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A. H. VanLandingham

Science

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FUTURE HOME ECONOMISTS

AGRICULTURAL SCIENTISTS

FORESTERS OF TOMORROW

★ TEACHING
★ RESEARCH
★ EXTENSION
★ SERVICE TO THE STATE

AGRICULTURAL EXPERIMENT STATION

WEST VIRGINIA UNIVERSITY

MARCH 1959

BULLETIN 426

(Parts 1 and 2)

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Science SERVES YOUR FARM AND HOME

ANNUAL REPORT OF A. H. VANLANDINGHAM, DIRECTOR, WEST VIRGINIA UNIVERSITY AGRICULTURAL EXPERIMENT STATION FOR THE PERIOD 1957-58

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IN THIS ISSUE

on our cover

The College of Agriculture, Forestry, and Home Economics at West Virginia University is the seat of agricultural, forestry, and home economics education and training in the State. Whether in the classroom and laboratory on the campus at Morgantown, or at a garden demonstration plot meeting in Wyoming County, the College seeks to serve producers, consumers, and all of the State's citizens as completely and effectively as possible.

The ingredients of this service are know-how, information, and encouragement, carried to wherever they are needed by the teacher, the researcher, and the extension worker.

Naturally, when the College is mentioned, folks think first of Oglebay Hall and the other facilities required to handle the hundreds of students attending classes on the campus. But this is only a small part of the College's activities.

The Agricultural Extension Service carries the work of the College into the homes and onto the farms of citizens throughout the State. The many activities of the Extension Service are discussed on Page 8.

Providing know-how and information is the primary responsibility of the Experiment Station. Through research projects here and in cooperation with many other experiment stations, the answers to agricultural questions are sought. Read about Research on Page 3.

Agriculture is big business, requiring many services. Your College of Agriculture, Forestry, and Home Economics wants to serve that business in the best manner possible.

on the calendar . . .

APRIL—

18—Little Eastern National Livestock Show, Morgantown

MAY—

1—1959 Dairy Cattle Congress, Morgantown

JUNE—

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406. Homer C. Evans. Competition and Apple Prices—(With Emphasis on Processors in the Appalachian Area). June 1957.
407. T. B. Clark. Turkey Breeder Flock Management and Artificial Insemination. June 1957.
408. K. L. Carvell. Convert Unproductive Hardwood Stands to Desirable Forest Types. October 1957.
409. G. C. Anderson, C. J. Cunningham, J. O. Heishman, E. A. Livesay. Roughage Supplements in Rations for Wintering Yearling Cattle. October 1957.
410. I. D. Porterfield, A. D. Longhouse, H. O. Henderson. Choose Comfortable Stalls for Your Dairy Cows. November 1957.

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412T. D. A. Hutchison, R. S. Dunbar, Jr., H. O. Henderson. Reproduction in the West Virginia University Dairy Herds. May 1958.

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414T. Anthony Berg, Genevieve Clulo Berg, C. R. Orton. Internal Bark Necrosis of Apple Resulting from Manganese Toxicity. June 1958

415. O. J. Burger, F. W. Glover, Jr. Smooth Brome Grass Varieties for West Virginia. June 1958.

416. Homer C. Evans, Ray S. Marsh. Cost and Mechanical Injury in Handling and Packing Apples. June 1958.

417. Roger W. Pease. Marketing of Ornamental Shrubs and Trees by West Virginia Nurseries. June 1958.

418. P. John Zachariah, K. C. Elliott, R. A. Phillips. Performance of Forage Crushers. June 1958.

419T. P. John Zachariah, Ross Phillips. Design and Construction of a Torsion Dynamometer. June 1958.

420T. H. L. Barnett, V. G. Lilly. Parasitism of *Calcarisporium parasiticum* on Species of *Physalospora* and Related Fungi. June 1958.

421. Wallace W. Christensen, Allen W. Goodspeed. Marketing Forest Products in West Virginia. June 1958.

422. Annual Report of A. H. VanLandingham, Acting Director, Science Serves Your Farm. June 1958.

423. C. J. Cunningham, G. C. Anderson, J. O. Heishman, E. A. Livesay. Value of Creep Feeding in Production of Feeder Calves. November 1958.

424T. E. H. Tryon, K. L. Carvell. Regeneration Under Oak Stands. November 1958.

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105. C. K. Dorsey. Termites and Carpenter Ants in West Virginia. April 1958.

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17. M. W. Johnson, R. J. Friant, W. L. Haltiwanger, V. L. Bolyard. Results of Hybrid Corn Yield Trials in West Virginia, 1956. February 1957.

18. M. W. Johnson, R. J. Friant. Hybrid Corn Performance Trials in West Virginia, 1957. February 1958.

19. Leonard M. Sizer. Population Estimates for the Counties of West Virginia, July 1, 1957. February 1959.

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513. Frederick S. Jewell. Insect Transmission of Oak Wilt. *Phytopath.*, Vol. 46, No. 5:244-257, May 1956.

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(*Continued on reverse side*)

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OUR AGRICULTURAL PROGRAM

YOUR State University's Agricultural program is geared to serve YOU . . . on the farm, in the home, in business, or in industry.

YOUR State University's agricultural research program is designed to pave the way to better living and better farming in West Virginia.

ON FEBRUARY 7, 1867, the West Virginia Legislature accepted the offer of Monongalia Academy and established the "Agricultural College of West Virginia" at Morgantown. This marked the beginning of the University's service to the citizens of West Virginia. Agriculture has been a part of that record of service since the beginning. It was not until 1895, however, that the work in Agriculture was organized as a College of Agriculture. Agricultural courses had been offered from the outset but agricultural research did not become an important activity until passage of the Hatch Act in 1887.

The Division of Agricultural Extension was organized in 1912 as a part of the College of Agriculture, and in 1914 the Department of Home Economics was transferred to the College of Agriculture. It was not until 1937, however, that the program in Forestry, begun in 1935 as a two-year curriculum in the College of Agriculture, was expanded to a four-year course, and the name of the sponsoring unit was changed to the College of Agriculture, Forestry, and Home Economics.

A People's Institution

As a Land-Grant University, established under the Morrill Act of 1862, West Virginia University has been truly a people's institution and, during the first half century of its existence when the State was so predominantly agricultural, the College of Agriculture exerted a very marked influence upon the life and work of the people of West Virginia. Our citizens have come to lean heavily upon the research findings of the Agricultural Experiment Station brought to them through the efforts of the Cooperative Extension Service in Agriculture and Home Economics. Throughout the years there has been a continuation and an improvement of this program of helping people help themselves.

This team effort of Research and Extension when combined with Resident Instruction and expanded to include not only Agriculture, but Forestry and Home Economics as well, has been of vital importance to every man, woman and child in West Virginia. This work has been of special significance to those of our people who are engaged in agricultural production whether of grain, livestock, fruits, vegetables or ornamental plants. It has guided the

ATOMIC ENERGY—as used in agriculture—will benefit mankind. This is one of some 150 studies being carried on by scientists of the Agricultural Experiment Station.

FIELD DAYS give the University opportunity to inform people of the results of research. Research information is also distributed through publications, press, TV and radio.

YOUR State University maintains five farms near the campus. Here is a view of the Dairy Farm and the University's outstanding, record-producing Holstein herd.

activities of food processors whether in canneries, milk processing plants or meat packing plants, and has been of inestimable service to those of our citizens engaged in marketing activities such as buying, selling, transporting, storing, packaging, wholesaling and retailing agricultural products.

Programs Important to Industry

The programs in Resident Instruction, Research and Extension have been important for dealers in farm machinery, for the manufacturers and marketers of fertilizers, pesticides, and other farm supplies. It is estimated that the Agricultural Experiment Station and the Extension Service have provided and are now providing vitally needed information and help for two persons employed in off-farm agricultural work for every one person engaged in producing food and fiber on our farms and in our orchards.

The impact of Home Economics on the pattern of living in our homes in West Virginia has helped to bring about improved nutrition, more adequate health programs, and a higher standard of living. Home management, clothing construction, foods, home furnishing, and various other educational programs in home economics are contributing to the health and happiness of our citizens.

The main stream of activity of the College of Agriculture, Forestry, and Home Economics has been and continues to be involved with helping the people of our State improve their efficiency and aiding them in achieving a pattern of family living compatible with our modern democratic society.

The work in Forestry, although only about twenty years old, has already made tremendous contributions through the education of young men who have been employed in large numbers by the Conservation Commission, by the National forests within our State and by private interests who have seen the need for and the economic desirability of forest management.

Outstanding Research Program

From a research standpoint, the West Virginia Agricultural Experiment Station has long enjoyed an enviable record both within West Virginia and throughout the Nation. Outstanding recent research discoveries of the West Virginia Station include:

(1) Isolation and identification of the infectious synovitis virus in poultry. Subsequent work on control measures has, by conservative estimate, saved thousands of dollars for West Virginia poultry producers. The nation-wide effect of these discoveries would run into many millions of dollars in savings to producers, such savings reflected in the providing of poultry products to consumers at lower cost.

Semen Extender Developed

(2) Development of a semen extender utilizing coconut milk. This discovery enables the artificial insemination industry to store semen for relatively long periods of time at room temperatures, thus resulting in considerable savings in refrigeration facilities and in technicians' time. Further, it is expected that this extender will improve conception rates. This development, which has only recently undergone successful field testing, has worldwide application for all species of domestic animals and perhaps even in human therapy. It promises to be of untold value to the livestock industry. (This work has been done cooperatively between the College of Agriculture, Forestry and Home Economics and the College of Arts and Sciences at West Virginia University. See story on this research on center spread, this issue.)

Carotene Producing Fungus

(3) The isolation and control of a fungus which produces carotene (precursor of vitamin A) in quantities so as to make it economically feasible to produce this very scarce vitamin in commercial quantities for addition to food products.

This research, done in the Department of Plant Pathology, Bacteriology, and Entomology may well prove to be a Godsend to the underdeveloped countries in the world where the diet is lacking in vitamin A. The effects of vitamin A deficiencies cause poor vision or even blindness.

This discovery of a carotene producing fungus also offers a valuable addition to medical practice. It is expected that this process can be utilized in the production of commercial food and feeds for human beings and livestock.

Here, then, is another bit of basic fundamental research which, in the years ahead, will be worth many millions of dollars to the people of the Nation and to the world. This is to say nothing of the untold millions of dollars that this discovery may be worth in terms of preventing human suffering and in improving the health of human beings and of livestock.

