

VIRGINIA

AGRICULTURAL ENGINEER

ANNUAL REPORT

1925

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PROJECT - 10

VIRGINIA POLYTECHNIC INSTITUTE,

Division of Extension,

DEPARTMENT OF AGRICULTURAL ENGINEERING,

Annual Report

December 1, 1924. - November 30, 1925.



PROJECT NO. 10
VIRGINIA POLYTECHNIC INSTITUTE,
EXTENSION DIVISION,
DEPARTMENT OF AGRICULTURAL ENGINEERING,
ANNUAL REPORT,
DECEMBER 1, 1924 - NOVEMBER 30, 1925

Blacksburg, Virginia,
November 30, 1925.

Mr. John R. Hatcheson,
Director of Extension,
Virginia Polytechnic Institute,
Blacksburg, Virginia.

My Dear Mr. Hatcheson:-

I am submitting herewith annual report of the Extension work in Agricultural Engineering, in accordance with Project No. 10, Co-operative Extension Work in Agriculture and Home Economics, for the period beginning December 1st, 1924, and ending November 30th, 1925..

CHANGES IN EXTENSION ORGANIZATION.

O.E. Seitz resigned as head of the department in February, and returned April 1st. in the same capacity, but on one-half Extension and one-half College time. Mr. Seitz' time has been taken up principally with executive duties, handling the drainage, tyrolol distribution, and rural electrification projects.

N.J. Marinson, one-half extension time, in charge of the Rural Architecture project, resigned August 15th. to accept a position at Amherst College. His project has been handled by Mr. Seitz since his resignation. No one has yet been selected to fill this position, but it is hoped that a successor will be found by January 1st.

J.B. Cole continues as full time Extension Agricultural Engineer, and has devoted most of his time to the following projects: Water supply, terracing, land clearing and water power.

There has been no outstanding change in the relations of Extension work in Agricultural Engineering to the other allied projects, or to the experimental and

teaching work in the subject. The Department has co-operated very closely with other departments in certain projects, such as the assistance given the Home Economics Department in their kitchen contests on installing water systems in the farm home. As the three main divisions of Agricultural Engineering, namely Extension, Resident Instruction, and Research, are under the direction of the subject matter head of the department, all the work is correlated. A four year professional course in Agricultural Engineering is now being given and a number of subjects are taught agricultural students. A research man was added to the department in September of this year to make a survey of farm machinery used in the state. From this survey, we hope to get valuable data on which to base further investigations, and to conduct our extension teaching in farm machinery. We have reached the point in agricultural engineering where it is necessary to develop the investigation side if we expect to continue carrying new ideas and practices on to the farmer.

PROGRAM OF WORK.

The chief problems in agricultural engineering with which Project No. 10 (Agricultural Engineering) is primarily concerned, are briefly as follows:

The proper drainage of farm lands for economical production; the prevention of erosion or washing of soils on cultivated lands; the removal of stumps and other obstructions from land in cultivation in order to reduce the cost of cultivation and the clearing of new land of stumps for the purpose of placing this land in cultivation; the equipping of the farm home with labor-saving conveniences, such as running hot and cold water, electric lighting, heating, and other conveniences, and the improvement of sanitary conditions around the farm home, in order to make farm home life more attractive and healthful; the improvement of the architectural style and design of farm buildings and the utilizing of economical and permanent building materials; the proper arrangement of these buildings for the most economical use of labor and equipment; the proper arrangement of fields and the location and construction of roads on the farm for economical use of labor, power and transportation; the instruction and advice on all forms of farm power, such as gas engines and tractors, improved farm implements, development of farm water power, the supplying of electricity to farms from central stations; miscellaneous and emergency work consisting of personal assistance in the field and the answering of letters from farmers, dealing with almost every conceivable engineering problem on the farm.

Project No. 10 - Agricultural Engineering - is divided into the following sub-projects, which cover the main problems enumerated above:

Sub-Project 10-A, Land Reclamation,

- 10-A-1, Land drainage.
- 10-A-2, Terracing.
- 10-A-3, Land Clearing.

Sub-Project 10-B, Farm Water Supply and Sanitation,

- 10-B-1, Farm Water Supply.
- 10-B-2, Farm Sanitation.
- 10-B-3, Farm Lighting, Heating and Ventilation.

Sub-Project 10-C, Rural Architecture,

- 10-C-1, Farm Structures,
- 10-C-2, Farmstead Planning,
- 10-C-3, Rural Community Plans,

Sub-Project 10-D, Farm Power and Operating Equipment,

- 10-D-1, Gas Engines and Tractors,
- 10-D-2, Farm Implements,
- 10-D-3, Farm Water Power Development.

Sub-Project 10-E, Miscellaneous,

All farm engineering problems not included under Sub-Projects A, B, C, or D.

METHOD OF PROCEDURE.

The methods of teaching the subject matter under Agricultural Engineering are by:

- A. **Short Courses and Meetings**, which are given when scheduled and consist of illustrated lectures, moving pictures, laboratory work and talks at meetings.
- B. **Publicity and Propaganda**, which is handled through correspondence, bulletins, circular letters, newspapers, and farm journal articles, and exhibits at fairs.
- C. **Field projects and Demonstrations**, which consist of supplying technical information and services to individuals, communities, and organizations in the state.

Individuals, county or home demonstration agents, or community organizations make application to the department for the services of the specialists. The individual project is visited, in company with the County agent if possible, surveys and other notes are made, and a detailed report, plans and suggestions furnished. Demonstrations consist of visits and meetings at projects under construction and at finished projects, in order to instruct on methods and show results obtained. The specialist endeavors to instruct in such a way that those in attendance at the demonstration can carry out the practice recommended without further assistance. Many of the projects are self advertising, such as improved farmsteads, new farm homes or other buildings, new operating equipment, water systems, and other conveniences in the home and reclamation projects, such as drained fields, terraced hillsides and cleared land.

RESULTS OBTAINED.

The following tables show the results obtained in summary form:

A. Short Courses and Meetings:

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SHORT COURSES

County or Course	Instruction Given	Attendance.
Fredericksburg.	Farm Machinery	70
Brunswick County	Water Supply and Concrete	40
Rockbridge County	Water Supply and Concrete	25
Cape Henry	Gas Engines	75
V.P.I. (State Short Course)	Gas Engines, Farm Implements, Tractors, Water Supply and Concrete, - - - -	125
Petersburg.	Concrete	122
Williamsburg	Concrete	75
Front Royal.	Concrete	175
Hampton.	Concrete	300

MEETINGS

Meetings addressed. 24 1627

B. Publicity and Propaganda:

Letters written	6155
Circular letters.	3060
Articles written for papers.	22
Bulletins sent on request, under the five main projects:	
Land Reclamation,	1771
Farm Water Supply & Sanitation	2522
Rural Architecture.	6721
Farm Power & Operating Equipment.	2002
Total	13,123
Farm building plans sent out.	875
Bills of material for plans.	449
Counties visited.	51
County Agents assisted.	42
Home Demonstration Agents assisted.	15
Farmers met or visited (exclusive of meetings, short courses and fairs.	1,475
Fairs attended with exhibits.	13

C. Field Projects and Demonstrations:

PROJECT	NO. OF DEMONSTRATIONS	UNITS
Land Drainage	17	559 acres drained
Terracing.	26	561 acres terraced, 69, 625 ft. terraces laid out.
Land Clearing (Pyrotol Demonstrations,	36	1050 farmers in attendance
Farm Water Supply	102	at Pyrotol demonstrations.
Water power development	14	

C. Field Projects and Demonstrations. (Continued)

PROJECT	NO. OF DEMONSTRATIONS.	UNITS.
Farm Building Plans	575	
Farmstead planning	5	
Farm Concrete,	20	
Gas Engines and Tractors,	2	
Farm Implements,	1	
Miscellaneous,	26	

County agents contributed to the forwarding of the agricultural engineering projects and, in most cases, gave realizable assistance in arranging for the demonstrations, etc. The specialists from this office worked with 42 County Agents during the year and 16 Home Demonstration Agents; three Negro agents, and the Boys' Club Department at the various Boy's Short Courses. The specialists also co-operated very closely with the Home Economics Department in the water supply project, the Animal and Dairy Husbandry Departments in the farm building projects; the Horticulture Department in designing apple packing plants, and the Poultry Department in designing and planning their poultry plant. Co-operative work was also done with the Agricultural High Schools of several counties in Concrete lectures and demonstrations; with the State Departments of Health and Forestry, and the Agricultural Departments of the E & W. Railway, and the C & O Railway companies, and with the State Department of Agriculture. The State Chamber of Commerce gave us very valuable co-operation in the matter of publicity of our various projects, especially the land clearing project.

