ELECTRICITY on MAINE FARMS

A Study Authorized by the Maine Federation of Agricultural Associations

PREPARED BY
Charles H. Merchant, Ph. D.

FEDERATION COMMITTEE ON RURAL ELECTRIFICATION
Edgar B. Lord — Charles H. Merchant
Leon S. Merrill — F. P. Washburn

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INTRODUCTION

There is an increasing demand from farmers in all parts of Maine for information on the possibilities and limitations of the use of electricity on farms. The Maine Federation of Agricultural Associations, in recognizing the importance of this fact, appointed a committee to make a study of the present situation. This committee has accordingly made an analysis of the problem and wishes to present the following report.

The rural electrification problem in its broadest aspect is to find profitable uses for electricity on our farms which will warrant the consumption of a sufficient volume of current to justify the service at a rate per kilowatt hour that the farmers are willing to pay and the power companies willing to accept. It is at once apparent that this is a two-fold problem, requiring the full cooperation of agricultural interests and the power companies serving the State.

The cost of generating electricity is only a fraction of the cost of delivering the current to the farms. The cost of building rural lines ranges from about $800 to $2,000 per mile. This necessary expenditure in line construction immediately involves a relatively high fixed charge to be pro-rated on the number of kilowatt hours consumed. It would appear obvious, therefore, that in the final analysis a low rate for electrical energy on the farm depends primarily on a relatively large amount of current consumed. How can farmers profitably use a large number of kilowatt hours? This question cannot be answered without a careful and thorough analysis of the farmers' production problems.

Agricultural production today is highly competitive. Neighboring farmers in Maine compete not only with each other but with producers scattered throughout the United States and, in fact, all over the world. Improvements in transportation, communication and knowledge of agricultural production have been largely responsible for this change in our economic system. In the future, competition will be even keener than at present.

Economic studies have shown conclusively that the better paying farms are those having relatively large size businesses, good production rates for both crops and animals, good farm balances and are operated by efficient and progressive farmers.

Much machinery and equipment are found on these better paying farms and no one questions the advisability of their use.

What equipment can be most economically run by electricity? Obviously, the question of the cost of electrical energy must be taken into consideration. The consumption of current for lighting alone is not sufficient to induce power companies to make rural extensions except at high rates. It would seem necessary, therefore, to put electricity to work on our farms and in our homes in order to enjoy relatively low rates for current. What are the uses, then, of electricity on farms for operating farm equipment and for removing household drudgery? Further, what uses are Maine farmers making of electricity where they have the service? A thorough discussion of these questions will be given in an attempt to state the facts and indicate the major principles involved in rural electrification.

FARM USES OF ELECTRICITY

It would seem sufficient to merely give a partial list of the various farm and household uses of electricity, which should indicate at least the possibilities of this form of energy on Maine farms.

Air Compressor
Air Heating, Radiant Heater
Babcock Milk Tester
Band Saw in Farm Shop
Battery Charger
Bone Grinding
Bottle Capping
Bottle Washing
Bottling Milk
Brooding Chicks
Churning
Cider Press
Clothes Drying
Coffee Grinding
Coffee Percolating
Concrete Mixing
Cow Clipper
Cream Separator
Cutting Green Feed for Poultry
Dairy Equipment Sterilizer
Dishwashing
Drill Press
Ironing
Lighting Farm Premises
Lighting for Egg Production
Lighting for Insect Control
Meat Grinding, Household
Milk Cooling
Milking
Milk Stirrer
Motor-driven Pasteurizer
Oat Hulling
Oat Sprouting
Portable Drill
Portable Motor
Potato Cutting and Grading
Poultry House Ventilation
Radio
Range
Refrigeration for Household
Refrigeration for Milk
Root Cutting
Sausage Grinding
Sawing Lumber

Egg Candling
Electric Fan
Electric Oven
Ensilage Cutting
Feed Mixing
Floor Waxing and Polishing
Fruit Grading
Grindstone
Heating Pad
Heating Poultry Mash
Honey Extractor
Ice Cream Freezer
Immersion Heater
Incubating Chicks
Sewing Machine
Sheep Shearing
Soldering
Threshing
Toaster
Tool Grinding
Ultra-Violet Light
Vacuum Cleaner
Waffle Iron
Washing
Water Heating for the Household
Water Pumping
Wood Sawing

ENERGY REQUIREMENTS

After one becomes acquainted with the uses of electricity it is important to know the energy requirements of the various appliances. Considerable information has been made available on this subject by the Committee on the Relation of Electricity to Agriculture. (Volume IV. Number 1. "Electricity on the Farm and in Rural Communities.") It is from this publication that much of the information for this part of the report is taken.

It would seem advisable to mention the energy requirements for only the more important electrical appliances adapted to Maine conditions. Consideration will be given first to household equipment, followed by farm power requirements.