22.7% Basic Research

The West Virginia Agricultural Experiment Station is proud of the fact that 22.7 per cent of its research, currently under way, is classified as basic research.

It would be possible to list many other accomplishments and contributions of the Agricultural Experiment Station, but the above-de-

(continued on page 18)

The Program In
RESIDENT INSTRUCTION

AGRICULTURE

FOURTEEN curricula are offered in the Division of Agriculture. Twelve curricula lead to the degree of *Bachelor of Science in Agriculture,* one curriculum in Agricultural Science leads to the degree of *Bachelor of Science,* and the curriculum in Agricultural Engineering leads to the degree of *Bachelor of Science in Agricultural Engineering.*

All candidates for the degree *Bachelor of Science in Agriculture* are required to take a core curriculum which includes 8 hours of biology, 8 hours of chemistry, 9 hours of English, 3 hours of economics, 3 hours of mathematics, 3 hours of history, and 3 hours of political science. All students except Agricultural Education majors are required to take 8 hours of physics. These requirements are in addition to the Military Science and physical education requirements. At least 60 hours of required or elective work must be taken in the College of Agriculture. A total of 144 semester hours and a grade-point average of at least 2.0 (C) are required for graduation.

The curriculum in Agricultural Science requires only 45 hours of courses in the College of Agriculture, but a total of 144 hours for graduation is the same as for all other curricula in Agriculture, and the subjects required include the core of courses previously listed.

Agricultural Engineering

Students in Agricultural Engineering are classified in the College of Engineering during the first three years, after which they are transferred to the College of Agriculture, Forestry, and Home Economics for their senior year. The program in Agricultural Engineering provides its students with general training in engineering fundamentals. Considerable stress is given to the basic requirements of animal and plant life on the farm as they affect engineering practices, but greater emphasis is made on a thorough knowledge of those underlying principles and methods which are the foundation of all engineering professions.

Enrollment Figures

Enrollment in Agriculture during the period 1950 to 1958, with the projected forecast for 1965 and 1970, is shown in Figure 1, where a comparison of enrollments in Home Economics and Forestry with Agriculture can be readily noted.

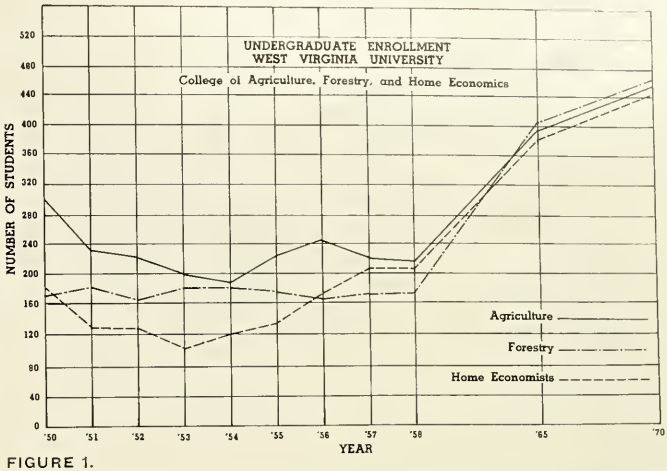


FIGURE 1.

Graduate enrollment during the past eight years is shown in Figure 2, for Agriculture and Home Economics. At present there is no graduate program in Forestry but it is contemplated that such a program will be initiated within the next few years. There is a great demand for graduate study in Forestry, and West Virginia Forestry graduates are now being forced to go out of the State to receive their graduate training.

In Figure 3 are shown the number of students taught during the academic year 1957-58 by the various departments in the Division of Agriculture. Figure 4 indicates the number of *full-time equivalent* staff members in the various departments.

The number of undergraduate and graduate students majoring in each department or curriculum is shown in Table 1.

Job Opportunities Great

Job opportunities across the Nation for Agricultural graduates in recent years have run about three jobs for each graduate. Starting salaries are in the neighborhood of $4,000-$5,000, depending upon the field and the qualifications of the graduate. Placement has presented a problem only in so far as there

FIELD TRIPS to observe practices of large agricultural industries play an important part in the student's training.

STUDENTS have advantage of working with the newest in equipment in the College's well-equipped laboratories.

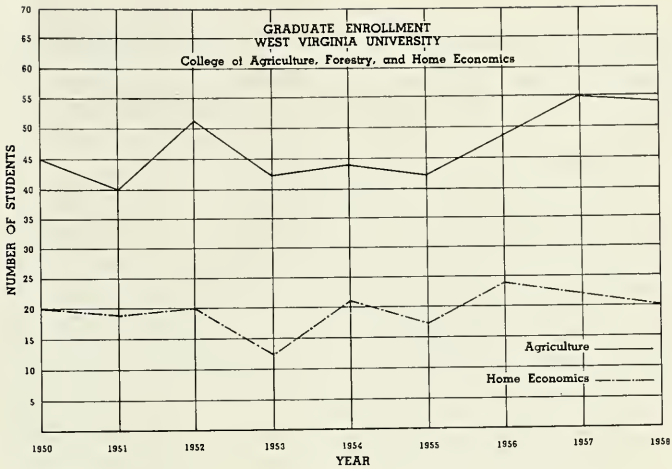


FIGURE 2.

TABLE 1. NUMBER OF MAJORS IN EACH DEPARTMENT, FIRST SEMESTER 1958-59

DEPARTMENT	UNDERGRAD.	GRAD.
Agricultural Biochemistry	—	7
Agricultural Economics	—	2
Agricultural Education	60	3
Agricultural Engineering	13	3
Agricultural Mechanics	22	—
Agronomy and Genetics	5	8
Animal Husbandry	37	2
Dairy Husbandry	18	4
Horticulture	7	4
Plant Pathology	—	14
Poultry Husbandry	4	4
Pre-Veterinary Medicine	19	—
General Agriculture	21	3
Agricultural Science	8	—
TOTAL	214	54

have not been sufficient graduates to meet the needs of industry, government, and educational institutions after allowing for those who return to the farm or go into business for themselves or with their relatives.

There is need for additional teaching staff members in Agricultural Engineering, Agronomy and Genetics, and in Animal Husbandry and Pathology. More effort must be made in advising undergraduates and in the freeing of staff members from teaching duties so as to provide them with an opportunity to advise and counsel with students.

FORESTRY

THE Division of Forestry offers four curricula leading to the degree of Bachelor of Science in Forestry. The four curricula are Forest Management, Wildlife Management, Wood Industry, and Wood Technology. The first year of work is the same in all four except that students majoring in Wood Technology must take college algebra. This allows students to complete the freshman year before choosing a curriculum.

The Forest Management curriculum is designed to train students for a professional forestry career in the management of public or private forest land. A little more than half of the graduates in the Forest Management curriculum hold positions in public forestry. They are employed by such agencies as state forestry and conservation departments, the U. S. Forest Service, and the Soil Conservation Service. Somewhat less than half are employed by private forest land owners, both corporate and individual, or they may enter business as consulting foresters.

Wildlife Management

The Wildlife Management curriculum gives basic undergraduate training in wildlife and fisheries biology. Graduates in this curriculum are qualified for positions with State and Federal government agencies in wildlife or fisheries management. Majors in this curriculum are encouraged to enroll for graduate work in other institutions as many wildlife and fisheries biology positions require the Master's degree.

The Wood Industry curriculum is designed primarily to develop qualified foresters for work with wood-using industries. The wood-using industry that includes basic lumber products, lumber and veneer products, paper and allied products ranks fourth in the Nation with respect to wage earners employed.

The Wood Technology curriculum is intended to prepare students to pursue graduate work in the technical phases of wood use or to enter directly into positions dealing with the conversion of forest crops into useful products. Graduates may be employed by governmental agencies or by private industry.

Summer Camp

Students in all four curricula are

THE Division of Home Economics offers a wide variety of training for ambitious young women. This training will lead to careers in nursing, foods and nutrition, research, teaching, textiles, costume design, and many other positions in industry.

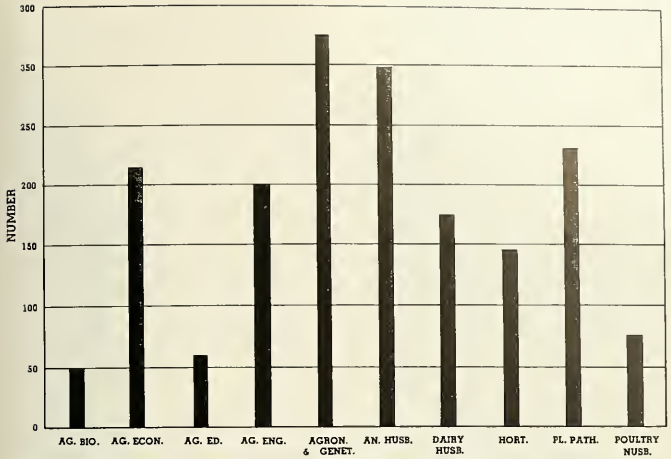


FIGURE 3. Number of students taught during the academic year 1957-58.

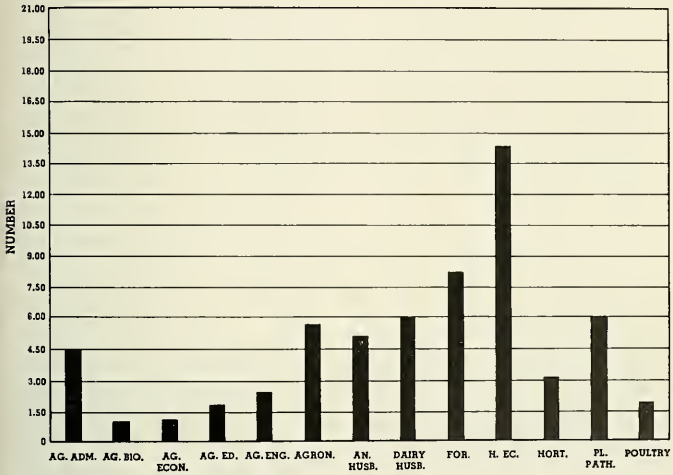


FIGURE 4. Number of full-time equivalent teaching staff members by department.

required to attend the ten-week summer camp during the summer preceding their junior year. The program at the summer camp is concerned with applied or practical work in forest management, wildlife, and wood utilization, according to the major of the student; all participate in forest mensuration and surveying. These are the types of work that the student will be doing when he is employed following graduation. The scientific basis enabling him to do the work has been presented to him during his freshman and sophomore years. Summer camp is an important part of the young forester's training.