DISCUSSION OF SUB-PROJECTS.

Sub Project 10-A. - Land Reclamation,

10-A-1, Land Drainage:

The farmers in most sections of the state have not yet entirely recovered from the financial depression in agriculture, and consequently, have not been able to do much drainage work. One exception to this, however, is on the Eastern Shore, in Accomac and Northampton counties. In these two counties, considerable tile drainage has been in progress during the year, but as there are several contractors handling the drainage work here, and as sufficient drainage demonstration work was conducted in that section in past years to establish the practice, it has not been found necessary to do any additional drainage work in that section.

This sub-project has, therefore, not been pushed. The work done during the year has only been at the urgent request of the farmers. Seventeen drainage surveys were made during the year, comprising 859 acres. In most cases, maps and reports were furnished, showing the proposed tile drainage system, grades, etc. as well as an estimate of the cost and instructions on the best methods of procedure. The following bulletins have been sent out under this sub-project; Tile Drainage on the Farm, F.B. 255, Surface Irrigation on Eastern Farms, F.B. 55, Tile Trenching Machinery, F.B. 124, The Corrugated Method of Irrigation, F.B. 115.

10-A-2, Terracing:

Terracing to prevent soil erosion continues to be an important project of the Department, but it is impossible to give this project the attention and time it

deserves, due to lack of personnel. "Considerably more requests for assistance in preventing soil erosion have been received than it has been possible to fill. An endeavor was made to make the best use possible of the limited time apportioned to this project.

Two terracing schools were held in Dinwiddie County, when instructions were given in the methods of laying off terraces. Twelve farmers attended these two schools, and expressed themselves as being capable of handling terracing work, after receiving the instructions at the schools.

Twenty eight terracing demonstrations were held in five counties, as follows: Necklesburg, 10, Charlotte, 8, Lunenburg, 5, Dinwiddie, 4, and Appomattox, 1. In these 28 demonstrations, 89,625 feet of terraces were laid out by the specialist, on 681 acres of land. The specialist built 9,675 feet of terraces in demonstrating the proper method of constructing a terrace. 77,545 feet of the terraces laid out have been completed, showing a record of 87.6% completed demonstrations.

Charlotte County seems to be leading the other counties in the interest being shown in terracing work. The County Agent has been especially active in this particular project, and has followed up each demonstration to see that the work laid out is actually completed. This agent has laid out many terraces himself and has seen to it that the farmers keep their terraces repaired when built.

There is a definite need for a study to be made on soil erosion problems in this state. It is known by observation that thousands of acres of farm land have been abandoned, due to the excessive erosion and other thousands are being eroded continuously. A study should be made to find out the amount of land abandoned due to erosion and the amount of land needing attention, as well as studies to find out the best and most economical methods of prevention and remedy. There is a tremendous loss to the State as a result of soil erosion and public attention should be focused on this loss. The only way this can be done is by finding out just what this loss really is. The following bulletins have been sent out under this sub-project: F.B. No. 297, Terracing Farm Lands, 518, F.B. No. 1286, Terracing Farm Lands, 128, F.B. No. "Bullies and How to control and reclaim them, 223.

10-1-3, Land Clearing

This project has received more attention, probably, the past year than any other project, due to the distribution of the Government explosive, Pyrotol. For the past few years, we had been receiving numerous inquiries from farmers in regard to securing Government explosives that were being distributed by the U.S. Department of Agriculture. Last year, these requests became so insistent that we decided to distribute some of this explosive in Virginia as a trial, although we did not have much faith in its taking well with the farmer. We distributed our first car of 20,000 pounds in February. The farmers using this explosive were very well pleased with it and in many cases they stated that it was superior to dynamite for stump blowing. The results from the first car were so favorable that it was decided to give as much time as necessary to this project, in order to give our farmers the advantage of securing cheap explosives. It takes a great deal of time, thought and work to handle this material, but we feel it is certainly time well spent, as we are not only saving the farmers thousands of dollars on the cost of explosives, but are enabling them to get rid of their stumps in cultivated fields, thereby putting their land in shape for economical production for all time. It is also enabling those farmers who wish to clear up new land to do so, as it offers an economical and efficient method of clearing land.

A great deal of correspondence has been necessary in connection with this project, numerous articles have been written for papers, and circular letters written, and posters, etc. sent to county agents. Thirty five (35) explosive demonstrations were held to demonstrate the correct method of handling Pyrotol to obtain the best results; to create interest and advertise this explosive, and to teach safety methods in handling. There was an average attendance of 30 farmers at each of these or city demonstrations, with a total of 1050 farmers at the 35 demonstrations. These demonstrations were held in the following counties: Lunenburg, Bedford, Appomattox, Prince Edward, Buckingham, Charlotte, Brunswick, Henkelburg, Accombe, Dismiddle, Nelson, Campbell, Prince William, Loudon, Augusta, Chester, Albemarle, and Montgomery. A demonstration was also held at Blacksburg during the County Agents' Meeting and the Farmers' Institute. This demonstration was attended by approximately 250 farmers and agents. One of the outstanding points of interest in the distribution of this explosive is the large number of farmers who have been reached by the Extension work who could not be reached before. Several agents report that they have been able to convert violent opponents of Extension work to real supporters through this project.

During the year, we have actually distributed five (5) car loads of Pyrotol, consisting of 113,000 pounds. Orders have also been placed for two more cars of 16,000 pounds and 25,000 pounds, respectively, with orders for two additional cars expected within the next few days. On the 113,000 pounds distributed, if figured conservatively, we have actually saved the farmers in dollars and cents over \$26,000.00, as compared with what they would have to pay for an equivalent amount of dynamite. We have also saved them a large sum on cost of blasting caps, as we have distributed these free. It is, of course, hard to estimate the further saving in enabling them to get rid of their stumps and thereby reduce the cost of production. This saving will be tremendous. We have sent out 315 of Farmers Bulletin No. 191, "The Use of Explosives in Blasting Stumps."

Sub-Project 10-B. Farm Water Supply and Sanitation:

10-B-1 Farm Water Supply.

This is one of the most important, if not the most important, project of the department from the standpoint of making the farm home a better place in which to live. This project would justify the employment of a specialist to devote his entire time to the work, as the department is unable to devote as much time as is necessary to the project. Work on this project has been done mostly in co-operation with the Home Economics Department. We have assisted the Home Economics Department in their kitchen contests in five counties. During the year, 102 water supply projects were put on in 19 counties, and of these projects, we know of 67 that have already been completed (that is water systems installed and in operation at the present time) Several more are in the process of completion and will be working soon.

The following table shows the results, by counties, of the water supply projects:

COUNTY	NO. PROJECTS	KIND OF SYSTEM.	NO. COMPLETED.
Charlotte	3	1 Hydraulic ram 2 gravity	3
Campbell	21	Rams and Pumps	19
Calypso	11	3 rams, 8 pumps and tanks	2
Stafford	1	Ram	0

NAME	NUMBER OF PROJECTS	KIND OF SYSTEM	NUMBER COMPLETED
London	2	Gravity	2
Hottelony	6	1 ran, 7 pump & tanks	5
Giles	1	Cistern	1
Amherst	2	Septic tank	1
Albemarle	2	Gravity, pump and tank	no data
Spotsylvania	1	Ran	1
Stafford	3	Ran	3
Grayson	2	Ran - gravity	2
Henry	1	Ran	0
Holston	1	Tank in cellar	1
Lunenburg	1	Ran	1
Stafford	8	Ran - Gravity	no data
Bedford	12	Ran, pump & tank, gravity	12
Augusta,	14	Ran, cistern, pump and tank	14

Of these 19 counties, Campbell, Bedford, Caswell and Hottelony and Augusta were enrolled in the kitchen improvement contest this year. By referring to the table it will be seen that Augusta was 100% in that all the projects were completed. Campbell was second.