Cooking

The average monthly consumption of energy on experimental projects where all the cooking is done electrically was 35 kilowatt hours per person. This consumption may be a little high as some of the current was donated to the cooperators. Two power companies in Wisconsin estimate the consumption of one kilowatt hour per person per day where all the cooking is done electrically and where the family consists of four to seven members.

Where combination ranges were used the energy requirement was about one-half that of electric ranges, averaging 17.7 kilowatt hours per person per month. An average of 20 to 25 kilowatt hours are consumed when the range is used only for baking.

It should be mentioned here that the energy requirements are usually in proportion to the experience of the operator.

Further, that the consumption per person decreases as the size of the family increases.

Washing Machines

Washing clothes is generally considered one of the unpleasant and laborious duties of the home maker. For this reason, the washing machine is generally one of the first pieces of electrical household equipment purchased. It saves both time and labor of the home maker. What is the energy requirement of the newer type washers, or in other words what is the cost? It is approximately two kilowatt hours per family of six per month. Stated in another way, it requires about 1.5 kilowatt hours to wash 100 lbs. of clothes.

Data from Illinois give the following interesting comparison: "In 1½ hours the average home maker can do with an electric washer what it would take her 3 hours to do with a hand washer or 5 hours with a washboard (neglecting entirely the much more strenuous character of the work in the latter cases)."*

Electric Hand Iron

The electric hand iron is the most popular electrical equipment of the farm. The average consumption is about 5.5 kilowatt hours for a family of five per month. However, there are rather large variations among families, ranging from a monthly average of 2.6 kilowatt hours to 7.3 kilowatt hours.

From experiments which have been conducted the electric iron saves the home maker about 3 hours of strenuous work per month when compared with using sad irons.

Household Refrigeration

The household refrigerator is becoming popular among farm users of electricity. In spite of the high price of this equipment over 50 per cent of the farms on several rural lines have installed electric household refrigerators. There is considerable variation in the energy consumption of this equipment. The more important factors affecting the amount of current consumed are the following: size of the refrigerated space, temperature maintained in the cooling compartment, temperature of outside atmosphere, insulation of the refrigerator, the amount of hot food placed in the refrigerator to cool, and the frequency with which the refrigerator door is opened.

* C. R. E. A. Bulletin. Volume IV. Number 1. "Electricity on the Farm and in Rural Communities."

The average monthly consumption of 47 electric refrigerators on rural test lines in eleven different states was 46.0 kilowatt hours.

Milking Machines

There are two general types of electric milking machines. One is the portable or pipeless which consumes on an average 13.7 kilowatt hours per month for 10 cows; and the other, the pipe line, with an average consumption of approximately 29 kilowatt hours per month for 10 cows. New type machines are requiring less energy and are easier to wash and keep clean. The Committee on the Relation of Electricity to Agriculture in their Bulletin on Electricity on the Farm made the following statement in regard to time test with milking machines:

> "According to some Minnesota tests, pipe line machines reduced the milking time, counting the labor of caring for the machine, by 35 to 38 per cent.
>
> "Indiana studies show that the time for hand milking without the care of equipment ranged from 13.5 to 17.6 man-minutes per cow per day. With machine milking, the time, including care of the milking machine, ranged from 8 to 9 man-minutes per cow per day. Indiana further reports that the use of a portable milking machine reduced the milking time by 41 per cent in one herd, while a pipe line machine reduced the time 45 per cent in another herd.
>
> "According to the work done in Illinois, it may not pay to use a milking machine on a bunch of strippers, but in a herd of ten good average cows it was found to reduce the milking, counting the labor required to care for the machine, by about 57 per cent—1.5 man-hours per day instead of the 3.47 man-hours formerly required."

Cream Separators

Cream Separators are important equipment on many dairy farms. Electrically driven separators of ordinary farm size are equipped with motors of $\frac{1}{8}$ to $\frac{1}{4}$ H. P. The smaller size will separate up to 1,000 lbs. of milk per hour; the larger size, up to 1,400 lbs. per hour, depending upon the kind and design of the separator.

The average energy requirement is approximately 2 to 2.5 kilowatt hours per month for 10 cows where all milk is separated. Dairymen using separators driven by electricity fully appreciate the uniform speed with which the machine runs and the uniformity of the quality of cream produced.

Ensilage Cutters

Silo filling is one of the heavy duty jobs on many dairy farms. The energy requirement per ton of fodder put into the silo is very variable, ranging from about .5 kilowatt hours to nearly 4.0 kilowatt hours depending on the conditions and methods of operation. Under efficient methods and favorable conditions the energy consumption should not be over 1 kilowatt hour per ton to fill a silo of 30 feet or less in height.

There are several factors which affect the energy requirements of ensilage cutters. The more important of these are: the speed of the cutter, sharpness of the knives, the clearance between the housing and fan blades of the machine, the kind of fodder ensilaged and the condition it is in, height of the silo, size of the delivery pipe on the cutter and the make of the cutter.