Graduate Program Needed

A graduate program, giving students advanced work in the various aspects of hardwood forestry, is needed. At the present time, the Division of Forestry does not offer work beyond the Bachelor's degree. In the entire United States, there is no forestry school with a research program devoted primarily to hardwood forestry, other than the Division of Forestry at West Virginia University. Its location, in the center of the hardwood region; a strong active program in undergraduate teaching and research stressing hardwood forestry; and this country's complete lack of a graduate program

FORESTERS of tomorrow get first-hand instruction in all phases of forestry.

dealing with hardwood forests of the kinds which cover our Appalachian Mountains, all point to the desirability of offering graduate work in forestry at West Virginia University.

Graduate work cannot be started at this time, although the faculty has the ability to offer a strong program. More office and laboratory space and a forest with well-developed timber stands are needed. An increased faculty is also needed before starting graduate work so that our undergraduate program will not be weakened.

Forestry Teaches 1,183*

Enrollment in Forestry is shown in Figure 1. The number of full-time equivalent teachers is eight. The number of students taught by the Division of Forestry during the academic year 1957-58 was 1,183.*

Teaching funds from State appropriations allocated to the Division of Forestry for salaries total $51,800 and for labor and supplies total $10,700, making a grand total of $62,500.

There is urgent need for additional staff members in Forestry to provide for graduate work in the several areas of Silviculture, Wood Technology, Forest Economics and Wildlife Management. There are also needs for laboratories, classrooms and equipment to do a more adequate job of undergraduate instruction and to initiate a new program in graduate instruction.

Foresters in Demand

The growing appreciation of the importance of forestry in West Virginia has meant that placement opportunities for graduates are exceptionally good. During the academic year 1957-58, 24 of the 37 Bachelor of Science graduates entered work in West Virginia. There have been, in addition, many job opportunities

*This is the number of students in all classes and not necessarily different students.

(continued on page 15)

The Agricultural Extension Service

County agricultural agents, home demonstration agents, and 4-H Club agents carry the work of the College to farms, homes, and markets throughout West Virginia

THE Agricultural Extension Service is that division of the College of Agriculture, Forestry, and Home Economics that has the responsibility for developing and carrying out educational programs for farmers and homemakers throughout the State. The center of agricultural extension work in any county is the County Agricultural Extension Office, usually located at the county seat. The workers in these offices —county agricultural agents, home demonstration agents, and 4-H Club agents—are anxious at all times to assist any citizen of the county with problems in farming, gardening, and homemaking.

These workers, assisted by the extension specialists and supervisors at the College, develop programs of activity that will best serve agriculture and family living in their counties. The various types of farming, existing problems, and the desires of the county's citizens are taken into consideration when the program is planned and developed.

Agents Advise Farmers

One area in which the county agricultural agent is very active is that of advising farmers in farm management. Modern commercial farms are business operations, and some of them are quite large businesses. Farmers have many of the problems of other businessmen in obtaining efficient, low-cost production that will produce a profit. Increasing costs of farm production necessities makes close attention to the business management of the farm of utmost importance.

The Extension worker tries to provide assistance in several fields so that farm families can develop businesses that will improve their living conditions. Effective use of land, labor, and capital investment of the family is stressed. Sometimes expanded production so as to better use available resources is recommended. Extension workers help farm families set up adequate records systems, so that the family will have more information about the cost-and-return operations of their farming activities, and to provide data for the income tax and social security reports that are required by the Federal Government.

Farm and Home Plan

For those families that desire it, Extension workers will assist in developing a "Farm and Home Plan." Improvements of the farm over a period of several years are mapped out so that the goal of improved income is realized as farming efficiency is improved. The making of wise decisions, in view of the future course of family activities, is one of the outstanding points of the farm management program.

Detailed farm and home planning is frequently very rewarding. One farm family in Berkeley County changed farm enterprises and realized a net increase in income of $1,100 in one year. A farm operator in Greenbrier County, after making a detailed plan, was able to turn a losing operation into a profitable one. Another farmer discovered, after completing a detailed plan, that he could improve his forage production and thus enlarge his dairy herd. The income of his family was increased.

In Upshur County, detailed planning with the county agricultural agent helped several farmers expand into strawberry and poultry production. Improvements to the land and to the farm homes, as well as new equipment, were made possible in this case by developing operations which provided for the wise use of all resources at hand.

Detailed farm and home planning has paid off for many West Virginia farm families. The farm and home management approach to a farming operation brings the entire family into the planning and enables recommendations to be made in terms of the conditions actually existing on that particular farm.

Rural Development

During the past decade many of our rural communities have shown clearly that lasting economic and social progress can be gained if people are willing to join together in an organized effort to build better living. The Rural Development Program is designed to encourage local people and their leaders to give direction and provide the initiative for area economic development. At the same time, the program recognizes that many rural areas need special assistance in organizing and carrying forward such work.

Rural development includes a great deal more than improved farming and farm living. The prosperity and well-being of farm families depend in great part on the prosperity of counties and trade-areas in which they live and the essential community services they have available. Promotion of sound, permanent business and industry, attention to the educational needs of young people, adaquate health services—these all have a direct bearing on the welfare of the farm family. On the other hand, the general prosperity of rural communities is dependent on the success of the farm families which it serves. Thus, low-income farms represent a problem for everyone in such a community.

In the Rural Development program, local, state, and federal leaders try to bring about the maximum cooperation of all agencies, both government and non-government, that can make a contribution or help in the solution of a particular economic problem. Local leaders from all areas—farm, business, church, school and civic—are encouraged to take the reins of county programs into their hands and determine what should be done and what methods have priority. Some of the various programs have these elements:

Intensive educational work to improve farm and home management on small farms.

Technical Aid

Technical aid to help small farmers to better manage their soil resources through soil and water conservation, the use of fertilizers, and other techniques.

Expansion of industry and business opportunity in the county.

A campaign to help people obtain off-the-farm employment within the area.

Changes in vocational training and other educational programs to give young people skills in many

different trades and prepare them for opportunities in any expanding economy.

Improvement in community facilities.

Finally, a vigorous effort to gain the support of everyone, young people and adults, in working together to benefit the entire community.

Rural Development started in West Virginia early in 1957 when Lewis County was selected as one of several "pilot" counties in the nation. An associate county agricultural agent was assigned to the area to assist local groups with the organization of the program. Now this program has expanded to include two general areas.

Rural Development Areas

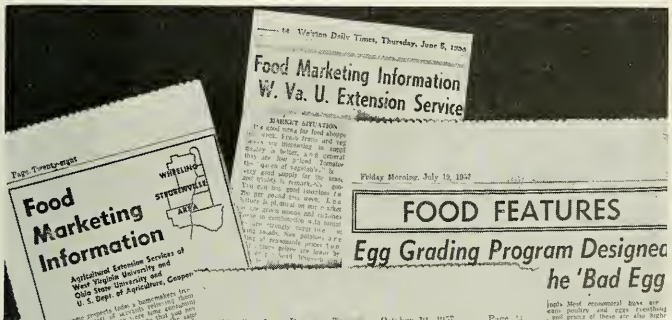
The area in the central part of the State includes Lewis, Braxton, Gilmer, and Upshur counties. The other, in the southern part, consists of Raleigh, Summers, and Fayette counties. Each of these areas is served by an Area Development Agent who is a member of the Extension staff. In some counties an assistant county agricultural agent has been assigned to work specifically with the program. The job of the Area Agents and the assistants are to help local groups with the organization and operation of the program.

Despite the newness of the Rural Development Program in West Virginia, tangible results have been reported. For instance, agriculture and labor surveys have been completed in the two areas by the Experiment Station. These surveys have provided information needed by the county industrial and agricultural committees in order to plan constructively.

One area of agricultural activity that has resulted from Rural Development planning is an increase in vegetable production. Production has expanded rapidly and the current acreage devoted to vegetable production exceeds 150 acres. Tomatoes, sweet corn, snap beans, cabbage, and other vegetables are grown and sold through the Farmers' Markets at Weston and Beckley. The Markets have cooperated by providing grading as well as marketing services.

CONSUMER MARKETING information includes food price and availability news, menu suggestions, "how-to" information for preparing, preserving. Consumer preferences are noted and reported to farmer, processor, and market operator.

ALL TYPES of media are used in distributing food and market information in Wheeling-Steubenville area. In 1958, specialists used 102 news releases, 158 radio broadcasts, 75 television shows. Reader-listener-viewership is rated high.



Western Ewes

Livestock farming has been strengthened appreciably by the addition of sheep on some farms. About 1,400 Western ewes have come into the Central area, contributing materially to increased income on livestock farms. Such expansion is expected to continue.

Most of the vegetable producers and many of the poultry and sheep raisers in the areas are new in the business and need help in determining the correct management and production practices.

Committees in all counties have been busy with efforts to secure small industries to provide off-farm employment. These efforts have met with limited success. Other committee projects have included watershed development, public health, library, and recreation programs.

The experiences of the farm and urban families and the leaders in these areas will be of interest to those concerned with area develop-

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Coconut Milk --

this new semen extender may revolutionize the artifical breeding industry.

Authors are Charles Norman, Associate Professor of Biology; C. R. Johnson, Graduate Student in Biology; I. D. Porterfield, Dairy Husbandman, Agricultural Experiment Station; and Robert S. Dunbar, Associate Statistician, Agricultural Experiment Station.

TWENTY years ago artificial insemination of dairy cattle was just beginning in the United States. Last year this practice had grown to the extent that approximately 7,000,000 dairy cows were bred artificially. Now there are close to 60 farmer cooperatives and 15 private businesses providing artificial insemination services.

In the past eight years, this new scientific technique has been responsible for a 20 per cent increase in total milk production, from 22 per cent fewer cows. Now it is no longer confined to dairy herds, but is being used more and more by the livestock industry to meet the demands of a rapidly expanding population.

New Technique Developed

Agricultural experiment stations, colleges, universities, and other institutions in all parts of the world are working to enhance and extend the benefits derived from artificial insemination. West Virginia University, through the joint research efforts of its biology and dairy husbandry departments, has contributed to this industry with the discovery of a new and improved method for storing bovine spermatozoa. This new method, if proven completely effective, promises to reduce the time required and eliminate the expensive refrigeration equipment needed in processing and transporting the sperm.