Two illustrations of how this project benefits the farm housewife by supplying running water follow:

Case 1. The housewife walked to the spring, 120 yards away, three times a day and carried back 6 gallons of water each time. In a years time, she walked 226,800 yards, or 149.3 miles, and carried 52,560 pounds of water, and as she had to lift the water through an elevation of 21 feet, she does work equivalent to 20.4 horse power. This housewife was in poor health, no doubt as a result of the work done in carrying water. A hydraulic ran was installed at the spring which now pumps the water to a tank at the house, and all she has to do to get water is to turn the spigot. The total cost of the water system installed was \$88.70.

Case 2. A "telegraph" or wire over a pulley, was used by the housewife to pull the water a dist noe of 149 feet, and up a steep slope. This arrangement was always giving trouble with the result that the woman had to carry the water most of the time. A hydraulic ran was installed, and it now pumps the water to the house. This installation cost \$42.50. Naturally, these two women are enthusiastic over the outfits, and give thanks to the extension work for relieving them of drudgery. These are examples of conditions found in all sections of the state that are really pitiful. In most cases, the farmers do not have any idea that they can get water into their homes at a cost they can afford. When it is considered that only approximately 10% of the farm homes of the state have running water, it can be realized what an important problem this is. The following bulletins have been sent out under this sub-project: "Running water in the Farm Home," 425, "Good Water for Farm Homes," 316, "Farm Reservoirs," 96, "Water Supply for Farm Homes," 266, "Farm Plumbing", 292, "Farm Reservoirs", 96.

10-R-2, Farm Sanitation:

This project has been handled in connection with the water supply project and by correspondence. The following bulletins have been mailed out in answer to requests describing proper methods of sewage disposal on the farm, "Sewage and Sewerage of Farm Homes", 145, "Sewage Disposal for Suburban and Country Homes," 290.

10-B-3 Farm Lighting, Heating and Ventilation.

This project has been taken care of in most cases through correspondence. Literature has been mailed and inquiries answered as to the best types of lighting plants and heating systems for farm use. Ventilation has been included in the building plans sent out. The following bulletins have been mailed out, "Operating a Home Heating Plant," 74, "Farm Home Conveniences," 267.

Sub Project 10-C, Rural Architecture:

10-C-1 Farm Structures:

During the year, 675 plans of farm buildings were sent out to farmers who requested them, and 449 bills of material were furnished with these plans. In addition to the plans, 540 copies of our poultry house bulletin were sent to farmers requesting them. This bulletin contains 8 plans for poultry structures, and eight bills of material. The poultry specialists report a large number of poultry houses have been built from the plans. Numerous letters have been answered pertaining to building problems. The following bulletins on farm structures have been sent out under this sub-project:

Farm Poultry Houses, (Va. Extension Bulletin)	540
Hog houses,	217
Ice houses,	26
Use of Paint on the farm	522
Poultry House Construction F.B. No. 514	507
Ice Houses and the Use of Ice on the Dairy Farm,	102
A Plan of a Small Dairy House,	117
Open Shed Compared with Closed Barn for Dairy Cows,	226
Homemade Silos,	127
Pit Silos,	127
Self Feeder for Hogs,	309
A Simple Hog Breeding Crate,	328
Poultry Houses, F.B. No. 1115	450
Farm Dairy Houses,	115
Poultry House Construction F.B. 1415	210

During the year 19 structures were designed and drawn as follows: Glass and laboratory building for Poultry Department; general purpose barn, scale shed, implement shed, poultry house, hog house, tenant house, 3 farm houses, addition to beef cattle barn for V.P.I., Milk House for V.P.I., apple packing house, plans for remodeling West end of V.P.I. Dairy barn, plans for remodeling 2 farm houses, 2 county fair exhibit buildings, stone community building, kitchen cabinet, reinforced concrete platform and steps, dairy barn and bill of material, machinery laboratory (unit for Agricultural Engineering Department, V.P.I.

Considerable time of the farm building specialist was devoted to the supervision of construction and preparation of plans for various buildings and improvements on the College farm, among the most important of which were the design and supervision of construction of the new poultry glass and laboratory building, plan and supervision of construction of addition to beef cattle barn, and plan and supervision of construction of milk house.

10-C-2, Farmstead Planning:

The work on this project has been confined to the planning of two farmsteads. A survey was made and plans prepared for R.T. Kincaid's farmstead in Lee County. Mr. Kincaid is a former V.P.I. student. His father has given him 250 acres of land and he is starting farming. He has agreed to follow the plan prepared for him in the development of his farmstead. Fields were laid out, buildings located, and plans prepared for a farm house, general purpose barn, scale shed, machinery shed, poultry house and hog house. Some of these buildings have been completed.

The other farmstead plan was for Dr. Insley, on a 40 acre farm near Bonnohe. A complete plan was made for the development of his farmstead. A complete plan was also prepared for the poultry plant at V.P.I. which can be used for future developments. Help was given also on a project in Louisa County, but the owner was advised to secure an architect to complete it. It is found that this sub-project takes too much time for the results secured, in that only in exceptional cases will we attempt a finished project. The following bulletins have been sent out under this sub-project: Concrete Construction on the Livestock Farm, - 377, The Preservative Treatment of Farm Timbers, 154, Fire Prevention and Fire Fighting on the Farm, 154, Beautifying the Farmstead, 285, Plain Concrete for Farm Use, 210, Floors and Floor Coverings, 352, Wagon Roads, 225, Benefits of Improved Roads, 186, The Road Drag and How It is Used, 66, Planning a Farmstead, 228, Chimneys and Fireplaces, 250.

10-C-3, Rural Community Plans.

Very little was done on this project. The only work of importance was the design of an apple packing plant for the Horticulture Department. Plans for two county fair buildings and a community house for a "Seaside Inn" were prepared. The bulletins sent out dealing with this sub-project were 125 "Plans of Rural Community Buildings."

Sub Project 10-D, Farm Power and Operating Equipment.

10-D-1 Gas Engines and Tractors:

Work done on this project during the year consisted of giving lectures and laboratory work at the various boys club short courses. Instruction was given in gas engines and tractors at the Tri-County Short Course at Cape Henry. A model gas engine was used and the boys were instructed in nomenclature, principles of operation, practical hints on running and finding and overcoming trouble. Seventy five boys received instruction at this course. Instruction was also given to 125 boys at the State Short Course at the college. These boys were given four days of work on gas engines and tractors, including the actual operation of both engines and tractors.

Numerous letters have been answered pertaining to gas engines and tractors, and the following bulletins on the subject were sent to farmers requesting them:

"An Economic Study of Farm Tractors in the Corn Belt."	205.
"Motor Transportation in Rural Districts."	167
"The Gas Tractor in Eastern Farming."	157
"Practical Hints on Running a Gas Engine."	168
"Laying Out Fields for Tractor Plowing."	174.
"Choosing a Tractor."	125.

10-B-2, Farm Implements:

The only work done on this project was instruction given at the Fredericksburg Short Course. This consisted of lectures on the proper selection, care and repair of farm implements. Approximately seventy boys were instructed at this course. Numerous letters were answered, dealing with all kinds of questions in reference to farm implements. There is a very definite need for more extension work on this project, but a limited force prevents our giving the project the attention it deserves. The following bulletins were sent out under this sub-project:

"Minor Articles of Farm Equipment,"	167
"Harvesting Hay with a Sweep Rake,"	129
"Care and Repair of Farm Implements, Flows and Harrows,"	109
"Labor Saving Practices in Hay Making,"	182
"The efficient operation of Thrashing Machines,"	126,
"The Use of Machinery in Cutting Corn,"	190

10-B-3, Farm Water Power Development

There is considerable interest in this project throughout the State, as is evidenced by the large number of inquiries we received during the year for information on this subject. We have been able to give advice in most cases by sending our bulletin "Power for the Farm From Small Streams." Many farmers believe that they can develop a stream of any size, but water-power-electric outfits have their limitations. The purpose of this bulletin is to acquaint the farmers with the possibilities of developing this power of small streams by converting it into electric energy, and the uses to which such power can be put; to give information which will enable them to avoid unnecessary expenditures; to explain how to determine the power a stream will supply; and to indicate the sources from which to secure additional information in regard to the approximate cost of installing a plant suited to the power available. Several hundred of these bulletins have been sent to farmers who asked for information on the subject. In addition to the requests for information, we received 44 requests for assistance in laying out a plant. Fourteen of these were given personal assistance by the specialist in this office. In 9 cases out of 14, it was found that the projects were practicable to develop. Out of the 9 practical projects, two have been completed and three are in the process of completion. These projects were carried on in Louisa, as follows: Pittsylvania, Rockingham, Calpeper, Madison, Alleghany, Rockbridge, Montgomery, Amelia, Giles and Appomattox.

