

AGRICULTURAL ENGINEERING - 1925
SUB-PROJECT - V - RURAL ELECTRIFICATION

#5438

PROJECT STATEMENT.

NAME OF PROJECT The Utilization of Electricity in Agriculture.

DEPARTMENT: Agricultural Engineering.

NUMBER OF PROJECT: No. 6.

PROBABLE DURATION: Two to Five years

IN CHARGE OF PROJECT: Chas. E. Seitz, Prof. Agricultural Engineering, V.P.I.

FIELD INVESTIGATIONS: J.A. Waller, Jr., Asst. Prof. Agricultural Engineering,
V.P.I.

ASSISTANTS: Graduate Students.

IMPORTANCE: This is a problem of state wide interest and importance. The constantly increasing shortage of farm labor has made it imperative that the farmer adopt labor-saving devices and practices if he is to make a success of his farming operations. Many farmers and others familiar with the subject believe that electricity offers a means of solving many of the farmers' labor and power problems, and everyone admits that electricity in the home will be a boon to the farm housewife and will be an important factor in improving living conditions on the farm.

There are certain difficulties, however, that at present prevent the general application of electricity to agriculture, but it is believed that by an intelligent study of the whole problem, many of these difficulties can be removed. Investigations of the economic use of electricity on the farm should precede the establishment and use of electrical equipment, in order to insure maximum results at a minimum cost.

There is little difference between the urban and rural electric service, except for the greater amount of distributing system necessary to serve the same number of rural customers. A mile of urban distribution line ordinarily serves from 30 to 100 or more customers, while a mile of rural line seldom serves more than three or four customers. At the present time, the farmer customer, as a general rule, uses very little more kilowatt hours of electricity than the urban customer. It is therefore clearly evident that it is necessary to charge the farmer considerably more for this service than the city user. In fact, the rural business, as a rule, has not been profitable to the power companies.

If the consumption of electricity on the farm could be materially increased, it could, in most cases, be done with only a comparatively small increase in the fixed cost, and the power company would be able to sell the larger amount of energy to the farmer at a very much reduced cost per kilowatt hour than when only a small amount of energy is sold, and in this way make it profitable, both to the farmer and to the power company.

IMPORTANCE: (Continued)

A request for this investigation has come from farmers, farmers' organizations, electrical power companies and from both the National and State Committees on the Relation of Electricity to Agriculture.

OBJECT: To determine the optimum economic uses of electricity in agriculture; To study the value of electricity in lowering the cost of agricultural production, and improving living conditions on the farm; To find practical means and methods of supplying the Virginia farmers with central station electrical service.

The problem resolves itself into two main divisions:

1. What is the best way to supply electricity to farmers, and what is involved in so doing?
2. How can the service be utilized by farmers so that it will be profitable to them?

In order to solve these problems, it is necessary that a thorough and systematic study be made of the application of electricity to agriculture. Such a study will be divided as follows:

SUB-PROJECT - I - A field study to determine the optimum and economic uses of electricity in agriculture, having as objectives the following considerations:

- (a) What field operations can be performed by electric power?
- (b) What operations on the farmstead can be performed by electrical power?
- (c) What industrial operations can be performed with profit on the farm?
- (d) What operations in the farm home can be performed by electrical power?
- (e) What other uses may be made of electrical energy that will increase the production on the farm?
- (f) What should be the arrangement of equipment on the farm and in the home that electrical power may be used economically to perform the above various operations and to develop machinery and equipment to carry out these operations?

SUB-PROJECT - II - A general survey of the present available sources of electric power, covering its application to agriculture, its geographical distribution, etc.:

- (a) What are the methods of supplying electric service to rural customers?
- (b) What are the costs of supplying electric service to rural consumers?

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(c) To what extent is electricity now being used, and for what purposes, on the farms? of the State?

SUB-PROJECT

- III -

A farm power survey for the purpose of finding out the power requirements for each distinct type of agriculture in the State, such as:

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| (a) Dairy Farming, | (e) Truck Farming, |
| (b) Beef Cattle Farming | (f) Tobacco Farming, |
| (c) General Farming, | (g) Poultry Farming. |
| (d) Fruit Farming, | |

METHOD OF
PROCEDURE:

The method of procedure under Sub-Project - I - will be to conduct definite experiments and studies at the college station and in the field.

At the College Station:

The Department of Agricultural Engineering will make investigations of certain problems that are turned in to the department by the field man and that can be handled to better advantage at the college than in the field.

In the Field:

Farms will be selected in communities of the State representing the distinct types of agriculture, and which offer the best possibilities for making the field studies. Communities will be selected where rural electric lines are already established and one or more communities where new rural electrical lines will be constructed. The cost of construction, maintenance, operation, and cost of energy, as supplied, will be determined by the power company supplying the service, and this data made available to the Department of Agricultural Engineering. Other data, such as maximum demand, the load, factor, power factor, distribution of load, etc., will be determined by the co-operation of the Department of Agricultural Engineering and the power company.

The Department of Agricultural Engineering will make a survey and prepare plans of the farmsteads and buildings on the farms selected for the studies, as well as make a farm power survey. A farm management survey will be made by farm management specialists. From these surveys can be determined what operations on the farm will be electrified and what equipment should be secured and installed. Records will be kept of each individual piece of equipment as to amount of work done and current consumed, together with the condition of operation, so that the value of this equipment can be accurately determined and the conditions required for the most efficient operation set forth.

The Department of Agricultural Engineering will secure data on the cost of present sources of farm powers and upon the labor required for carrying out the operations on the farms that are to be electrified. This study will be continued after the farms are electrified, in order to show the cost of electric power as compared with other power. The farmer will be required to keep certain labor records,

but most of the data will be secured by the field man who will be right on the job to keep records of all operations, advise the farmer on the installations, etc. This department will conduct all experimental work, keep all records secured from the project, and formulate the results of the work for publication.

An attempt will be made to use electricity for all power purposes on the farm, and to develop new uses and new equipment for the old operations and for the new operations, in order to determine the optimum economic uses of electricity on the farm.

The method of procedure under Sub-Project - II - will be to get a list of all farm consumers and the amount of electricity used from central station power companies, and such other data as the number of farmers to the mile of line, type of contract, rates, etc. will be secured from these companies. A list of all isolated plant owners, both gas engine and water power, will be secured. A questionnaire, dealing with the principal items on which information is wanted will be sent to all these users of electricity.

The method of procedure under Sub-Project # III - will be to use the data gotten from the National Farm Power Survey, recently made by the U.S. Department of Agriculture, supplementing this data by more specific studies to be made by the Department of Agricultural Engineering in certain sections of Virginia.

ORGANIZATION
AND
CO-OPERATION:

The Department of Agricultural Engineering of the Virginia Polytechnic Institute will conduct the experiments and research studies necessary. The Virginia State Committee on the Relation of Electricity to Agriculture will act as an advisory and co-ordinating body for this work. The co-operation of other departments of the College, Extension Division and Experiment Stations and other interested agencies will be solicited.

SOURCES OF
MAINTENANCE:

The general supervision of these investigations, laboratory and office facilities will be provided by the Department of Agricultural Engineering. Traveling and sustenance expenses for the field force and such other expenses and help that may become necessary will be provided by the special fund raised by the Virginia State Committee on the Relation of Electricity to Agriculture, and given to the Virginia Polytechnic Institute, for the purpose of conducting these investigations. The amount of the fund already pledged for the first year's work is \$4500.00, with the probability of a considerable addition to this amount.