Chemical Inhibitor Desired

In 1955 a research project was started at the University which advanced the idea that bovine sperm could be preserved for long periods of time at room temperature by the use of chemicals. This idea was based on the assumption that reduction of the sperm's activity will prolong its life. Reducing sperm activity by lowering its temperature, the process currently used in the industry, represents one method of extending its life-span. Scientists have calculated that by lowering and maintaining the temperature of bovine sperm at −80°C. (that is 110° below zero, Fahrenheit), its laboratory life can theoretically be increased to 100 years. Supposedly the same end might be achieved by reducing the activity of sperm through the use of chemical inhibitors. Upon treatment with such a chemical, the sperm would become dormant and might then remain at room temperatures for long periods of time. The sperm could be reactivated (brought out of their resting state) either by the addition of another chemical compound which would neutralize the inhibitor, or by washing the sperm to remove the inhibitor.

In order to accomplish the objectives set forth in the original research proposal, it was necessary to find a diluent which would satisfactorily maintain sperm life at room temperatures. Among others, coconut milk was suggested and tested. It was found to possess the remarkable capacity of supporting bovine sperm at room temperatures.

Coconut Milk Ideal

In preliminary experiments with the new diluent, sperm dilutions were prepared which contained 50 per cent boiled coconut milk in addition to sodium citrate and the usual antibiotics. With this diluent it was possible to maintain the sperm in an active state with little or no

EVALUATING sperm activity. Worker A is measuring oxygen consumption (respiration); B, estimating motility with microscope; and C, determining acidity of coconut milk extender. As extender becomes more acidic, sperm is inhibited, thus decreasing activity.

mortality for approximately three days at room temperatures. After the third day it was found that the activity of the sperm had diminished considerably, although the number of living sperm cells indicated that there was still no mortality. The data collected from indicators of sperm activity—such as oxygen uptake or respiration, lactate production, and motility—showed that sperm stored for three days in 50 per cent coconut milk were actually inhibiting themselves by producing lactic acid. The lactic acid increased the acidity of the diluent, causing the sperm to become inactive. Presumably, the increased acidity blocks some of the life processes of the sperm cells, in turn slowing down their activity.

When the acidity was decreased, either by adding a neutralizer or by removing the old diluent and adding fresh diluent, sperm activity again resumed. Using this procedure, the sperm cells were kept alive at room temperatures for six to seven days.

Smaller Percentages Tested

Further experimentation with smaller percentages of coconut milk produced still more promising results. It was found that a diluent containing only 15 per cent coconut milk kept the sperm cells alive and active for 7 to 10 days. At the end of this period of relatively undiminished activity, the sperm showed signs of self-inhibition, but there was no appreciable death loss. When the sperm were kept in storage at room temperatures for three weeks, it was found that they could be reactivated by simply adding solid base "Tris" (hydroxymethyl aminomethane) to the diulent, making it less acidic.

So, at the present, a sperm diluent has been developed which, on the basis of laboratory tests, is superior to the milk or egg yolk citrate diluents now used. The coconut milk diluent will be more economical, since it requires no ice or refrigeration. It will be less expensive to ship, and its transportation by inseminators will be simpler and easier. Preparing coconut milk extender takes less time than the diluents now in use; with practice, a technician can make it up in about one hour, and it may be prepared in advance and stored either at room temperature or in the refrigerator.

Sperm suspended in the coconut milk can withstand greater fluctuations in temperature. Since the sperm cells retain their activity for 7 to 10 days with no appreciable loss of viability, farmers will have the advantage of a wide choice of bulls, and of selecting sperm from any bull on any day.

Field Tests Promising

A field trial was conducted in cooperation with the Maryland-West

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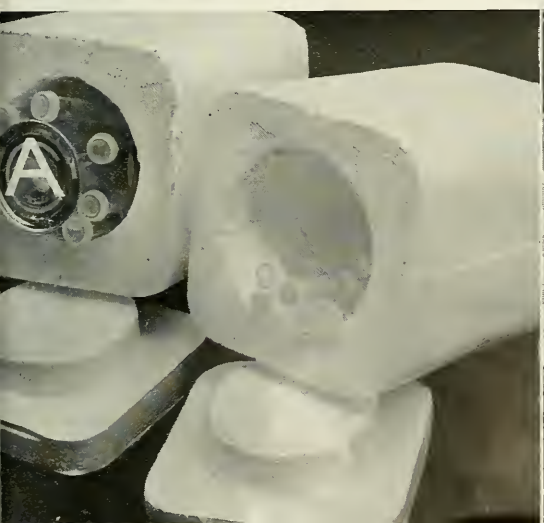
FRESH, undiluted semen is placed on warm counting chamber and sperm-count is made with microscope. Staining is technique used to differentiate live and dead sperm (slides in foreground).

APPARATUS for recording the oxygen used by the sperm (in coconut milk extender) during seven days of storage at room temperatures. Oxygen consumption indicates degree of sperm activity.



CAN of ice (A), needed in shipping refrigerated semen, is eliminated; space-weight advantages mean extra savings.

TRANSFERRING the diluted sperm, in coconut milk extender, to vials. Vials will be stored at room temperatures.

FARM AND FOREST PRODUCTION in West Virginia

by W. W. Armentrout, Agricultural Economist

THERE are several ways to indicate the importance of agriculture and forestry in the WestVirginia economy. One way is to compare the number of her people living on farms with those living in other places. Data in Table 1 show that 20 per cent of the State's population lived on farms in 1950. This percentage is probably somewhat smaller now, but the U.S. Census of 1950 gives the only recent breakdown of population by places of residence.

TABLE 1. POPULATION OF WEST VIRGINIA BY PLACE OF RESIDENCE, 1950

LOCATION	NUMBER	PER CENT OF TOTAL
Farm	410,922	20
Rural non-farm	900,143	45
Total rural	1,311,065	65
Urban	694,487	35
TOTAL	2,005,552	100

Another way to indicate the relative importance of agriculture and forestry is to compare the gross farm income with (a) the value of coal mined; (b) the value added to products by manufacture, and (c) the value of commercial forest products. This comparison is made in Table 2.

TABLE 2. GROSS AGRICULTURAL INCOME, VALUE OF COAL MINED, VALUE ADDED TO PRODUCTS BY MANUFACTURE, AND VALUE OF COMMERCIAL FOREST PRODUCTS

Gross Agricultural Income 1957	$170,500,000
Value at Mine of Coal Mined 1956	$793,000,000
Value Added to Products By Manufacture 1956	$988,000,000
Value of Commercial Forest Products*	$ 19,000,000

*This figure was furnished by W. W. Christensen, Associate Professor of Forest Economics, West Virginia University, and represents his best estimate of the value of forest products marketed in 1957 from commercial forest lands on a base comparable to that of "cash receipts from farm marketings."

Amount and Source of Farm Income

Gross farm income in West Virginia amounted to 170.5 million dollars in 1957 and cash receipts from farm marketings, it's largest component, amounted to 110.5 million dollars.

TABLE 3. COMPONENT PARTS OF GROSS FARM INCOME, WEST VIRGINIA, 1957 (IN MILLIONS OF DOLLARS)

Farm Marketings	
Crops	$ 22.3
Livestock and Livestock Products	$ 88.2
Government Payments	$ 2.6
Total Cash Income	$113.1
Products Consumed By Farm Households	$ 38.6
Rental Value of Farm Dwellings	$ 18.8
Gross Farm Income	$170.5

In Table 3 the component parts of the gross farm income are shown. The sale of livestock and livestock products contributed the most to the gross farm income but products consumed by the farm households amounted, in value, to about 35 per cent as much as total marketings.

In many instances the "census farm" in West Virginia is simply a place on which to live and produce much of the food for the family.

This source of the cash receipts from farm marketings are shown in Table 4.

Trends in West Virginia Agriculture

West Virginia agriculture is in a process of adjustment, and, in the aggregate, this adjustment has been downward, especially in recent years.

Chart 1 shows that cash receipts from sale of crops in West Virginia has not kept pace with such receipts for the United States as a whole. On the other hand, it may be observed from Chart 2 that cash receipts from the sale of livestock and livestock products in West Virginia has decreased *only slightly* in relation to such receipts in the United States as a whole.

TABLE 4. CASH RECEIPTS FROM FARM MARKETINGS, BY COMMODITIES, WEST VIRGINIA, 1957

Total Livestock and Livestock Products	$ 88,174,000
Dairy products	24,698,000
Cattle and calves	23,504,000
Broilers	15,904,000
Eggs	9,904,000
Turkeys	4,773,000
Hogs	3,700,000
Sheep and lambs	3,394,000
Chickens	497,000
Wool	947,000
Other livestock	853,000
Total Crops	22,345,000
Tobacco	1,950,000
Hay	1,447,000
Corn	1,545,000
Wheat	583,000
Other field crops	1,271,000
Apples	7,414,000
Peaches	924,000
Other fruits	356,000
Forest products	3,392,000
Greenhouse and nursery	3,463,000
Total All Commodities	$110,519,000

Data in Table 5 show the adjustments that have taken place in the acreage and production of the principal crops harvested in West Virginia by years, 1920-1957. The data in Table 5 indicate that both the acreage and production of the principal grain crops have been declin-

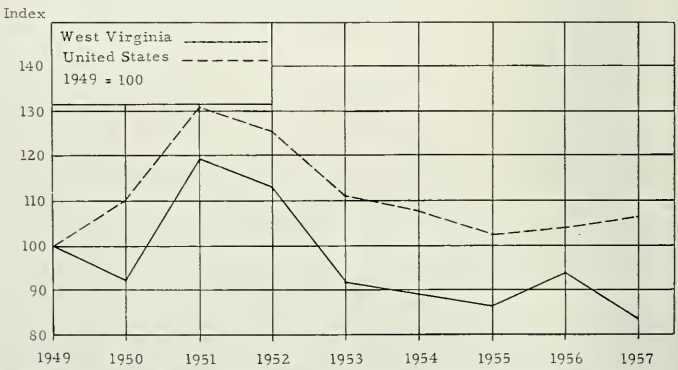


FIGURE 1. Index of net farm income, West Virginia and United States.