One plant of particular interest is located in Alleghany County, and will develop 20 K.V. This current will be used over a distance of 2 miles and is to furnish electricity for several farms, as well as an educational institution. More emphasis, however, is being placed on developing the smaller individual farm plants of 2 or 3 K.V.

Numerous conferences were held on this subject with J. L. Horsley, Director of the Water Power Development Commission, and Chairman of the Agricultural Engineering Committee of the Virginia Agricultural Council. Three hundred bulletins on Power for the Farm From Small Streams, were distributed from our office, and several hundred from the Experiment Station office.

Sub Project 10-E, Miscellaneous.

Miscellaneous and emergency work performed during the year consisted of the answering of many letters of inquiry on various engineering problems, as well as some actual personal assistance. Some of the most important of the miscellaneous projects were as follows:

Concrete Demonstrations: The Portland Cement Association has co-operated with us very effectively during the year in the matter of demonstrating the proper way of mixing, handling and curing concrete on the farm to get the best results. A concrete specialist was assigned to the department to work directly under our supervision and some very effective work has been accomplished. This specialist put on concrete demonstrations and lectures with agricultural high school teachers in the following counties: Potomac, Buckingham, Cumberland, Westmoreland, Rowan, Shenandoah, Loudon, Accomac, and Lee. He gave lectures and showed films on concrete at the following short courses: Brunswick County, Petersburg, Cape Henry, Blacksburg, Hampton, Williamsburg, Rockbridge, and Front Royal. He also lectured to the Agricultural High School Teachers' Meeting at Blacksburg; the County Agents Meeting, and the Farmers Institute. (These lectures were followed up by literature on the proper use of concrete on the farm, sent to each of the boys in attendance.) Concrete exhibits were put on at a number of fairs. This exhibit consists of a Kalexicon which shows various methods of using concrete on the farm, the proper way of proportioning, mixing and handling. Considerable interest in these exhibits was shown by the farmers attending these fairs. The fairs at which the exhibit was shown are estimated attendance follows. - Smyth County, 20,000, Grant Galax, 15,000, Fredericksburg, 12,500, Albemarle County, 10,000, Bedford County, 5,000, Fairfax County (Suffolk), 25,000, Petersburg, 18,000, Halifax County, 8,000, Buckingham County, 1,800, Brunswick County, 2,000.

Rural Electrification

The head of this department is chairman of the Virginia Committee on the Relation of Electricity to Agriculture, which is studying the question of supplying the farms of the State with electricity from central station service. Considerable progress has been made on this project. Several meetings have been held by the committee, and the project leader has collected data as to the uses and amount of electricity on the farms of the State. Equipment has been installed on 5 farms selected for study, and data is being collected on the economy, etc. of using electrical energy for farm and household jobs. These studies, so far, show conclusively that the farmer who has electric light or power is absolutely sold on it and would not do without it at any cost.

School Grounds:

A survey was made of a County Agricultural High School grounds, and play grounds, athletic fields, etc. were laid out.

City Power Plant:

An investigation was made of the Chase City power plant at the request of the County Agent and town officials, for the purpose of advising the value of the plant. An offer had been made for the purchase of this plant and the officials did not know if the offer was large enough. We were able to help them and advised the sale of the property for the amount offered.

Tourist's Park. A survey was made and plans prepared for a farmer in Montgomery County for a community tourist's park. This farmer is situated on the Lee Highway and has a splendid location for a tourist's camp. Plans were made for him for a large concrete dam that will store water and create a large lake for swimming and boating. The dam will also store water for the development of electrical energy to light the camp as well as his house and barns. A plan was also prepared for a tourist's lodge on the property. Construction work has been started on the project and it is hoped to have it completed by next summer.

Plan of V-P-I. Exhibit Building:

A floor plan was drawn up for the V-P-I. exhibit building at the state fair, showing the size of space assigned to various departments, etc.

Exhibits at Fairs:

A Pyrotol exhibit was put on by the department at the state fair. This exhibit included charts, maps, and models, showing the proper method of blowing straight of different sizes and kinds, and the use of explosives in blasting ditches. The exhibit attracted considerable attention and resulted in many orders being received for the explosive, Pyrotol. This exhibit was also shown at the Rockleburg and Chesterfield County Fairs.

Poultry House Bulletin:

The poultry house bulletin was received from the printer early in the year and several hundred copies have been mailed. This bulletin contains eight plans of poultry houses with bills of material and instructions on building.

Demonstration Galleries. Copies of project outlines, and other subject matter material used in the work during the year is attached to this report.

OUTLOOK.

The farmer has done very little building during the past year as compared to a few years ago. There seems to be a gradual picking up in the activity, however, and we expect a considerable increase in the demand for building plans as the farmer resumes his building operations. The demands made upon the department for assistance and information are constantly increasing, even in the face of the poor financial condition of the farmer. It has been impossible to meet all the demands made upon the department during the year for assistance, but an effort was made to give assistance in the most important cases, and when it was felt that the greatest good to the greatest number could be accomplished. The work has been organized in such a way that the most effective progress could be made with the limited force available. There should be at least one more full time specialist on this project if we can be expected to make much progress on the various projects. As it is, the demands are such that we cannot neglect any one sub-project, and the result is that we cannot concentrate on the more important projects which is necessary for real progress.

From all indications, it looks as if the demands on the department for the coming year will continue to increase. We will do our best to meet these demands.

We will emphasize the following projects during the year, not that these are the most important, but that our organization and present demands seem to justify concentration on these sub-projects:

Land Clearing: By the use of Pyrotol, the Government explosive.

Water Supply and Sanitation.

Farm Building Plans.

Terminator.

Copies and outlines of some of the subject matter material used in this project are appended to this report.

Respectfully submitted,

Chas. E. Seitz

Chas. E. Seitz,

Head of Department.

Per m m

Federal Land Bank

of the United States

LAND CLEARING

EXTENSION DIVISION, V. P. I.
DEPARTMENT OF AGRICULTURAL ENGINEERING
BLACKSBURG, VIRGINIA

DISTRIBUTION OF PYROTOL FOR AGRICULTURAL PURPOSES.

Purpose of Distribution. The purpose of this distribution is to put surplus war explosive directly into the hands of the individual farmer for use in improving his own land. Pyrotol will not be disposed of through commercial agencies, nor supplied to such agencies or to drainage districts, development companies, contractors, etc. Under no circumstances will pyrotol be furnished to be resold. Evidence of reselling at a profit will be considered cause for discontinuing distribution within the State involved. The amount that any individual may secure is limited to 1,000 pounds.

What Pyrotol is. Pyrotol is a high explosive composed largely of ground smokeless powder and sodium nitrate. It is prepared for use in double-dipped paraffined cartridges, weighing about six ounces. The cartridges are packed in wooden boxes, each containing 50 pounds of pyrotol.

It is a Safe Explosive. Pyrotol is a comparatively safe explosive. While it is more sensitive than TNT or picric acid, there is no danger whatever in handling it provided that the ordinary care used in handling dynamite or other explosive is used. It will burn without exploding, at least in small quantities, and should not be exposed to fire or flame.

Toxic Effects. So far as ordinary handling is concerned, pyrotol has no toxic effects. It can be used in any open air blasting operations and will not cause headaches, stain the hands or clothing, or cause other ill effects.

Strength. A cartridge of Pyrotol, as it has been prepared for distribution, weighs about six ounces and is approximately equal in strength for agricultural blasting to the usual cartridge of dynamite which weighs eight ounces. That is, in a 50-pound box of dynamite there are 100 cartridges while in each box of pyrotol there are about 100 cartridges, each one of which is approximately equal in strength to a cartridge of 20 percent dynamite.