The results of tests conducted at Wisconsin, New York and Minnesota were published in the bulletin on "Electricity on the Farm and in Rural Communities", by the Committee on the Relation of Electricity to Agriculture. The findings are of such significance to warrant quoting here in detail. They are as follows:

> "The first of these series of tests was conducted at the University of Wisconsin. It was shown that the speed of elevating fans is often excessive; the clearance between the fan and the housing should be less than one-fourth inch; small delivery pipes are not efficient, and under ideal conditions a 30-foot silo could be filled with a 5 H. P. motor. This year 35-foot silos were filled with a 5 H. P. motor operating cutters with 13 and 15-inch throats, the corn being cut into one-half inch lengths.
>
> "In the second series of tests, New York confirmed the possibilities of the 5 H. P. motor for filling silos up to 30 feet in height with a cutter having a 13" throat, under New York farm conditions, one man feeding the cutter and the bundles being lapped one-third. One hundred and fifty tons of silage were ensiled at the rate of 8 tons per hour (actual cutting time) with an average demand of 7.02 H. P. The corn was cut into one inch lengths and the knives were sharpened at least once daily.
>
> "The third series of tests was conducted in Minnesota. A 27-foot silo was filled with a machine having a 13" throat at the rate of 8 tons per hour (actual cutting time) with an energy consumption of about .5 kilowatt hours per ton, the ensilage being cut into one-half inch lengths, sharp knives being put on the machine every half day. However, a most significant result of these tests was the discovery

that if the rate of feeding does not exceed 8 tons per hour, machines with 15 and 16-inch throats also can be operated successfully with 5 H. P. and probably with greater efficiencies than machines with smaller throats. In Minnesota, as is the general practice in the Middle West, no extra man feeds the cutter, the man on the wagon throwing the bundles directly on to the cutter apron. Since a 15 or 16 inch machine will increase the ease of feeding this finding represents a point of considerable importance. Furthermore, the capacity of the machine under average conditions will be around 8 tons per hour as compared to 6 or less for a cutter with a 13" throat, according to tests in New York (wagon feeding)."

Sawing Wood

Sawing wood is an important job in the spring on many Maine farms. This operation ordinarily requires the use of a combustion engine or electric motor for power. The motor furnishes reliable and dependable power at all temperature conditions. The energy requirement for sawing wood is very variable, depending largely upon the size and condition of the wood, and the length in which it is cut. The average consumption ranges from about 1 kilowatt hour to approximately 6.0 kilowatt hours per cord of wood.

Incubators and Brooders

It is impossible to state definitely the energy requirements of incubators and brooders due to extreme variations in size of equipment and varying conditions under which they are operated. It is significant to note that there is a very marked decrease in the consumption of energy per unit (100 eggs or chicks) with large type machines. Electrically controlled incubators and brooders are being used by a large number of poultrymen. This would seem to indicate that this type of equipment is proving satisfactory both from the standpoint of efficiency and the cost of operation.

Hay Hoisting

The energy consumption in hoisting hay varies with the type of hoist and the conditions of hoisting, ranging from .1 kilowatt hour to .7 kilowatt hour per ton. The annual consumption of energy is low, often averaging less than 10 kilowatt hours per season. A 5 H. P. motor should handle the job with ease under any conditions. Two and three H. P. motors have proven satisfactory under ordinary farm conditions.

APPLICATION OF ELECTRICITY ON MAINE FARMS

The uses of electricity on the farm and the energy requirements for a few of the more popular appliances have been mentioned. Our next step will be to give a brief summary of the applications of electricity on Maine farms.

In order to obtain information from a representative sample of farm users of electricity a mail questionnaire was sent to 254 Maine farmers using electricity supplied by power companies. Eighty replies were received.

These 80 farmers were served by 12 different power companies. Fifty-one per cent of the farms were located on main lines between cities or villages while 49 per cent were on rural extensions of various length.

The farms reporting averaged 195 acres per farm, of which 39 acres were in cultivated crops in 1928. These farms had on an average 16 cows, 3 horses, 36 sheep and 326 hens per farm. Twenty-five farmers reported one tractor each, and two farmers two each. Thirty-three farmers had one or more small gas engines. It is significant to note that these farms are larger in every respect than the average Maine farm. Further, it should be stated that these farms are among the more efficiently operated and better paying farms of the state.

The cost of wiring farm premises is a very important factor in electrifying Maine farms and homes. In fact, the cost is burdensome and often prohibitive for many of our farmers, especially among those operating small farm businesses. The serious problem here is one of efficient production and not so much one of cost of wiring farm premises. The cost of wiring varies widely, depending largely upon the number of outlets and the fixtures installed. The average cost of wiring farm premises on the 65 farms reporting was $250 per farm. The lowest cost was $70 and the highest amounted to $1,000. In Table 1 is shown the average number of outlets for each building based upon the number of farmers reporting this information.