TABLE 5. AVERAGE AND TOTAL PRODUCTION OF PRINCIPAL CROPS IN WEST VIRGINIA, 1920-1957

YEAR	CORN		OATS		WHEAT		BARLEY*	ALL HAY	
	1000 ACRES	1000 BU.	1000 ACRES	1000 BU.	1000 ACRES	1000 BU.	ACRES 1000	1000 ACRES	TONS
1920	568	15,418	184	4,784	212	2,650		718	756
1921	540	14,382	188	4,324	211	2,582		725	668
1922	524	13,804	173	3,806	189	2,174		768	801
1923	498	13,076	164	3,772	148	1,850		753	723
1924	448	9,706	150	3,000	115	1,438		771	970
1925	493	12,663	158	3,397	109	1,472		783	754
1926	483	11,648	161	3,542	125	2,000		745	786
1927	440	10,608	155	3,177	112	1,456		753	916
1928	453	11,156	139	3,127	101	1,364		731	811
1929	434	11,656	140	3,010	104	1,362	1	719	751
1930	421	4,600	144	2,736	121	2,118	2	636	412
1931	497	13,048	145	3,045	131	2,489	4	658	668
1932	497	10,920	128	2,496	122	1,403	5	642	592
1933	552	13,824	104	1,872	131	1,900	6	671	713
1934	530	12,005	85	1,615	145	1,856	5	677	526
1935	556	13,650	80	1,760	154	2,541	4	689	795
1936	467	10,281	74	1,406	157	2,120	5	672	507
1937	481	12,458	82	1,763	155	2,480	5	666	759
1938	428	10,918	86	1,935	135	2,025	7	670	807
1939	440	12,648	73	1,555	124	1,798	10	714	782
1940	414	11,372	70	1,680	118	1,770	12	747	844
1941	373	11,520	74	1,850	105	1,680	11	761	877
1942	366	12,492	77	1,925	94	1,504	12	785	994
1943	362	12,492	78	1,638	78	1,053	11	844	1,051
1944	348	9,207	67	1,501	87	1,618	9	835	904
1945	299	10,619	72	2,016	87	1,610	9	840	1,061
1946	296	9,656	68	2,040	77	1,424	7	812	1,045
1947	293	11,398	64	1,952	82	1,599	9	803	928
1948	284	11,836	58	1,769	82	1,517	10	796	1,026
1949	253	10,384	44	1,232	68	1,292	12	812	1,018
1950	238	8,177	41	1,271	66	1,221	14	791	1,009
1951	214	7,644	40	1,360	58	1,073	12	778	1,015
1952	205	7,667	36	1,116	56	1,176	12	770	961
1953	195	6,401	36	1,044	59	1,268	13	752	897
1954	201	8,370	35	1,312	46	1,150	15	744	984
1955	187	6,435	38	1,520	40	920	13	744	986
1956	170	7,550	33	1,089	40	960	14	735	1,020
1957	148	5,082	33	1,155	31		13	731	

*Figures not available.

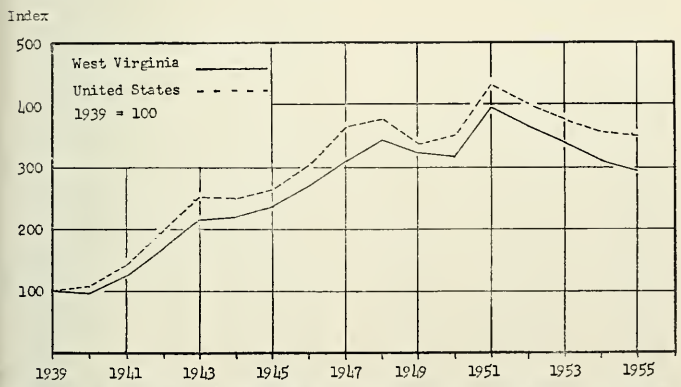


FIGURE 2. Livestock and Livestock Products: Indices of Cash Receipts in West Virginia and United States, 1939-56. (Data from Agricultural Statistics, United States Department of Agriculture, Issued as follows: 1956, p. 470, and West Virginia Agricultural Statistics, Federal-State Crop Reporting Service, Issued as follows: 1955, p. 46; 1956, p. 66.)

ing, especially since about 1940. Barley acreage and production have remained about constant in recent years. Hay, alone of the major crops, has remained about constant in acreage but has increased in total production.

The decrease in production of the grain crops has been largely a function of the decrease in acreage.

Data in Table 6 indicate that the trend of yields per acre has been generally upward for each of the major crops. How much of this increase is due to abandonment of the less fertile acres and how much to improved cultural and management practices cannot be answered from available data. There is some basis to believe, however, that a considerable portion of the increase in yields is due to the adoption of better practices.

Livestock

In recent years the trend in cattle numbers in West Virginia has been slightly upward, whereas the trend for sheep, hogs and workstock numbers has been downward.

Table 7 shows the numbers of the various kinds of animals on West Virginia farms, January 1, 1930-1957.

Dairy cow numbers have remained about constant over the past several years but milk production per cow and total milk marketed has increased considerably as may be observed from data in Table 8.

The Income Position of Farm People in West Virginia

In 1957 the net income per farm in West Virginia was $813.00, the lowest of any state in the United States. Net farm income is the sum of cash receipts from farm marketings, Government payments, value of home consumption, and gross rental value of farm dwellings minus the sum of farm production expenses and net change in farm inventories.

In Table 9 the net income per farm for West Virginia is compared with the net income per farm in neighboring states and the United States for 1949-57.

The low net income per farm in West Virginia results from the very large proportion of its farms which are small in terms of returns. In 1954 there was a total of 68,575 farms in West Virginia. This number is the base for all agricultural statistics for that year. When these farms are grouped according to the value of farm products sold in 1954 it is clear that there are many farms yielding very satisfactory incomes but the great majority have very low incomes.

Non-farm Income

The relatively low net income per farm from agriculture, $813.00, *does not represent the true income situation for the farm people of West Virginia.* In 1954, 51 per cent of the farm families had income from non-farm sources which exceeded the value of farm products sold. No other state in the United States has

Table 6. Yields Per Acre of the Principal Farm Crops

Year	Corn	Oats	Wheat	Barley	All Hay
	bu.	bu.	bu.	bu.	Tons
1920	28.5	26.0	12.5		1.05
1921	28.0	23.0	12.0		.92
1922	28.0	22.0	11.5		1.04
1923	28.0	23.0	12.5		.96
1924	23.5	20.0	12.5		1.24
1925	27.0	21.5	13.5		.95
1926	26.0	22.0	16.0		1.04
1927	26.0	20.5	13.0		1.20
1928	23.5	22.5	13.5		1.10
1929	28.5	21.5	13.1	22.5	1.04
1930	12.0	19.0	17.5	23.5	.64
1931	28.0	21.0	19.0	27.0	1.00
1932	24.0	19.5	11.5	25.0	.91
1933	27.0	18.0	14.5	23.0	1.05
1934	24.5	19.0	12.8	20.0	.76
1935	26.0	22.0	16.5	27.0	1.16
1936	23.0	19.0	13.5	22.5	.76
1937	27.5	21.5	16.0	27.0	1.15
1938	26.5	22.5	15.0	28.0	1.21
1939	29.9	21.3	14.5	26.3	1.10
1940	28.5	24.0	15.0	23.5	1.19
1941	32.0	25.0	16.0	23.5	1.15
1942	35.0	25.0	16.0	26.0	1.26
1943	36.0	21.0	13.5	19.0	1.22
1944	27.9	22.4	18.6	26.8	1.08
1945	37.0	28.0	18.5	27.0	1.26
1946	34.0	30.0	18.5	30.0	1.29
1947	41.0	30.5	19.5	31.0	1.16
1948	44.0	30.5	18.5	34.5	1.29
1949	44.0	28.0	19.0	31.4	1.25
1950	37.0	31.0	18.5	29.0	1.28
1951	39.0	34.0	18.5	26.0	1.30
1952	41.0	31.0	21.0	32.0	1.25
1953	37.0	29.0	21.5	33.5	1.19
1954	46.5	37.5	25.0	39.0	1.32
1955	39.0	40.0	23.0	33.0	1.33
1956	50.0	33.0	24.0	37.0	1.39
1957	38.0	35.0	21.0	33.0	1.25

Table 7. Number of Animals on West Virginia Farms

Year	Total Female Dairy Animals	Total Other Cattle and Calves	Sheep and Lambs	Hogs and Pigs	Workstock
		(Thousand head)			
1930	276	234	601	200	129
1931	281	219	625	168	123
1932	313	233	631	176	118
1933	331	265	631	196	115
1934	345	282	610	188	113
1935	346	266	606	188	119
1936	338	262	588	207	110
1937	318	239	533	213	110
1938	318	245	515	209	109
1939	321	248	510	217	110
1940	322	247	485	250	110
1941	327	259	461	235	111
1942	331	256	447	240	111
1943	340	265	434	310	111
1944	345	283	391	370	109
1945	328	256	348	263	107
1946	316	250	334	268	106
1947	318	254	321	276	102
1948	319	236	305	279	99
1949	320	229	302	268	97
1950	322	232	296	247	93
1951	315	256	308	227	88
1952	304	278	314	193	82
1953	302	303	327	166	75
1954	301	304	317	129	69
1955	291	302	311	142	62
1956	284	309	314	170	57
1957	274	307	308	138	52

Table 8. Milk Production Per Cow and Total Milk Marketed in West Virginia, by Years, 1930-1956.

Year	Milk Production Per Cow (All Cows)	Milk Production Per Cow DHIA Herds	Milk Marketed
	(Pounds)	(Pounds)	(Millions of Pounds)
1930	3620	6826	364
1931	3670	6916	382
1932	3540	7007	375
1933	3310	7444	357
1934	3250	7022	362
1935	3420	7070	392
1936	3420	7338	381
1937	3500	7268	381
1938	3570	7076	395
1939	3530	7396	380
1940	3460	7375	376
1941	3520	7475	401
1942	3580	7519	437
1943	3440	6895	431
1944	3550	6853	444
1945	3860	7134	479
1946	3810	7316	451
1947	3850	7292	456
1948	3900	7407	461
1949	4000	7626	493
1950	3970	7785	490
1951	4080	7684	473
1952	3970	7723	460
1953	4000	7960	476
1954	4200	8150	498
1955	4350	8496	506
1956	4420	n.a.	507

as high a proportion of its farm families with income from non-farm sources. In 1956 the Department of Agricultural Economics and Rural Sociology obtained information on the amount and source of income of 757 farmers found in a state-wide segment sample. The average receipts from farm sales of these farmers amounted to $2,215 and the average income from non-farm sources amounted to $1,739. This is a dependable indication of the amount of non-farm income available to the farm families of the State.