Temperature Effects. Pyrotol is a low-freezing explosive and will give good results at all ordinary temperatures.

Moisture Effects. The sensitiveness of Pyrotol decreases with increased moisture content; it should, therefore, be stored in a dry place. The cartridges, as prepared for distribution, can be left in wet holes for several hours without loss of sensitiveness or strength. In such wet holes the covering in the cartridge shell which is made to admit a primer should be covered with soft soap, axle grease or other water-proofing material, after the primer has been put in place.

Detonators. Pyrotol can be completely detonated by a No. 6 cap of either the electric or the fuse type.

How to Secure Pyrotol. For various reasons, among them the high freight charges on explosive in small lots, shipments of pyrotol can not be made by the United States Department of Agriculture in less than car lots. The Department of Agricultural Engineering of the Virginia Polytechnic Institute will handle the distribution in Virginia. Car lots will be shipped to selected distribution points, where individual orders will be billed to farmers direct. Orders should be given to the County Agent or sent direct to the Department at Blacksburg.

Cost of Pyrotol. Pyrotol is made largely from surplus war materials that have been made available by Congress for the benefit of the farmers of the county. No charges is made for the explosive itself but the cost of putting it in cartridge form, packing and shipping, and the cost of the necessary ingredients not furnished by the Government, must be paid by the consumer. The consumer must also bear the freight charges on such amounts as he sources. The cost to Virginia farmers will be \$8.75 per 100 pounds f. o. b. distribution point, which is less than half the cost of an equivalent amount of agricultural dynamite.

Freight Charges. Pyrotol will be shipped "freight charges collect". In calculating what the freight charges will be on a shipment of pyrotol, it should be remembered that freight must be paid on the container as well as on the explosive itself. The box and packing material for 50 pounds net of pyrotol weigh from 17 to 18 pounds. Hence on 100 pounds net of explosive, freight must be paid on approximately 135 pounds.

How Pyrotol is Used. For stump and rock blasting, pyrotol can be used in exactly the same way as dynamite is used. A special method of priming is recommended which is explained in detail in the Instruction Sheet enclosed in each box of pyrotol.

For blasting ditches, the electric method of firing must be used because the pyrotol is so insensitive that it will not "propagate".

Department Circular 191. Detailed instructions as to the use of explosive in stump blasting are contained in Department Circular 191. "The Use of Explosive in Blasting Stumps", which can be secured by application to the Department of Agricultural Engineering, V. P. I., Blacksburg, Virginia.

VIRGINIA POLYTECHNIC INSTITUTE,
AGRICULTURAL ENGINEERING DEPARTMENT

PYROTOL ORDER.

RECEIVED: _____

SHIPPED: _____

DATE: _____

Department of Agricultural Engineering,
Virginia Polytechnic Institute,
Blacksburg, Virginia:

Please secure for me _____ hundred pounds of Pyrotol allotted to Virginia for land clearing purposes. I enclose money order for \$_____, to pay cost of grinding, drying, rixing and cartridging, boxing, packing materials, freight and expenses, amounting to \$3.75 per hundred pounds in carload lots for same. _____ to call for the explosive at the railroad station immediately upon its arrival and pay local freight.

SIGNED: _____ I get my mail at _____

_____ My Railroad shipping station is _____
(A regular station agent must be employed at this station or explosives cannot be shipped.)

MAKE ORDER PAYABLE TO THE DEPARTMENT OF AGRICULTURAL ENGINEERING, V.P.I.

--- Tear off here and retain lower half for reference. ---

--- READ BEFORE SIGNING ---

1. To prevent speculation, not over 1,000 pounds of Pyrotol will be allotted to one individual in one year.
2. Orders shall be for even hundred pound lots. In case the supply of Pyrotol is exhausted before the order is received, the money order will be returned. I caps or fuse is included. These accessories shall be secured locally.
3. The Cost, (\$3.75 per hundred pounds Pyrotol) includes delivery at the car door where a car is unloaded at one shipping point. If less than a car load of Pyrotol is ordered at one station, it will be necessary to have a car load shipped to some central point. From this central point the Pyrotol will be shipped by local freight. The farmer will pay this local freight charge when he gets his explosive at the station.
4. Send your order for Pyrotol through your County Agent or Agricultural High School teacher, or direct to the Department of Agricultural Engineering, Blacksburg, Virginia.
5. Pyrotol is cartridged and packed in 50-pound boxes ready for immediate use in land clearing. It is distributed at cost of operation, trucking and other expenses. No charge is made for the material.
6. Pyrotol is prepared from surplus war material transferred by Congress to the Bureau of Public Works and the United States Department of Agriculture, and distributed in co-operation with the Extension Division, Virginia Polytechnic Institute. It was made primarily for war, and would cost considerably more than dynamite to manufacture. When the supply is exhausted, it will be impossible to secure an additional supply for land clearing at these prices.

LOWSE YOUR COST OF PRODUCTION WITH PYROTOL.

#642

COOPERATIVE EXTENSION WORK
IN
AGRICULTURE AND HOME ECONOMICS
STATE OF VIRGINIA

VIRGINIA AGRICULTURAL AND MECHANICAL
COLLEGE AND POLYTECHNIC INSTITUTE
U. S. GOVERNMENT PRINTING OFFICE
WASHINGTON, D. C.

EXTENSION SERVICE

Blacksburg, Virginia,
October 15, 1925.

Dear Sir:-

Your Pyrotol will be shipped from Richmond within the next few days, and we hope it arrives promptly after shipment.

We are enclosing a couple of sheets of instructions on how to care for blasting caps, and how to avoid hang-fires and accidents resulting from hang-fires.

You, of course, realize that there is a certain amount of danger in handling any explosive, and we just wish to caution you before hand. If you will not take any chances and use ordinary care in handling this explosive, there should be no danger from accidents. We trust that you will read these sheets carefully and act accordingly.

Hoping that your explosive proves satisfactory to you, and assuring you that we are glad to have been of service to you along this line, I am,

Very truly yours,

Chas. E. Scitz

Chas. E. Scitz,
DEPT. AGRICULTURAL ENGINEERING

S/M

BLASTING CAPS ARE DANGEROUS!

TAKE NO CHANCES

AFTER THE ACCIDENT,
IS TOO LATE!

DO NOT CARRY CAPS LOOSE IN YOUR POCKETS.

DO NOT CARRY MATCHES WITH CAPS.

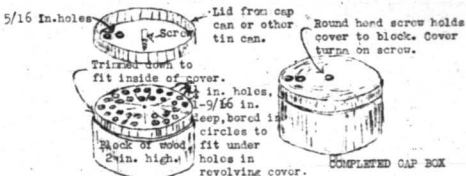
DO NOT CARRY OR STORE CAPS IN SACK OR BOX WITH PYROTEC.

KEEP CAPS AWAY FROM CHILDREN.

KEEP CAPS IN A DRY, COOL PLACE.

CRIMP CAP ON FUSE ONLY WITH A CAP CRIMPER. NEVER WITH YOUR
TEETH, KNIFE OR PLIERS. IMPROPERLY CRIMPED CAPS CAUSE
ACCIDENTS, MANG-FIRES, MISFIRES, AND BURNED CHARGES.

HOW TO MAKE A GOOD, SAFE CAP BOX



Do not "thread" fuse thru powder.



KEEP AWAY!

TO AVOID "HANG-FIRES."

1. Prime carefully, using approved methods.
2. Use good fuse that has been kept dry.
3. Avoid bending, pinching, or otherwise damaging fuse.
4. Use only cap crimpers. Pliers, knives, or teeth (very dangerous) may crush fuse.
5. Carefully prepare fuse for lighting.
6. Learn how to light fuse.

CARELESSNESS CAUSES HANG-FIRES IN FARM BLASTING.

Explosives Are Safe When Properly Used.

Explosive accidents result from the carelessness that comes with familiarity. The man who always fears and respects explosives knows enough to be careful and guard against indifference. It is more often the "experienced" blaster who neglects well established rules for handling explosives.

