH

Missouri Public Utilities Interested.—The public utility companies of Missouri are interested in the coming of this new business because the Missouri farmer is beginning to realize the advantages of electric service.

There are many problems connected with rural electric service which it is necessary to understand before satisfaction can result. The most important among them are: How to get the most out of present equipment, and How to apply power to operations which are as yet comparatively new. With this in mind, the Missouri

Association of Public Utilities, composed of the following members, is financing the Missouri Project on Rural Electrification Research through the College of Agriculture.

Kansas City Power & Light Company	Kansas City
Laclede Gas & Electric Company	St. Louis
Union Electric Light & Power Company	St. Louis
Empire District Electric Company	Joplin
City Light & Traction Company	Sedalia
St. Joseph Railway, Light, Heat & Power Company	St. Joseph
Missouri Power & Light Company	Kansas City
Missouri Utilities Company	St. Louis
Missouri Gas & Electric Service Company	Lexington
Springfield Gas & Electric Company	Springfield
Ozark Utility Company	Bolivar
West Missouri Power Company	Pleasant Hill
East Missouri Power Company	Troy
Trenton Gas & Electric Company	Trenton
Arkansas-Missouri Utilities	Caruthersville
United Utilities Corporation	Oregon
Missouri General Utilities Company	Rolla
Maryville Electric Light & Power Company	Maryville
Western Public Service Company	Tarkio
Gasconade Power Company	Gasconade

Manufacturers Interested.—We have attempted to point out in this publication that rural electrification cannot succeed without the combined cooperation of the electric service company, the farmer, and the manufacturer of equipment. Rural electric service means more than just building a service line to the customer's farm. Making electricity pay its way means more than just using it for lighting alone; and, in order for either to do its part, the manufacturer has to furnish equipment with which the farmer can make electricity do the tasks which he wants it to do. Knowing that their cooperation in such a big problem is necessary and that success to one means success to all, the following companies are assisting the Missouri Committee in its work.

The Brown Manufacturing Company	Chicago
Century Electric Company	St. Louis
Commercial Electrical Supply Company	St. Louis
Copeland Products Company	Detroit

Decatur Pump Company	Decatur, Illinois
Deming Pump Company	Beatrice, Nebraska
Louden Barn Equipment Company	Chicago
Mundie Manufacturing Company	Peru, Illinois
Pine Tree Milking Machine Company	Chicago
Prater Pulverizer Company	Chicago
Taylor Instruments Company	Rochester
Tork Company	New York
Dempster Manufacturing Company	Beatrice, Nebraska
Fairbanks, Morse and Company	St. Louis
Federal Electric Company	Chicago
Frigidaire Corporation	Dayton, Ohio
General Electric Company	Schenectady, New York
Iowa Gate Company	Cedar Falls, Iowa
Sangamo Electric Company	Springfield, Illinois
Universal Milking Machine Company	Waukesha, Wisconsin
Wagner Electric Company	St. Louis
Wesco Electrical Supply Company	St. Louis
Westinghouse Electric & Manufacturing Company	St. Louis

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American Farm Bureau Federation

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The National Grange

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National Association of Equipment Manufacturers

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Individual Plant Manufacturers

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R. A. LUNDQUIST

United States Department of Interior

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