The downward trend in West Virginia agriculture when compared with the United States as a whole is due primarily to the failure of West Virginia farmers to adopt and profit by the new technologies in agriculture. In many instances farmers have not been able to adopt some of these new technologies nor would they have profited from their adoption. Reference is made here particularly to mechanization. Because of the rugged terrain and the small acreages of many farms it has not been possible to mechanize many farm operations economically. In some instances improvements in long distance transportation have taken away the advantage of nearness to market enjoyed by many local farmers. Also, for one reason or another,

Table 9. Total Net Income Per Farm for United States and Selected States, 1949-57

Year	United States	W. Va.	Penna.	Ohio	Kentucky	Va.	Md.
1949	$2,259	$ 981	$1,782	$2,036	$1,598	$1,480	$2,108
1950	2,479	909	1,600	2,044	1,393	1,586	1,866
1951	2,951	1,171	2,038	2,324	1,831	2,024	2,474
1952	2,829	1,120	1,902	2,629	1,670	1,873	2,418
1953	2,502	896	1,791	2,374	1,594	1,390	2,469
1954	2,440	1,029	1,715	2,675	1,693	1,606	2,007
1955	2,313	842	1,545	2,040	1,455	1,530	1,561
1956	2,341	930	1,793	2,025	1,740	1,779	2,221
1957	2,388	813	1,335	1,910	1,494	1,229	1,287

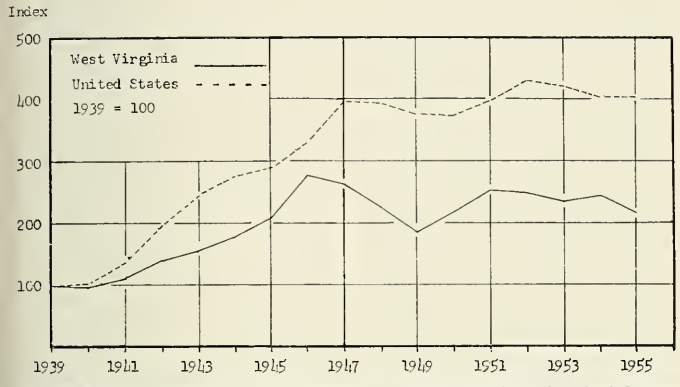


FIGURE 3. Crops: Indices of Cash Receipts in West Virginia and United States, 1939-56. (Data from Agricultural Statistics, United States Department of Agriculture, Issued as follows: 1956, p. 470, and West Virginia Agricultural Statistics, Federal-State Crop Reporting Service, Issued as follows: 1951, p. 45; 1956, p. 66.

Table 10. Grouping of Farms in West Virginia by Value of Products Sold in 1954

Value of Farm Products Sold	Number of Farms
$25,000 or more	350
10,000 to 24,999	1,158
5,000 to 9,999	2,264
2,500 to 4,499	3,137
1,200 to 2,499	5,737
250 to 1,199	8,833
Part-time*	12,054
Residential**	35,018
Abnormal†	24
Total	68,575

*Part-time farms with a value of sales of farm products of $250-$1199 were classified as part-time if the farm operator reported (a) 100 or more days of work off the farm in 1954, or (b) the non-farm income received by him and members of his family was greater than the value of farm products sold.

**Residential farms include all farms except abnormal farms with a total value of sales of farm products of less than $250.

†Abnormal farms include public and private institutional farms, etc.

many farmers in the State have been slow to use those new technologies which are applicable to their situations. The net result is that, in the aggregate, the competitive position of West Virginia has worsened in recent years.

This period of adjustment in which West Virginia agriculture finds itself provides a great challenge not only to farmers and those public agencies charged with working with farmers but also to all who are interested in the economy of the State.

RESIDENT INSTRUCTION

(continued from page 7)

outside of West Virginia and beginning salaries have been in the range of $4,000 to $5,400.

HOME ECONOMICS

THE Division of Home Economics offers courses leading to the granting of a B.S. and an A.B. degree in Home Economics. At least 40 hours of work are required in Home Economics for the B.S. degree. The curriculum for the first two years is uniform for all students. Students may prepare for positions in Teaching, Foods and Nutrition, Dietetics, Textiles, Clothing and Retailing, Extension Service, Home Economics in Business, and Child Development. The Division of Home Economics offers a two-year course in Home Economics designed to meet the needs of those students who do not wish to spend four years working toward a degree but who desire some college training.

The Master's degree in Home Economics Education is offered for graduate work, as is the Degree of Master of Home Economics. At the present time, the Master of Home Economics degree students take work in at least five of the following areas: (1) Foods and Nutrition, (2) Institution Management, (3) Textiles and Clothing, (4) Applied Art, (5) Health and Child Development, (6) Home Management, and (7) Home Economics Education.

Enrollment in Home Economics is shown in Figure 4.

The number of full-time equivalent teachers in Home Economics is 14.4. The number of students taught by the Home Economics staff during the academic year 1957-58 was 1,247.* The allocation of State appropriated teaching funds for the Division of Home Economics is $61,000 for salaries plus $6,600 for labor and supplies, making a grand total of $67,600.

Many Jobs Available

Job opportunities for graduates in Home Economics far exceed the supply of graduates, and starting salaries are very attractive. Since Home Economics is "the science of better living" there is an increasing number of young women taking Home Economics in preparation for homemaking. The number of women in professional jobs in Home Economics is likewise increasing, thus making for a very excellent demand situation.

There is urgent need for additional staff to release teachers from some classroom work so that they may do advising, course development and course revision and research. It is also important that work be offered in Dietetics and that the work be expanded in the areas of Institution Management, Foods and Nutrition, Health and Child Development, and Home Economics Education.

*This is the number of students in all classes and not necessarily different students.

These station projects were active in the year 1957 - 58

(Abbreviations of funds supporting projects: H-Hatch; NE-Northeastern Regional Research; NEM-Northeastern Regional Marketing Research; S-State; SCS-Soil Conservation Service; USDA-United States Department of Agriculture.)

Administration

General Administration of Federal-Grant Fund Research (H 1)

Planning and Coordination of Cooperative Research (H 2)

Agricultural Biochemistry

Unidentified growth factors in proteins (H 5)

Prevention of rancidity in carcass fats of turkeys and hogs (H 6; coop. Poultry Husbandry)

Broiler rations for high efficiency (H 17; coop. Poultry Husbandry)

Measuring the nutritive value of forage crops (H 46, NE-24; coop. Animal Husbandry)

The relationship of plasma protein-bound iodine to productive potential in dairy cattle (H 96, NE 30; coop. Dairy Husbandry; Animal Husbandry)

Metabolic interrelationships between protein and bound ascorbic acid (H 103, NE 37; coop. Home Economics, University Health Service)

The influence of autoxidized fat in the diet on protein requirements (H 118, NE 37; coop. Home Economics)

Miscellaneous chemical investigations (S 5)

Agricultural Economics and Rural Sociology

Organization as a factor affecting 4-H Club work (H 24; coop. U. S. Extension Service)

The diffusion of recommended farm practices in two West Virginia counties (H 25; coop. U. S. Extension Service)

Lime, fertilizer and barnyard manure used on West Virginia farms (H 41; coop. Agronomy and Genetics)

Marketing peaches (H 64)

The physical and economic input-output relations of forage and other feed production in the Appalachain Valley (H 70, NE 18; coop. Agronomy and Genetics)

Improvement of market procedures and outlets for West Virginia livestock (H 73, NEM 7)

The production–consumption balance and efficient utilization of milk for non-fluid uses in West Virginia (H 75, NEM 13)

The economics of broiler production on West Virginia farms (H 85; coop. Poult. Husbandry, Agricultural Extension Service)

Marketing nursery crops in West Virginia (H 93, NEM 15)

Evaluation of the effects of retail vending machines on the sale of fluid milk, and cost and efficiency of distributing milk through vending machines (H 94, NEM 14; coop. AMS, USDA)

Improved marketing for cut flowers and potted plants (H 95, NEM 8)

Handling methods and cost in packing apples (H 97, NEM 19; coop. Horticulture)

Economics of packaging selected food (H 98, NEM 17)

Improving the usefulness of livestock marketing information (H 99, SM 20; coop. Southern Region)

Effects of national production control and price support programs on incomes of farmers in the Appalachain area (H 100, IRM 1; coop. Interregional)

An economic evaluation of the use of irrigation on West Virginia farms. (H 101, NEM 33)

The influence of population change and migration upon agriculture and rural community life in West Virginia (H 102, NE 31)

The effect of advertising and promotion on milk sales (H 114, NEM 14)

Effects of market innovations on costs of and returns for poultry (H 115, NEM 21)

Manpower utilization and agricultural adjustment potentials in Fayette, Raleigh, and Summers counties, West Virginia (H 121; coop. Agricultural Extension Service, ARS, W. Va. Dept. of Employment Security, USDA)

An evaluation of the marketing information for consumers (M.I.C.) program in the Wheeling-Steubenville area (H-122; coop. Agricultural Extension Service, Federal Extension Service)

The marketing of lime and fertilizer in West Virginia (Title II, ES 259; coop. Farmer Cooperative Service, USDA)

Agricultural Engineering

Determination of factors influencing the drying rates of grains (H 15; coop. Engineering Experiment Station)

Poultry house design for West Virginia (H 65, NE 8; coop. Poultry Husbandry)

The mechanization of forage crop harvesting, processing, storing, and feeding (H 69, NE 13; coop. Animal Husbandry, Dairy Husbandry, Reedsville Farm)

Factors involved in the use of supplemental irrigation under West Virginia conditions (H 92, NE 22; coop. Agronomy and Genetics)

Agricultural climatology of West Virginia (H 105, NE 35)

Curing and handling of burley tobacco (H 123; coop. Agronomy and Genetics, Ohio Valley Experimental Farm)

Study of the design of operating characteristics of a grain conveyor using fluidization principles (S 63; coop. Engineering Experiment Station)

Preliminary and exploratory investigations pertaining to agricultural engineering (S 97)