A hang-fire is a charge of explosive which fails to go at the expected time when fuse is lighted, but may explode later. A misfire is a charge which is lighted but fails to go off at all.

Causes, and How to Prevent.

1. Improper methods of lighting. Use the flaming match head just as it flares up. Slit fuse to expose powder. Take time to be sure the fuse is lighted.
2. Careless handling of fuse. Bending, breaking, kinking, pinching, or wetting the fuse may stop the burning of the powder and cause the fire to smolder its way for hours in the cotton covering till it reaches new, dry powder leading to cap.

TAKE PLENTY OF TIME TO REMOVE MISFIRES.

Do not investigate hang fires until NEXT DAY. By that time, they will be misfires. To remove misfire, carefully dig out charge. Gradually work soil away with hands of a piece of wood until charge is reached. This should be done very carefully, however, taking plenty of time to avoid explosion of the cap by friction or impact. The charge can then be removed or fired with a new primer if the explosive is still dry.

Avoid the practice of placing a second charge a few inches from the first one which misfired. Sometimes this throws an unexploded cap out in the field where it may be walked on or otherwise accidentally set off.

Write the Department of Agricultural Engineering for Circular #191, "The Use of Explosive in Blasting Stumps."

PYROTOL

**NEW SALVAGED
WAR EXPLOSIVE**

For Agricultural Purposes

**Supplied Farmers
at cost of Preparation and Freight.**

**Distributed by Department of Agricultural Engineering
Extension Division, V. P. I., Blacksburg, Va.**

See your County Agent or write direct to the Department at Blacksburg, Virginia

PROJECT DEMONSTRATION OUTLINES

- PROJECT I. FARM DRAINAGE DEMONSTRATIONS.
- " II. TERRACING DEMONSTRATIONS.
- ✓ " III. FARM WATER SUPPLY & SANITATION.
- " IV. FARM STRUCTURES AND FARMSTEAD PLANNING.
- " V. SHORT COURSES.
- " VI. MEETINGS.

PROJECT 1. - FARM DRAINAGE DEMONSTRATIONS.

- OBJECT:**
- (1) To demonstrate the right methods of draining farm lands by the use of tile and open ditches.
 - (2) To impress upon the farmers the value of their marsh or other lands too wet to cultivate.
 - (3) To guide land owners in the steps leading up to the organization of drainage districts for the drainage of large areas.

- IMPORTANCE:**
- (1) Practically every farm has some cultivated land that could be greatly increased in productive value and made safe by drainage. Farmers lose thousands of dollars annually by working land improperly drained. Tile drainage increases the productive value of land at least \$20.00 per acre.
 - (2) Virginia has 1,038,000 acres of land unfit for cultivation without drainage improvements, and 1,448,000 acres in need of community drainage. In addition to the above, there are thousands of acres under cultivation that should be tile drained, if economical production is to be secured.

PROCEDURE: Promotion of drainage through demonstrations, meetings, bulletins, circulars, and other publicity methods.

The Agricultural Engineering Department will:

- (1) Furnish County Agents with educational publicity material for use in their county papers; supply the agent with drainage circulars, bulletins, and other material for distribution.
- (2) Send an engineer into the county to make a survey of the land to be drained; furnish a map showing the proposed drainage system; prepare a report on the project, giving instructions, amount of tile, estimate of cost, etc.; stake out the system and demonstrate the proper methods of construction when the tile has been delivered.
- (3) In counties where there is sufficient interest in drainage, help organize a ditching machine company or secure a contractor with ditching machine to do ditching work in the county.

The County Agent Will:

Promote the project in his county by distributing the publicity material, bulletins, etc. furnished by the department.

- (1) Select reliable farmers in different sections of his county who have land in need of drainage and who agree to follow instructions.
- (2) Arrange for holding drainage demonstrations when the engineer makes the second trip to stake out the system and start the ditching work; advertise these demonstrations.
- (3) Obtain a record of the results gotten in his county due to the work of this project.

RESULTS: Results will be measured by number of acres drained as a result of demonstration increased returns from the land after drainage, as compared with the returns before the land was drained.

AGRICULTURAL ENGINEERING, - 1926

PROJECT 11, - TERRACING DEMONSTRATIONS.

- OBJECT:** 1. To demonstrate the method of preventing soil erosion by the use of the broad base, or Huguenot terrace.
- IMPORTANCE:** Soil erosion occurs to some extent in every county in the state, and in some counties it constitutes a very serious problem. Soil erosion results in a tremendous loss of fertility, as well as the soil itself. If not checked in time, it will necessitate the ultimate abandonment of the land.
- In twelve of the Southern Piedmont counties, erosion occurs extensively on about 10% of the farm land, or on 3,000 acres. The value of terracing improvements can be figured at from \$25.00 to \$50.00 per acre. Figuring conservatively at \$10.00 per acre, the value of the project could be estimated at \$3,000,000.00.
- PROCEDURE:** Promote terracing through demonstrations, meetings, bulletins, and other publicity methods.

The Agricultural Engineering Department will:

1. Furnish county agents with educational publicity material for use in their local papers; supply bulletins and other material on terracing for distribution; furnish agents with complete instructions on methods of handling projects
2. Send an engineer to the county to assist the agent in making surveys for and laying off terracing systems; construct one model terrace on each farm laid off; instruct interested persons in the use of the level in laying off terraces, and give talks at meetings.

The County Agent will:

1. Promote the project by distributing in his county the publicity material, etc. furnished by the department.
2. Select reliable farmers in different communities who have land in need of terracing who agree to follow instructions.
3. Make all the necessary arrangements for holding the terracing demonstrations such as having terrace drags ready, advertising the demonstrations, and arranging for at least three demonstrations, one each day.
4. Obtain a record of the results gotten in his county due to the work of this project.

- RESULTS:** Results will be measured by number of feet of terraces laid out and constructed; number of acres terraced; number of farmers attending demonstrations; spread of influence, etc.

AGRICULTURAL ENGINEERING, -- 1926.

PROJECT III. - FARM WATER SUPPLY & SANITATION.

- OBJECT:**
1. To demonstrate the most practical methods of securing running water and other conveniences in the farm home.
 2. To improve the sanitary conditions around the home and thereby help the health of the whole family.

As the ultimate object of Extension work is to improve the farm home life, this project should be the most important in Extension work.

IMPORTANCE: According to the best figures available, only approximately 10,000 of the 152,342 farms in the state have running water at the home. The lack of water and other conveniences entails great hardships on the farm women. By installing inexpensive water and sewage disposal systems, the women can be relieved of a lot of drudgery and the health and happiness of the whole family improved. Good health is fundamental to progress in all activities.

PROCEDURE: Promote the project in the county by means of meetings, demonstrations, bulletin newspaper articles and other publicity means. As this project deals directly with the farm home, it should be handled by the home demonstration agent where one is available.

The Agricultural Engineering Department will:

1. Furnish the agent with instructions on methods of handling this project; supply bulletins, plans, etc. for distribution on water supply, sanitation and home conveniences; furnish educational publicity material for use in the county papers.
2. Send an engineer into the county to visit the farm homes and advise on the most practical water system, sewage disposal system or other home conveniences; give an estimate of the cost of installing such conveniences, and advise where equipment can be secured, etc.

The County Home Demonstration Agent will:

1. Promote the project in the county by distributing the publicity material, etc. furnished by the department.
2. Select a number of farmers or farmers' wives who are interested in getting home conveniences; arrange for the engineer to visit these homes (several visits can be made in one day).
3. Obtain a record of the results gotten in the county due to the work of the project.

RESULTS: Results will be measured by number of water systems, sewage disposal plants, conveniences, etc. installed in the county.

AGRICULTURAL ENGINEERING, 1925.

PROJECT IV. - FARM STRUCTURES AND FARMSTEAD PLANNING.