TABLE 1
Average Number of Outlets per Farm

Building	*Average No. of Outlets per Farm*
House	26.4
Barn	12.9
Garage	2.0
Silo	1.1
Yard	2.0
Hen house	5.8
Other buildings	6.1

Running water in the farm buildings is fast becoming one of the modern improvements on Maine farms. Forty-five farmers reported having electric water systems in their houses, 40 in their barns and 12 in other buildings. There are many farmers having gravity water systems while many others have not yet replaced small engines with motors.

As previously stated, rural electrification means putting electricity to work on the farm and in the home. In Table 2 is shown the uses of electricity in the home in addition to lighting purposes.

TABLE 2
Household Appliances

Kind	*No.*	*Kind*	*No.*
Iron	73	Ice Box and Refrigerator	7
Washing Machine	58	Hot Water Heater	3
Vacuum Cleaner	36	Mangle	3
Toaster	13	Corn Popper	3
Stove	11	Hot Plate	3
Heater	11	Battery Charger	2
Radio	8	Fan	2
Percolator	8	Broiler	1
Curling Iron	5	Griddle	1
Sewing Machine	4	Soldering Iron	1

There were 54 farmers using 129 motors. This gives an average of 2.4 motors per farm. The size of motors used on these farms ranged from $\frac{1}{8}$ H. P. to 10 H. P. The most common size motor was that of $\frac{1}{4}$ H. P. The number of motors of various sizes is shown in Table 3.

TABLE 3

Number of Motors of Various Sizes

Horse Power	*Number*	*Per Cent of Total*
$\frac{1}{8}$	10	7.75
$\frac{1}{6}$	9	6.97
$\frac{1}{5}$	1	.78
$\frac{1}{4}$	41	31.77
$\frac{1}{3}$	1	.78
$\frac{1}{2}$	19	14.72
$\frac{3}{4}$	8	6.20
1	14	10.85
$1\frac{1}{2}$	7	5.43
$1\frac{3}{4}$	1	.78
2	5	3.88
3	3	2.33
5	7	5.43
$7\frac{1}{2}$	1	.78
10	2	1.55
Total	129	100.00

Motors are used to furnish power for a great variety of jobs. Forty-five per cent of the motors were used to operate water systems; 14 per cent, milking machines; 11 per cent, cream separators; 6 per cent, shop equipment; 5 per cent, churns; 4 per cent, bottle washers; and the remaining 15 per cent, for other purposes. The data is given in Table 4.

TABLE 4

Use of Motors

	Number	*% of Total*
Water Pumping Systems	49	45.40
Milking Machines	15	13.89
Cream Separators	12	11.11
Shop Equipment	6	5.56
Churn	5	4.63
Bottle Washer	4	3.70
Grindstone	3	2.78
Incubator Fans and Equipment	3	2.78
Clippers	3	2.78
Silo Filling	2	1.85
Feed Grinder	1	.92
Fanning Mill	1	.92
Beet Cutter	1	.92
Milk Pump	1	.92
Hoisting Hay	1	.92
Sawing Wood	1	.92
Total	108	100.00

The question was asked whether the farmers planned on replacing their small gas engines when worn out, with electric motors. Fourteen replied "yes" and six "no".

Those reporting in the affirmative gave the following reasons: more economical, more convenient, more dependable, and safer. Farmers reporting in the negative gave the following reasons: electricity too expensive and distance from wires too great.

Twenty-two farmers used electric lights to increase egg production. These farmers had on an average 588 birds per farm as compared with 204 birds per farm where lights were not used. Thirteen farmers used lights in the morning, two in the evening and three both morning and evening, (four failed to report). The average length of the lighting period was 2.4 hours for those reporting on this question.

In order to ascertain what electrical equipment farmers would like to have, the following question was asked: "List the jobs for which you would like to use electrical appliances

if available". The replies indicate that farmers desire appliances for a wide variety of jobs on the farm and in the home. The more important of these are: milk cooling, feed grinding, sawing wood, filling silo and mixing feed. In Table 5, is shown a complete list of the equipment desired.

TABLE 5
Equipment Desired

Kind	*No. desiring Eqpt.*	*Kind*	*No. desiring Eqpt.*
Milk Cooler	10	Apple Grader	1
Feed Grinder	7	Churn	1
Sawing Wood	5	Bottle Washer	1
Filling Silo	5	Potato Hoist	1
Feed Mixer	4	Bag Rack	1
Milking Machine	3	Brooding	1
Household Refrigerator	3	Cooling System	1
Unloading Hay	3	Lighting Hen Houses	1
Dairy Refrigerator	2	Threshing	1
Separator	2	Egg Cleaner	1
Incubator	2	Blacksmith Shop Eqpt.	1
Stoves and Ranges	2	Water Heater	1
Washing Machine	2	Grain Sprouter	1
Pumping Water	2	Potato Grader	1
Bone Grinder	1	Bread Mixer	1
Grindstone	1	Ice Cream Freezer	1
Heating Ice Box in Winter	1	Root Grinder	1
Machine Shop	1		

It would be interesting to know the reasons why farmers have not purchased this desired equipment. The question was asked, "What are the principal reasons why you are not using electricity for other purposes than for which you are now using it?" Of the replies, ten farmers stated that they did not have sufficient funds; nine mentioned the cost of appliances; six, the cost of electric current; six, that it was too expensive, and four stated that they did not have large enough business.