Agronomy and Genetics

The phosphorus and potassium supplying and fixing power of several important West Virginia soils (H 18)

The influence of fertility and management on several ladino clover-grass mixtures (H-19)

The lime requirements of a number of West Virginia soil types (H 20)

Corn genetics and breeding (H 29; coop. Reymann Farms, N.E. Corn Conference, Ohio Valley Farm, Extension Service)

Selection and breeding of superior strains of red clover for West Virginia (H 34; Coop. Plant Pathology, Extension Service, USDA)

The interrelation of soil fertility, planting rate and geometry of spacing in relation to yield of various hybrid corn varieties (H 38; coop. Ohio Valley Farm)

Crop rotation experiments (H-43; coop. Ohio Valley Farm)

Maintaining profitable stands of alfalfa (H 50; coop. Plant Pathology, Reymann Farms, Ohio Valley Farm)

Weed control in corn (H 52; coop. Reymann Farms)

Forage crops, varieties, strains, and species for West Virginia (H 54, NE-10; coop USDA)

Alfalfa breeding and genetic investigations (H 66, NE 28)

The influence of several management practices on the performance of alfalfa and ladino clover grown alone and in association with grasses (H 68, NE 29)

Factors affecting the herbicidal activity of some chemicals applied to the soil surface (H 76, NE 12)

Some chemical properties of the major soil types of West Virginia (H-81; coop. SCS, USDA)

Using nitrogen fertilizer efficiently (H 82; coop. Ohio Valley Farm)

Breeding winter barley for high yields and powdery mildew resistance (H 86, NE 23; coop. Plant Pathology)

The molybdenum status of West Virginia soils (H 104)

Nutrient availability in relation to soil structure (H 106, NE 11)

The production of burley tobacco (H 108; coop. Ohio Valley Farm)

Studies of soil properties that affect establishment and growth of oak stands in West Virginia (H 117)

Field crop variety testing (S 6)

Soil Survey Work in West Virginia (S 8)

The establishment and testing of grass and legume species and strains for soil conservation (S-87; coop. Nursery Division, SCS)

Preliminary investigations in soil science (S 94)

Animal Husbandry

The relation of birth weight within breeds to growth rate of purebred mutton-type lambs (H 12)

Nutritional requirements of swine for growth (H 22)

Breed as a factor in the production of ewes retained for flock replacement and for the production of market lambs and wool (H 23)

Nutritional requirements of the brood sow (H 40)

Methods to increase non-protein nitrogen utilization by ruminants (H 45; coop. Agricultural Biochemistry)

Control of chronic respiratory disease (CRD) (H 53, NE 5; coop. Reymann Farms)

Causes of sterility in cattle (H 55, NE 1; coop. Dairy Husbandry, Artificial Breeder's Coop.)

Avian infectious anemia-synovitis (H 88, NE 5; coop. Agricultural Biochemistry)

Reproductive efficiency of beef cattle (H 90)

Exploratory or preliminary investigations on diseases, feeding and management of farm animals (S 89)

Fat calf versus feeder calf production in West Virginia (S 95; coop. Reymann Farms)

Hay versus hay and silage for ewes (S 103; coop. Agricultural Biochemistry)

Increasing the utilization of low quality hays by wintering beef cattle in West Virginia (S 111; coop. Reymann Farms)

Methods of feeding growing-fattening pigs for economical production of lean carcasses (S 113; coop. Agricultural Biochemistry)
Studies on infectious synovitis (S 117; coop. Agricultural Biochemistry)
The effects of two systems of selection of breeding stock on beef cattle performance (S 118; coop. Reymann Farms, Dairy Husbandry)

Dairy Husbandry

The transmission of milk and butterfat production and body conformation of dairy sires (H 7; coop. USDA)
The keeping quality of milk in home refrigerators (H 11)
The effect of water hardness on cleaners for dairy utensils (H 26)
Comparison of young bulls with proven bulls in artificial breeding (H 27; coop. W. Va. Artificial Breeder's Coop.)
Breeding efficiency of dairy cows (H 33; coop. Animal Husbandry)
The use of type and production records as a basis for a dairy cattle improvement program (H 35; coop. Ayrshire Breeder's Association)
The effects of early versus delayed breeding of dairy heifers (H 107)
The fat globule membrane protein of milk (H 110)
Preliminary or exploratory investigations on diseases, feeding and management of dairy cattle (S 86)
Miscellaneous investigations of dairy products (S 90)
Selecting for milk production in Jersey cattle (S 106)
Chemical inhibition as a means of preserving bovine sperm (S 114; coop. College of Arts and Sciences)
Effects of increasing the upper limit of feeding concentrates to Holstein cows (S 120; coop. Animal Husbandry)

Forestry

Efficient forest management practices for West Virginia cut-over and burned-over hardwood forest lands (H 36; coop. W. Va. Conservation Commission)
Animal repellents on hardwood forest plantations (H 37)
A survey of multiflora rose plantings in West Virginia, with special reference to growth characteristics and spreading tendencies (H 42; coop. SCS, Conservation Commission)
Timber management for the market demands in southern West Virginia forests (H 56; coop. Island Creek Coal Company)
Marketing forest products in West Virginia (H 61, NEM 6; coop. Agricultural Economics)
Factors affecting natural regeneration in upland oak types (H 67; coop. Plant Pathology)
Production of plantation-grown Christmas trees in West Virginia (H 119; coop. Agronomy and Genetics)
Revegetating spoil banks with forest trees species (H 120; coop. SCS)
Improvement of farm game and wild life conditions on a soil conservation district (S 42)
Plantings of forest trees and shrubs at Greenland Gap (S 56)
Determination of optimum growth of West Virginia hardwoods (S 60)
Conversion of unproductive hardwood stands to desirable forest types (S 107)
Planting forest trees in West Virginia (S 108)
Strength and related properties of *Ailanthus altissima* grown in West Virginia (S 110; coop. College of Engineering)

Home Economics

Qualities in blouses: the relations of those considered in selection to the satisfactions found in wear (H 77, NE 19)
Effect of a liquid and a dry chlorine bleach used in laundering of white cotton sheeting (S 122)
Survey of laundering practices of farm women in West Virginia (S 123)

Horticulture

Improvement of potato varieties for West Virginia (H 4; coop. Plant Pathology)
Nutrition of apple trees in West Virginia (H 16; coop. University Experiment Farm)
Improvement of apple juice (H 21; coop. Agricultural Biochemistry)
The selection, breeding and propagation of the low-bush blueberry *Vaccinium Vacillans* (H-31)
The effect of certain chemicals on color, finish and maturation of apples (H 39)
Selection, breeding and propagation of nursery crops (H 59)
Effects of herbicides on tree fruits and small fruits (H 116)
Miscellaneous horticultural investigations (S 27)
Variety tests of tree and small fruits (S 29)
Variety and strain studies of vegetables (S 31)
Lily bulb production trails (S 61; coop. USDA)
The effect of new growth substances on the preharvest drop of apples (S 66; coop. University Experiment Farm)
Chemical thinning of apples and peaches (S 69; coop. University Experiment Farm)
Propagation and selection of edible nut-bearing trees suitable to West Virginia (S 98)
Testing of azaleas (S 112; coop. Reedsville Farm)
Turf trials for home lawns (S 116)
The improvement of Geranium (*Pelargonium hortorum*) through breeding (S 121)

Plant Pathology, Bacteriology and Entomology

The relation of genetics and environmental factors to growth, physiology and reproduction of fungi (H 3)
Apple measles (H 8; coop. Horticulture)
Black rootrot of apple (H 9)
The microbiology of strip mine spoil (H 13)
Decay as a factor in sprout reproduction of yellow poplar (H 14; coop. Forestry)
The nutrition of fungi and bacteria with especial reference to substances which induce, stimulate, or inhibit growth and reproduction (H 28)
The fungicidal efficiency and phytotoxicity of orchard sprays as influenced by methods of application, timing, and environmental factors (H 30; coop. University Experiment Farm)
Testing new fungicides and insecticides for values as pesticides on small fruit and vegetable crops (H 32)
The cause of, and remedy for, red clover failures in West Virginia (H 51)
Biology and control of tree-wilt pathogens (H 57, NE 25; coop. W. Va. Dept. of Agriculture, W. Va. Conservation Commission)
Improvement of tomato varieties for West Virginia (H 58; coop. Horticulture)
The symbiotic relationships between microorganisms and insect vectors of plant diseases (H 62)
The structure and function of specialized tissues in insects (H 63)
Biology and control of nematodes affecting fruit trees and forest seedlings (H 72, NE 34; coop. University Experiment Farm, USDA)
Diseases of forage grasses (H 78; coop. Agronomy and Genetics, USDA)
Arthropods affecting livestock in West Virginia—their distribution and control (H) 79)
Cereal and forage crop pests—their distribution, incidence and control in West Virginia (H 80)
Virus diseases of sour cherry and other stone fruits (H 89-; NE 14; coop. University Experiment Farm)
The possible relationship of metallic iron toxicity to dought injury in shade and forest trees (H 109; coop. Forestry)
The cause and control of "hemlock canker" (H 113)
Miscellaneous plant disease investigations (S 19)
Miscellaneous insect and insecticide studies (S 24)

Poultry Husbandry

Methods of feeding growing pullets (H 10; coop. Reymann Farms)
Simplified methods of improving initial interior egg quality and shell quality through selective breeding (H 44)
Improving the reproduction performance of turkeys (H 49)
Breeding for efficient production of eggs and meats (H 74, NE 6; coop. Reymann Farms)
The effect on hatchability, chick viability and growth rate of fortifying chick embryos (H 11)
Broiler management investigations (S 104; coop. Reymann Farms)
Development of satisfactory broiler rations (S 105; coop. Reymann Farms)
Intermingled versus individual pen rearing for broiler strains (S 119; coop. Reymann Farms)
Radionuclide mineral metabolism of chicks which differ genetically (S 124)

University Experiment Farm

The effect of chemical spray schedules on the quality and quantity of apples produced (H 83; coop. Plant Pathology, Entomology Res. Branch of USDA)
Apple and peach insect control (S 81; coop. Bureau of Entomology and Plant Quarantine)
Delicious budsport evaluation tests (S 115)

November 1, 1958

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Poultry Husbandry

Homer Patrick, Ph.D., Poul. Husb.
L. F. Cassell, B.S., Asst. in Poul. Husb.
T. B. Clark, M.S., Assoc. Poul. Husb.
Anthony Ferrise, B.S., Grad. Res. Asst.
H. M. Hyre, M.S., Assoc. Poul. Husb.
W. G. Martin, M.S., Asst. in Poul. Husb.
E. D. Nestor, B.S., Grad. Res. Asst.
Mary Pervola, Laboratory Aide

Miscellaneous

G. D. Bengtson, B.S., Asst. Editor
D. R. Creel, Photographer
Robert S. Dunbar, Jr., Ph.D., Assoc. Statistician
John Luchok, B.S.J., Editor
Martha R. Traxler, Chief Clerk

COCONUT MILK

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Virginia Bull Stud during the last half of the month of November. In this trial, 1,224 Holstein cows were bred with 1- to 7-day-old sperm diluted in coconut milk. During this time, the semen was maintained at room temperatures by the technicians. Data for computing the non-return rates on a 60-90-day basis are not available as yet, but the 30-60-day non-return rate looks very promising. Seventy-one per cent of the cows artificially bred with the coconut-milk-extended sperm were settled, indicating that fertilizing capacity of the sperm was unimpaired. Plans are already underway for conducting a second trial in cooperation with another artificial breeding organization.