- OBJECT:**
1. To demonstrate the use and value of modern farm buildings.
 2. To demonstrate the value of proper arrangement of buildings, fields, etc. so as to conserve labor.
- IMPORTANCE:** The farmers of the state have \$268,000,000.00 invested in farm buildings, or more than the combined value of implements and livestock. Thousands of dollars are spent annually by farmers for new buildings. In most cases, these buildings are constructed without plans and the farmer often finds, after he has finished a building, that it is not what he wanted. By using a good plan, he can usually save money and get a building suitable to his needs.
- PROCEDURE:** Promote better buildings through the distribution of standard building plans, bulletins, etc.
- The Agricultural Engineering Department will:
1. Furnish the agent with educational publicity matter for use in local papers; supply bulletins on farm buildings, concrete construction, etc.
 2. Furnish the agent with blue prints, specifications, and bills of material for any farm building needed by any of his farmers; prepare new plans when requests cannot be filled from plans on hand.
 3. In cases of community buildings, such as packing houses, county fair buildings, etc. send an engineer to the county to lay off the grounds, buildings, etc.
 4. Answer all requests for information on the farmer's building construction problems.
- The County Agent will:
1. Promote the project in his county by distributing the publicity material, etc. furnished by the department.
 2. Select farmers who intend to build and send to the department for plans and other information relating to the proper construction of the structure in question.
 3. Obtain a record of the results gotten in his county due to the work of this project; cost of structures, and changes made in plans, if any.
- RESULTS:** Results will be measured by number of new buildings constructed, old buildings remodelled, value of new structures constructed, rearranged farmsteads, etc. and the spread of influence.

AGRICULTURAL ENGINEERING, 1926.

PROJECT V. - SHORT COURSES.

OBJECT: To give instructions in the operation, care and overhauling of farm power and operating equipment.

IMPORTANCE: The farm power and operating equipment projects are best handled through short courses. The farmers of Virginia have over \$50,000,000.00 invested in farm machinery. Thousands of dollars worth of new equipment is purchased annually, and there is need for still more use of labor-saving farm machinery. Thousands of dollars can be saved the farmers of the State by more intelligent care and operation of their equipment, which can best be learned at short courses.

PROCEDURE: Short courses, (one to four days) will be given as scheduled, and will consist of chalk talks and illustrated lectures, moving pictures, and practical work on the following general subjects as desired by communities.

Single cylinder gas engines,
Farm Motors, & Tractors,
Automobiles and trucks.

The Agricultural Engineering Department will:

1. provide an instructor.
2. Send a complete set of teaching equipment, such as charts, sectional models, tools and all necessary supplies.
3. Send out mimeographed programs and, when desired, assist with the publicity.

The County Agent will:

1. Make arrangements for a well lighted, warm room for handling the course. (It is suggested that these courses be put on in co-operation with the agricultural high school instructors, and the school shop be used.)
2. Provide for demonstration a used engine, tractor, automobile or truck, according to the course given.
3. Advertise the course and sign up the required number of farmers.
4. Obtain a record of the results gotten in his county due to the short course.

RESULTS: Results will be measured by number of farmers attending the course; number applying what they have learned to the operation of their own equipment, etc.

AGRICULTURAL ENGINEERING, - 1925.

PROJECT VI. MEETINGS.

OBJECT: To promote a better understanding of some of the more important agricultural engineering subjects.

PROCEDURE: Provide an spread information on certain subjects by means of meetings.

FOUR SUGGESTED SUBJECTS FOR MEETINGS.

1. Water Supply and Sanitation. Methods of getting running water in the home. Types of water supply systems. A discussion of the selection, arrangements, and cost of various fittings. Improving sanitary conditions by means of sewage disposal systems. Selecting lighting and heating systems and other home conveniences. Lantern slides and moving picture films will be used when possible. From one to two hours will be required for this talk.

2. Concrete Construction on the Farm: A discussion of aggregates, quantities and proportions of materials; construction of forms; mixing and handling; principles of reinforced concrete; surfacing and water proofing and typical applications of concrete on the farm. Where possible, this lecture will be illustrated with lantern slides. One to two hours required for this talk.

3. Land Reclamation: A general discussion, covering the general principles of practical farm drainage, terracing or land clearing as applicable to community benefits to be derived from drainage, terracing or land clearing; costs, construction, etc. This talk will be illustrated with lantern slides whenever possible. Time required, one to two hours.

4. Farm Structures and Farmstead Arrangement: The need for better planned and arranged buildings on the farms; standard types of construction; materials; estimating; costs; laying out fields and buildings so as to conserve labor. Lantern slides will be used when possible. One hour required for this lecture.

The Agricultural Engineering Department will:

1. Provide the lecturer.
2. Furnish all charts, lantern slides, etc. needed for the lectures.

The County Agent will:

1. Advertise the course and provide a place of meeting.
2. Obtain a record of the number of farmers attending meetings.

RESULTS: Results will be measured by number of farmers attending lectures and number applying what they have learned.

RESEARCH PROJECT OUTLINES

HYDRAULIC RAM INVESTIGATIONS

By

DEPARTMENT OF AGRICULTURAL ENGINEERING

VIRGINIA POLYTECHNIC INSTITUTE

1934-1935

The principle of the action of the hydraulic ram was recognized in 1778, and the first self-acting ram was built in 1794. Since that time, quite a little experimental work has been done, but more or less of a commercial nature.

While the hydraulic ram is an old pumping device, its application is not so widely understood as it should be. People throughout the State show an utter lack of information on this subject. During the past few years, the Department of Agricultural Engineering has had an opportunity to make a study of the farm water supply in the State at close range. The department has, by request, made surveys for sixty four ram installations during the past year. In most cases, the entire water supply comes from these springs, which means an enormous expenditure of time and energy in carrying the amount of water used an average distance of several hundred feet, and an average elevation of possibly 35 feet. Recognizing the lack of dependable information on the subject of ram installation, and the very positive need for it, this department will endeavor to obtain it in such a way as to be of practical benefit to the average user.

OBJECT: An investigation of the operation of hydraulic rams working under practical conditions.

PROBLEMS: The problem will be conducted, having the following points in mind:

- (1) To test the efficiency of all makes of rams used in this State. Each ram to be installed and worked under similar conditions.
- (2) To determine the advantages of a stand pipe. To note the effect the stand pipe has on the operation of the ram at different distances from it. To check the formula now used for different pipe lengths.
- (3) To find the minimum flow necessary to operate all the smaller rams, working under practical conditions.
- (4) To get the most efficient relation between fall and length of drive pipe. To get a definite relation between fall and elevation.
- (5) To get some data on friction as applied to the delivery pipe.
- (6) To experiment with different sizes of drive pipe on the same ram.

(V) To get the most efficient number of strokes per minute for the different heights of fall and lengths of drive pipe.

PROCEDURE: The investigation will include the installation and running of all runs that are available. No difficulty is anticipated in getting one or more of all the well known runs. The smaller sized will be used, as they are more applicable to Virginia conditions. The work will be done in the rear of the Farm Machinery Laboratory. Water from the college tank is accessible there; it is convenient to the tool room, and the contour of the grounds lends itself admirably to hydraulic run conditions. The various manufacturers are expressing their desires cooperatively by consigning the needed equipment. With the possible exception of a small outlay for pipe fittings, the equipment will represent no money.

GRADUATE REQUIREMENTS: This investigation will represent the major subject for a degree in Master of Science in Agricultural Engineering to Mr. C. E. Robeson. He will meet the following requirements:

(1) Regular attendance of graduate seminar in Agricultural Engineering during the school year 1924-1925

(2) An accepted thesis, typewritten and bound, upon the investigation to be divided into these general heads:

- | | |
|------------------|----------------------------|
| (a) Introduction | (f) Content |
| (b) Object | (g) Calculations |
| (c) Theory | (h) Curves |
| (d) Subject | (i) Results |
| (e) Arrangement | (j) Summary and Conclusion |

(3) A year of resident work:

1. June 1924, to Sept. 1924, academic work,--obtaining 60% studying all available literature on hydraulic runs.

2. Sept. 1924, to June 1925, academic work,-- investigation work as outlined.

(4) The following academic subjects will be required; Business Law, Industrial History.

(5) An examination in the major subject will be required after the completion of all other work for the degree.

AN ECONOMIC STUDY OF FERN WATER POWER PLANTS.

The subject of power developed from small streams for farm use receiving widespread attention throughout the State. Authentic information is lacking as to the cost of such development. There are hundreds of installations of water wheels and water turbines in this State, and a study should be made of their installation for the purpose of finding out the cost of such installations.

OBJECT: To obtain reliable information on the methods, costs and uses of water power plants.