There were twenty-six farmers who reported the actual number of kilowatt hours consumed and cost of the current by months for the year of 1928. The total consumption on these

farms was 12,657 kilowatt hours and the cost of the current amounted to $1200.52. This gives an average consumption of 487 kilowatt hours and a cost of $46.17 per farm. The average monthly consumption and the cost of the service are given in Table 6.

TABLE 6

Average Consumption and Cost of Current per Farm

Month	Kwh. Used	Cost	Month	Kwh. Used	Cost
January	50	$4.65	July	31	$3.01
February	46	4.28	August	34	3.31
March	45	4.23	September	37	3.47
April	40	3.88	October	41	3.90
May	34	3.40	November	49	4.46
June	32	3.12	December	48	4.46
	Total	487		$46.17	

In discussing cost of electricity on farms, it would seem desirable to know something of the benefits of its uses. The farm users of electricity were asked the following question, "How many days of labor per year has the use of electricity saved in farm work? . . . . How many days in household work?" Twenty-two farmers reported a saving of 1,176 days in farm work and 819 days in household work. This is an average of 53.5 days and 37.2 days respectively per farm. If the labor saved was worth $3.00 per day this alone (convenience and ease in doing work not considered) would amount to two to three times the cost of electric current.

The cost of electricity per kilowatt hour decreased as the consumption increased. There were thirty farmers who furnished information on the total number of kilowatt hours and the cost of current consumed on their farms during the year 1928. Three farmers used less than 200 kilowatt hours for the year at an average cost of 12.31 cents per kilowatt hour; eight farmers used 200 to 399 kilowatt hours at an average cost per kilowatt hour of 11.25 cents; six farmers used 400 to 599 kilowatt hours at an average cost per kilowatt hour of 9.82 cents; six farmers used 600 to 799 kilowatt hours at an average cost per kilowatt hour of 8.37 cents; and six used 800 kilowatt hours and over, at an average cost per kilowatt hour of 3.18 cents (Table 7).

TABLE 7

Relation of the Consumption of Energy to the Cost per Kilowatt Hour

Kw. Hours Consumed	*No. of Farmers*	*Average Annual Kw. Hours Used per Farm*	*Aver. Cost per Year per Farm*	*Aver. Cost per Kw. Hr (cents)*
0–199	3	135	$16.61	12.31
200–399	8	306	34.37	11.25
400–599	6	502	49.27	9.82
600–799	6	700	58.58	8.37
800 and over	6	4,561	145.02	3.18

It would seem, therefore, that the principal problem of the farmers is to find profitable uses of a relatively large amount of current. This same problem is of vital interest to power companies in extending rural lines. As previously stated power companies do not consider it advisable to extend their service unless a sufficient volume of electricity is consumed on the line to justify its construction.

In order to furnish some additional facts as to (1) how much electric energy a farmer might expect to use with satisfactory results and (2) what items of equipment are practical for farm and household use, a large power company has equipped electrically three farms. Arrangements were made with these farmers to supply the College of Agriculture of the University of Maine with weekly readings of all meters and a record of the work done by each major item of equipment.

The three farmers selected for these tests were: Charles C. Clements and Son, Winterport; Harold S. White, Auburn, and Harry A. Rackley, Topsham. The Clements farm has been equipped for somewhat over a year. A report will be given of this farm, (Clements farm was not included in the discussion of the above 80 farms) giving a summary of the records from October 1, 1927, to September 30, 1928. These records show the amount of current used for the operation of different items of equipment and a statement of the work accomplished when such could be conveniently measured.

The Clements farm consisting of 150 acres, is a combination of orcharding and poultry raising. There are 2,000 apple trees on the farm, of which 1,600 are of bearing age and 400 non-

bearing. Two thousand pullets are wintered annually. There is also a rather large baby chick business. The buildings comprise an up-to-date stand, consisting of a two-family house of 13 rooms; a 40 by 76 ft. barn; a 20 by 75 ft. poultry house, and minor buildings.

The total consumption of current on this farm for the year ending September 30, 1928, was 4,085 kilowatt hours. This gives an average monthly consumption of 340.4 kilowatt hours. The energy used may be divided into the three general classes, as follows: (1) for lighting, (2) for household uses including some poultry equipment (3) and for power. A total of 656 kilowatt hours was used for lights during the year, 2,857 kilowatt hours for household uses and 572 kilowatt hours for power. The monthly consumption of energy for each of the classifications is shown in Table 8.