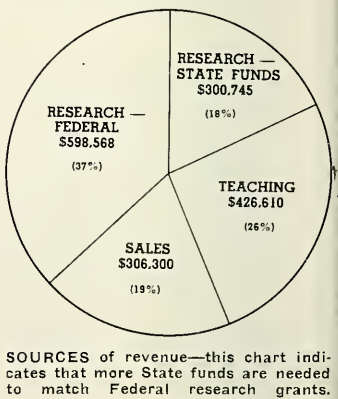
AGRICULTURAL PROGRAM

(continued from page 4)

scribed results of research, all of which have been achieved within the past five years, provide a fair appraisal of the tremendous contribution that the Agricultural Experiment Station has made and is making to the people of West Virginia and to the Nation.

More State Funds Needed

The Cooperative Research Program in Agriculture, Forestry, and Home Economics is made possible by both Federal-grant funds and State appropriations. Federal-grant funds are provided on the basis that they are to be matched by State appropriations. In recent years, the Federal-grant funds have exceeded State appropriations by significant amounts (see pie chart), making it difficult for the Experiment Station to continue to accept the Federal aid which is available. In order to secure the Federal funds, it has been necessary to utilize sales income for matching purposes. This is not only a dubious practice from the standpoint of continuation of Federal support, but it is a practice which surely our responsible citizens in West Virginia would not wish to see continued.



SOURCES of revenue—this chart indicates that more State funds are needed to match Federal research grants.

It seems a certainty that our people want the benefit of more research rather than less and that they will be willing to provide the funds necessary to match Federal funds by State appropriations. Additional State appropriations represent a goal which must rapidly be achieved and maintained if we are to enjoy those advancements in technology which research in Agriculture, in Forestry, and in Home Economics can bring to the citizens of West Virginia. Con-

Financial Statement for the Year July 1, 1957 to June 30, 1958

Classification of Receipts and Disbursements	Hatch	Regional Research Fund	Title II	Non-Federal Funds	Total
RECEIPTS					
Received from the Treasurer of the U. S.	478,590.59	101,330.00	2,500.00	....	582,420.59
State appropriations:					
Main Station	....	....	....	286,530.00	286,530.00
Special (Oak Wilt Research)	....	....	....	10,000.00	10,000.00
Special endowments, fellowships and grants:					
Foundations	....	....	....	8,138.17	8,138.17
Industry	....	....	....	14,319.53	14,319.53
Sales	....	....	....	186,662.50	186,662.50
Balances forward July 1, 1957	4.41	....	....	215,933.09	215,937.50
Total Available	478,595.00	101,330.00	2,500.00	721,583.29	1,304,008.29
DISBURSEMENTS					
Personal services	380,750.83	63,955.43	860.00	286,724.97	732,291.23
Travel	12,515.35	15,575.30	....	4,618.35	32,709.00
Transportation of things	218.33	100.09	....	1,341.06	1,659.48
Communication service	659.74	63.94	....	5,215.30	5,938.98
Rents and utility services	413.91	1,031.73	....	22,804.77	24,250.41
Printing and reproduction	5,459.93	1,323.97	....	1,944.84	8,728.74
Other contractual services	2,924.47	1,065.87	....	18,718.21	22,708.55
Supplies and materials	38,739.26	14,110.09	....	130,055.20	182,904.55
Equipment	24,915.36	3,593.30	....	41,910.08	70,218.74
Lands and structures (contr.)	5,343.22	....	....	175.00	5,518.22
Taxes and assessments	6,654.60	296.29	19.36	2,044.96	9,015.21
Total Disbursements	478,595.00	100,916.01	879.36	515,552.74	1,095,943.11
Reverted Balances		413.99	1,620.64		2,034.63
Non-reverted Balances Available for 1958-59				206,030.55	206,030.55

tinuing levels of support for research must be attained by both State and Federal governments if we are to realize the "American dream" of a continually rising level of living for all people in our society!

EXTENSION SERVICE

(continued from page 9)

ment elsewhere. West Virginia leaders know that the problem of bringing some of America's rural areas into the main stream of progress will not be solved in a year—or perhaps even in five years. Yet a successful beginning with sound organization and a variety of projects can lead to economic improvement for many rural families.

Consumer Marketing

In serving agriculture the Agricultural Extension Service, like most agricultural agencies, has an intense interest in the consumers of agricultural products. Consequently, consumer-education activities represent a large part of the Extension effort.

A full-time "Marketing Information for Consumers" Program is being conducted for the Wheeling-Steubenville area of West Virginia and Ohio. Two full-time Extension Marketing and Consumer Information specialists operate this program, under the cooperative sponsorship of West Virginia University, Ohio State University, and the United States Department of Agriculture. In 1957, these workers used 108 newspaper articles, 35 television shows, and 173 radio broadcasts to reach into the area's some 100,000 homes with food marketing and food preparation information.

Information to Consumer

In addition to providing consumers with information as to wise buying, price information, and the use of agricultural products, the marketing specialists also collect "feed back" information for the grower and the food processor—information as to the needs and desires of the food-buying consumer. Collectively, these activities serve to strengthen the producer-user relationship, making for greater satisfaction all around.

Judging from consumer reaction, the Program seems to be filling a real need. One homemaker said, "I use the information in buying and in planning menus." Another said, "I bought plentiful foods and stocked up the freezer when I was told of the price and supply advantage." Hundreds of consumers have related that they use the information received in planning, buying, stocking, and preparing foods.

Another method of reaching consumers is through the weekly *Food Marketing Information Bulletin*. This publication is prepared for 380 cooperators who meet with large numbers of consumers in their normal course of work. The cooperators include home economists with utility companies, home economics teachers, social workers, food retailers, and others. The remarks of these cooperators are indicative of the value of the program information. One such cooperator said, "I like the Bulletin. I work with various groups and can use all the information in it. I could hardly give a broadcast without using the materials included."

Many consumer leaflets and other publications have been prepared and several thousand copies have been distributed to consumers through

(continued on next page)

SUBSTATIONS . . .

The Agricultural Experiment Station's substations play a vital role in your State University's research, teaching, and Extension programs.

FROM the standpoint of agricultural research, West Virginia presents some interesting problems. Because of wide ranges in temperature, altitude, moisture, and soil conditions, researchers have many "agricultural climates" to consider when developing a new plant variety or when drawing up new insect and disease control programs.

A hybrid that grows well for farmers in Mason County may not do well at all on Pocahontas County farms, and vice versa. For this reason, it is important that the agricultural research program be geared to allow for the many variations existing in terrain and altitude. An example is the county hybrid corn trials, in which researchers recognize four different "regional and climate sections" in the State. Hybrids to be tested are selected according to their suitability to these areas.

Such a situation makes it necessary to have facilities in different regions of the State, so that research may be conducted under realistic conditions. The Experiment Station has four experiment substations, located at Point Pleasant, Reedsville, Kearneysville, and Wardensville. At each of these substations the experimental work deals with the problems typical of the agriculture being practiced in the surrounding area.

The Ohio Valley Substation, on the Ohio River at Point Pleasant, is devoted to work with tobacco and field crops of special interest to farmers in the Ohio and Kanawha valleys. The substation has an altitude of 600 feet, and is in the "long season" climatic region.

The Reymann Memorial Farms at Wardensville, altitude 950 feet, is included in the "medium-long season" region. This 987-acre Substation lies on the Cacapon River in Hardy County. Its principal activities include research with beef cattle, sheep, and poultry. Small grains, forages, pasture improvement, soil and water conservation, and irrigation projects are also under way there.

The Reedsville Experiment Farm in Preston County, at an altitude of 1800 feet, lies in the "short season" region. Production of fruits, vegetables, and ornamental plants is investigated here. Agricultural engineering studies, dealing with forage production, processing, handling, and storage, are also being conducted here.

At the University Experiment Farm at Kearneysville, Jefferson County, research work is conducted with production, insect, and disease problems associated with the fruit industry. Located at 550 feet altitude in the heart of the commercial fruit area, this Substation is the fruit research center for West Vriginia.

UNIVERSITY Experiment Farms, Experiment Forests, and Forestry Research Plots are located in every section of the State, making it possible to conduct experiments under many different soil, climatic, and terrain situations.

EXTENSION SERVICE

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the cooperation of food wholesalers and retailers. Exhibits and demonstrations with consumer groups have been another effective means of reaching consumers and producers with food marketing information.

The program has conducted special educational projects with farmers, wholesalers, retailers, and consumers as a means of improving the quality of a product and increasing consumer understanding of a product. An evaluation of this phase of the work showed that an egg marketing project influenced consumer knowledge of egg quality. Seventeen of 46 retailers reported that their customers possessed a better knowledge of egg quality upon completion of the project.

An intensive study is now underway to evaluate the entire consumer marketing information program, in order to determine consumer needs and interests in the field. Such information will help keep the Program in the Wheeling-Steubenville area up-to-date, and will be useful in conducting the many small marketing-information activities in other parts of the State.

Editor's Note: Due to the lack of space we were unable to carry a complete list of new publications released by the Agricultural Experiment Station. A complete listing of these publications can be found on a separate sheet enclosed with this *Report*.