PROBLEM: An investigation of fern water power plants, with special reference to the economy of such installations

1. To what extent are water power plants being used in Virginia, and for what purpose,
2. What types of water power plants are being used in Virginia, and what are the best conditions for their use?
3. What is the average life of such plants, and the cost of operation?
4. What is the average cost of installing water power plants?

PROCEDURE: A list of water power installations of all types in Virginia will be secured from manufacturers of such plants, County Agents and other sources. A questionnaire will be sent to all the owners of such plants in order to get the information necessary for making this study and arriving at conclusions.

GRADUATE REQUIREMENTS: This investigation will represent the major subject for a degree of Master of Science in Agricultural Engineering for H. E. Wallace. He will meet the following requirements:

1. Regular attendance of graduate seminar in Agricultural Engineering during the school year 1924-1925.

2. An accepted thesis, typewritten and bound, upon the investigation, to be divided into the following general heads:

- | | |
|------------------|----------------------------|
| (a) Introduction | (b) Calculations |
| (b) Object | (b) Curves |
| (c) Theory | (c) Results |
| (d) Subject | (c) Summary and Conclusion |
| (e) Arrangement | (c) Bibliography |
| (f) Contact | |

3. A year of resident work:

(1) September 1924 to June 1925, academic work, - investigations as outlined.

(2) An examination in the major subject will be required after the completion of all other work for the degree.

THE APPLICATION OF ELECTRICITY TO AGRICULTURE

This is a problem of state wide interest and importance. The constantly increasing shortage of farm labor has made it necessary that the farmer adopt labor saving devices and practice 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 farmer's 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.

The economic features of the application of electricity to agriculture are of first importance from the farmer's standpoint. He is vitally interested in knowing the comparative costs of the various methods of getting electricity on the farm, such as purchasing electric power from central service electric power companies, using isolated gas engine electric plants, using farm water power plants.

OBJECT: To obtain reliable information on the methods, costs and use of electricity on the farms of Virginia.

PROBLEM: An investigation of the present available sources of electricity power, covering its application to agriculture.

1. To what extent is electricity now being used, and for what purpose, on the farms of the State?
2. What are the methods of supplying electric service to rural customers.
3. What are the costs of supplying electric service to rural customers?

PROCEDURE: The method of procedure will be to send a questionnaire to all electric power companies in the State. In this questionnaire, the companies will be asked for the number of farm customers they are serving; amount of electricity used by each farm customer; number of farmers to the mile of transmission line; type of contract; rates charged farm consumers; method of financing the rural distribution lines; names of farmers who are on rural lines. A questionnaire will also be sent to the farmers having individual electric light plants, in order to get the information required in regard to these plants. Tests will be run on the individual electric light plants in the department laboratory to get the K. W. hour cost of electricity from this source. Comparative tests will also be run on feed grinding with electricity from this source, as compared with gas engine, power.

GRADUATE REQUIREMENTS: This investigation will represent the major subject for a degree of Master of Science in Agricultural Engineering for Mr. F. H. Sommerville. He will meet the following requirements:

1. Regular attendance of graduate seminar in Agricultural Engineering during the school year, 1924-1925.

2. An accepted thesis, typewritten and bound, upon the investigation, to be divided into the following general heads:

- | | |
|--------------------------|------------------|
| (a) Introduction | (e) Arrangement |
| (b) Object | (f) Conduct |
| (c) Theory | (g) Calculations |
| (d) Subject | (h) Curves. |
| (i) Results | |
| (j) Summary & Conclusion | |
| (k) Bibliography | |

3. A year of resident work;

(1) September, 1924 to June 1925, academic work investigations as outlined.

(2) The following academic subject will be required: Industrial History, Business Law-two terms- Elements of Electrical Engineering.

(3) An examination in the major subject will be required after the completion of all other work for the degree.

SPRAY EQUIPMENT INVESTIGATION.

FOREWORD: The control of insect and disease parasites of fruit crops is one of the major problems of the fruit grower. Methods of control have been determined in a large measure, yet a considerable percentage of loss occurs each year. This loss must be the result of the orchard being under-equipped with spray outfits; to the use of faulty equipment, or to the poor application due to the personnel of the labor force, weather conditions, etc.

At this time, we are particularly interested in the type of outfit offered to the grower. High powered outfits of large capacity, working under very heavy pressure are generally advocated as a means of rapid and efficient application. The larger outfits are a labor saving development and came into use both on account of labor shortage and for the reason that finely divided spray is said to be more effective in parasite control. Very high power engine and large pump capacity are necessary to secure a large volume of spray and at the same time to deliver it in a finely atomized form. The use of such equipment is very expensive; the initial cost is high and constant repairs are necessary, due to the fact that the outfits are worn at full, or over, capacity. Any further increase in pressure can only be met by the companies redesigning the outfits, according to the work received from the manufacturers of spray outfits. Redesigning is very expensive and the cost would be passed on to the grower at a time when economy in production is especially essential.

The spray outfits have now reached the size that limits their rapid transportation through the orchard and limits the use of the larger outfits on the rougher orchard lands. A size limit has to be reached at some point; this limit should be at the point where efficiency of application and economy of use coincide. No data are available to fully determine the efficiency and economy of the various per minute rates of application now available by the use of various types of modern equipment. Neither is the effect of degree of atomization or the covering power of the spray material, burning, amount of material used, nor the required type of outfit, etc. known. It seems as though there is a real need for a study of some of the physical problems connected with orchard spraying and the following tentative outline is suggested for such an investigation.

PROBLEMS: An investigation of spray equipment, with a special reference to effects of size of nozzle orifice and pressure on atomization of spray material and the resultant effects on:

1. Covering power of the spray material.
2. Penetration power of the spray material.
3. Carrying power of the spray material.
4. Economy of spray material.
5. Emission of force of spray material.
6. Injury to fruit and foliage.

In addition, the corrosive action of the spray material in increasing the size of the nozzle orifice, under different pressure constants will be measured. Its necessity will be recorded as they come to light.

EQUIPMENT AND MATERIALS: A five-horse-power Deering spray outfit is available to furnish power for the tests. If higher power than the Deering outfit will furnish is thought advisable, it is probable that such a pump can be secured from the Engineering College. If found advisable, other makes of spray outfits will also be used.

The Frieda type nozzle will be used in the test. The Frieda Manufacturing Company will probably furnish these accessories free of charge. Instruments for accurately measuring the size of the orifice and for correctly determining amount of pressure can be obtained from the Engineering College.

A mechanical driven sprayograph can possibly be secured from the Iowa State College. Dyes & color spray material, gasoline, photographic supplies, etc. will have to be purchased; screens for penetration tests can be purchased or obtained from hardware or spray companies. Some method of measuring impaction force will have to be devised if this information is to be secured.

PROCEDURE: The laboratory procedure involves the testing of several definitely measured nozzle orifices under numerous pressure constants. The distance from the spray nozzle at which tests will be determined will be varied for each pressure constant, so that they approximate field conditions under which spraying is done. (See graphic outline)

The effect of each test will be recorded for atomization of spray material, covering power, penetration, carrying power (horizontally and at incline) amount of discharge per minute, rate of erosion of the orifice, impaction force, etc. The power required in each case will be determined.

GRADUATE REQUIREMENTS: The investigation will represent the major subject for a degree of Master of Agricultural Engineering to Mr. W.F. Simpson. He will meet the following requirements.

1. Regular attendance of graduate seminar in Agricultural Engineering during the school year, 1924 - 1925.

2. An accepted thesis, typewritten and bound, upon the investigation, to be divided into three general heads:

- | | |
|-------------------|-----------------------------|
| (a) Introduction, | (f) Conduct. |
| (b) Object, | (g) Calculations. |
| (c) Theory, | (h) Curves. |
| (d) Subject, | (i) Results. |
| (e) Arrangement. | (j) Summary and conclusion. |

3. A year of resident work.

1. June, 1924, to September, 1924, academic work, - obtaining and studying all available literature on spray equipment.

2. September 1924 to June, 1925, academic work, - investigation work as outlined.

3. The following academic subjects will be required, Industrial History, Business Law.

4. An examination in the major subject will be required after the completion of all other work for the degree.