TABLE 8

Monthly Consumption of Energy on Clements Farm

(October 1927 to September 1928)

Month	*Lights*	*Household Purposes including some Poultry Eqpt.*	*Power*	*Total*
October	73	209	71	353
November	74	214	53	341
December	127	228	47	402
January	87	216	49	352
February	62	221	28	311
March	42	147	33	222
April	38	185	26	249
May	29	244	48	321
June	26	246	76	348
July	31	326	72	429
August	30	319	28	377
September	37	302	41	380
Total	656	2,857	572	4,085

Current Used for Household Purposes (including Immersion Heater for Poultry and Incubator Fans but Exclusive of Lights)

The following household equipment was in operation on this farm: range, refrigerator, mangle, water heater, washing machine, battery charger, toaster, room heater, electric iron, gong and sewing machine. The first five of these, an immersion

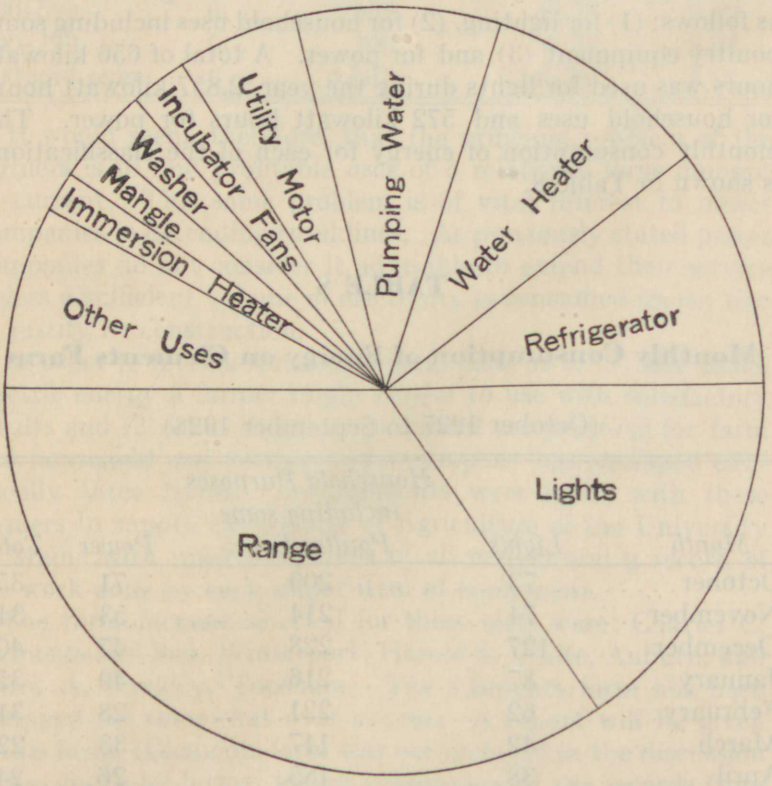

Fig. 1. Relative Amounts of Energy Consumed on Clements Farm for Various Purposes.

heater for poultry and incubator fans were wired to separate meters; the others were grouped, as their individual current consumption was known to be low.

The range was an 8,550 watt Universal, having four covers with baking oven, warming oven and broiler. This equipment

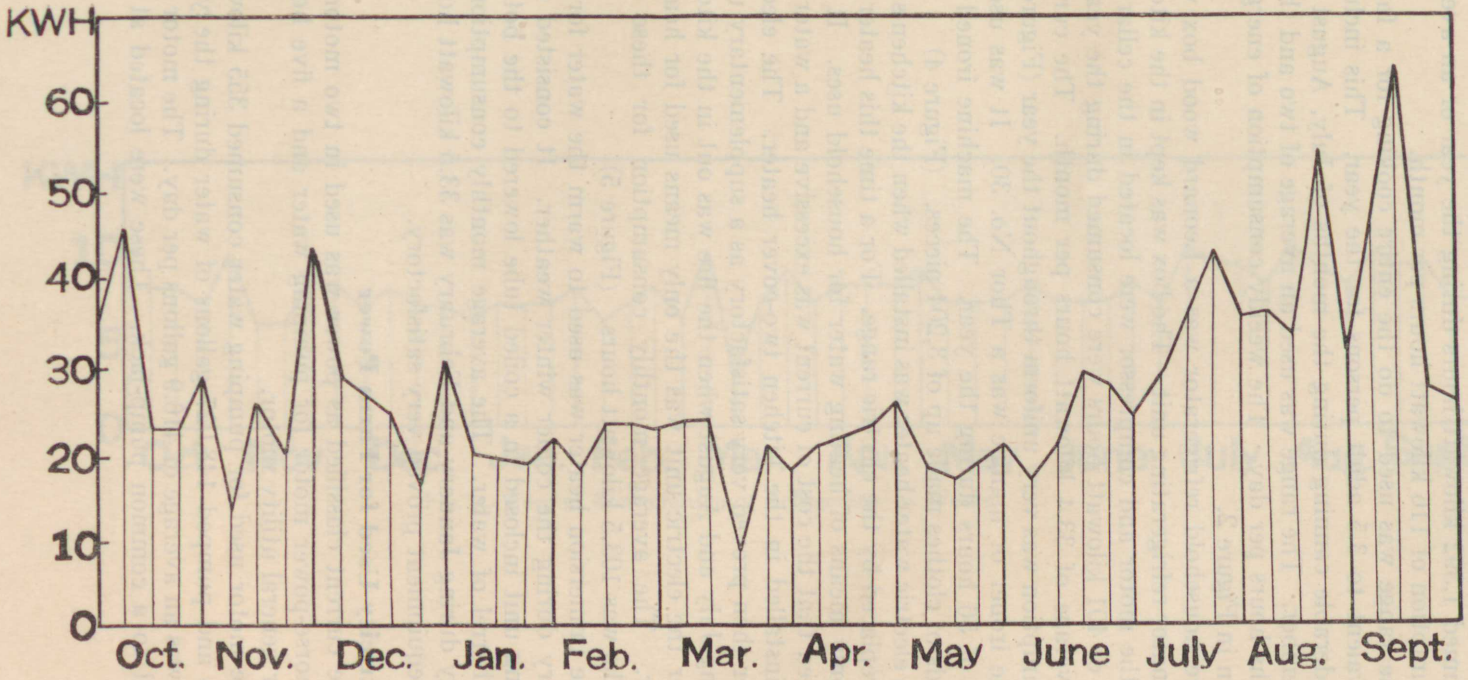

Fig. 2. Current Consumption of Electric Range by Weeks

consumed 1,392 kilowatt hours during the year or an average consumption of 116 kilowatt hours per month.

The range was used to do the entire cooking for a family equivalent to 3.5 adult persons for the year. This included considerable canning during the months of July, August and September. The range was used an average of two and three-fourths hours per day. The weekly consumption of energy is shown in Figure 2.

The household refrigerator was a Leonard wood box with kelvinator refrigerating unit. The box was kept in the kitchen and the motor and compressor were located in the cellar. A total of 401 kilowatt hours were consumed during the year or an average of 33.4 kilowatt hours per month. The current consumption was very uniform throughout the year (Figure 3).

The ironer or mangle was a Thor No. 30. It was used a total of 56 hours during the year. The machine ironed 554 pounds of clothes made up of 3,204 pieces. (Figure 4)

An electric water heater was installed when the kitchen stove was replaced by the electric range. For a time this heater was the only means of heating water for household uses. It was decided that the cost of current was excessive and a water coil was installed in the kitchen two-cover heater. The electric heater then proved very satisfactory as a supplementary unit. During July and August when the fire was out in the kitchen heater the electric unit was the only means used for heating water. The average monthly consumption for these two months was 103.5 kilowatt hours. (Figure 5)

The immersion heater was used to warm the water for the poultry during the colder winter weather. It consisted of a heating unit inclosed in a coiled tube lowered to the bottom of a barrel of water. The average monthly consumption of energy during January and February was 33.5 kilowatt hours. This equipment proved very satisfactory.

Electricity Used for Farm Power

The current classified as power was used in two motors, a one horse-power motor for pumping water and a five horse-power general utility motor.

The motor used for pumping water consumed 355 kilowatt hours and pumped 148,027 gallons of water during the year. This was an average of 416.9 gallons per day. The motor was belted to a common pump-jack. These were located at the

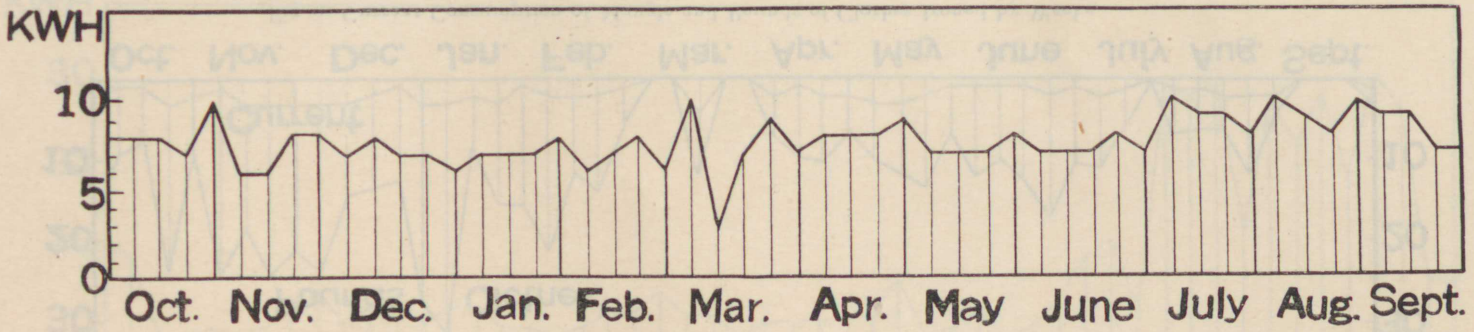

Fig. 3. Current Consumption of Refrigerator by Weeks

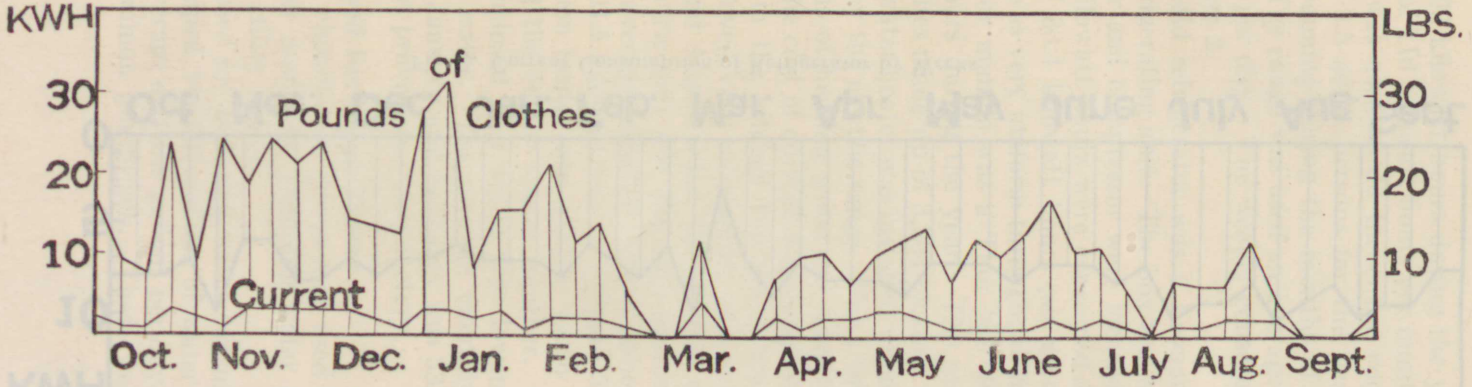

Fig. 4. Current Consumption of Mangle and Pounds of Clothes Ironed by Weeks

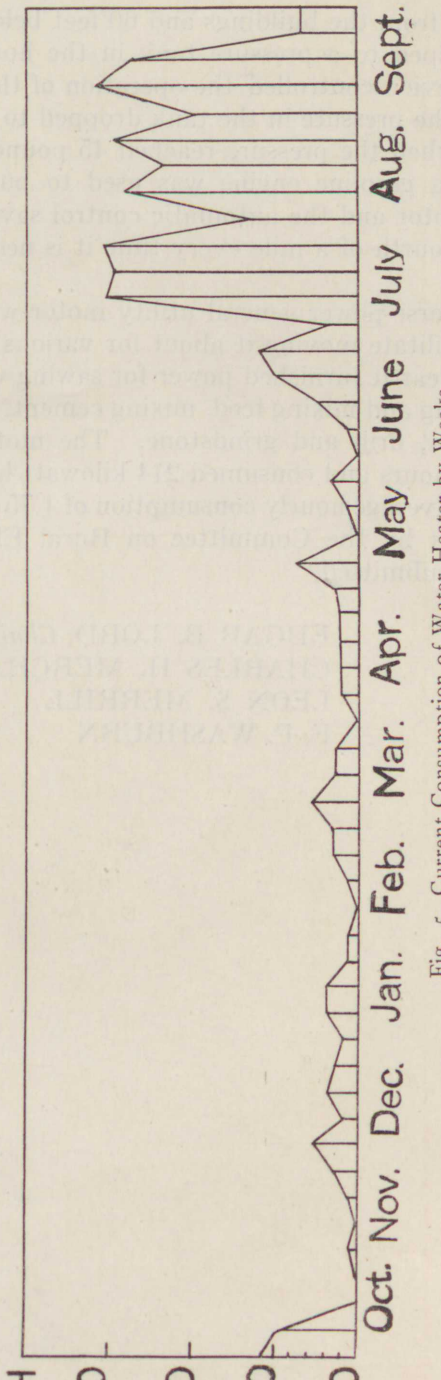

Fig. 5. Current Consumption of Water Heater by Weeks

well 800 feet from the buildings and 60 feet below them. The water was piped to a pressure tank in the house cellar. An automatic device controlled the operation of the motor, starting it when the pressure in the tank dropped to 30 pounds and stopping it when the pressure reached 45 pounds.

Formerly a gasoline engine was used to pump the water. Using the motor and the automatic control saves a round trip of over one-fourth of a mile every time it is necessary to start the pump.

The five horse-power general utility motor was mounted on trucks to facilitate moving it about for various kinds of work. During the year it furnished power for sawing wood, elevating grain, grinding and mixing feed, mixing cement, and for operating a rip saw, drill and grindstone. The motor was used a total of 122 hours and consumed 214 kilowatt hours of energy. This was an average hourly consumption of 1.75 kilowatt hours.

This report by the Committee on Rural Electrification is respectfully submitted,

EDGAR B. LORD, *Chairman*
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