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A. H. VanLandingham

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Science

Serves your farm and home

Annual Report of A. H. VanLandingham, Director, West Virginia University Agricultural Experiment Station

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A. H. VanLandingham
Director

LET'S DEFINE OUR TERMS!

THERE are several definitions of "farming" and the one used can make a world of difference in presenting the importance, or seeming lack of importance, of this vital occupation. If farming is defined merely as the value of products of the land, including forests as stumpage, measured at the farm gate, than only between 4 and 5 per cent of the gross national product is represented. If, however, agriculture is defined as including the production of the land from the time of planting of seed or the breeding of animals to the point of final use of these products by the consumer then around 20 to 25 per cent of the gross national product is represented. Greater still, if the labor used by agriculture is also included in the latter definition, around 30 to 35 per cent of the labor force in this country is represented.

The State Agricultural Experiment Stations and the U. S. Department of Agriculture are concerned with the whole concept—not only the production of farm products and their use, but with factors that affect people who produce and consume them. Economically, experiment stations are concerned with the conservation and efficient use of resources available to agriculture so that all people may continue to enjoy an abundant supply of food, fiber, and forest products at a reasonable price. In addition, experiment stations are concerned with factors such as water and air pollution affecting environmental conditions of plants, animals, and people and with the conservation, wise use, and greater development of agricultural resources.

COVER PHOTO

The new Forestry Center on the Evansdale Campus is an impressive sight at night as well as in the daytime. The Center will serve West Virginia with much-needed research facilities and will offer the student a rewarding challenge in his forestry-related studies. Read more about the Forestry Center on page 8. (Vic Haines photo)

Combat Herbaceous Competition With The Use Of Large Yellow-Poplar Planting Stock

The terminal bud on this yellow-poplar was removed to delay leaf development after planting, resulting in a permanent crook where the leader (arrow) died back to the first live bud.

KENNETH L. CARVELL
Silviculturist

HARDWOOD plantations are more difficult to establish than coniferous plantings. Various factors contribute to hardwood planting failures. These include competition from grass sod and herbaceous plants, damage by rabbits and mice, and insufficient knowledge of hardwood site requirements. Up to the present time the only two hardwoods that have been planted successfully over large acreages in West Virginia are black locust (*Robinia pseudoacacia* L.) and yellow-poplar (*Liriodendron tulipifera* L.). Even when these two species are used, however, landowners must often expect survival percentages far below those usually obtained from coniferous plantings.

Yellow-poplar plantations are customarily established with one-year-old seedling. For most planting areas, seedlings of this size are sufficiently hardy to withstand transplanting and compete successfully with the existing herbaceous vegetation.

However, some planting sites support an unusually luxuriant growth of herbs. During the growing season this herbaceous carpet may increase to a depth of 3 feet or more, engulfing newly-planted seedling. This results in high or complete seedling mortality by cutting off the sunlight, or by the matting of herbs during the fall and winter. Cutting the rank herbs and vines surrounding small seedlings is costly, and often must be repeated several times during the growing season.

The herbaceous problem is particularly acute when selecting sites for yellow-poplar plantings, since often the sites with the most severe herbaceous problems are potentially the most productive poplar areas. Yellow-poplar makes its best growth on moist, but well-drained, soil—the moister the soil, the greater the herb problem.

It should be pointed out that where wet sites have poor internal drainage, as evidenced by mottling in the upper 15 inches of the surface soil, yellow-poplar should not be used, since this species is quickly flooded-out on these areas. The few seedlings that do survive are stunted and crooked.

Experimental plantings were made at the University Farm Woods in Monongalia County, West Virginia, to determine a practical method of establishing yellow-poplar plantations on sites where a dense carpet of herbs and vines develops annually. These plantings were made with four-year-old yellow-poplar seedlings. Many seedlings of this age are between 5 and 6 feet tall. Even during mid-summer, stock of this size will tower above the herbaceous layer, and is sturdy enough to stand erect when the surrounding dead herbaceous vegetation is matted down by late fall rains and winter snows.

Procedure

One of these experimental plantations was established in the spring of 1958. Nineteen rows with eleven seedlings each were planted, giving a total of 209 seedlings. The planting site was formerly an old field which had seeded-in some thirty years before with scattered trees of low commercial value. The lush herbaceous layer that developed annually often reached a depth of 3 feet. At the time the yellow-poplar seedlings were planted, the overstory trees were frilled and poisoned.

The planting stock was obtained from the Parsons State Forest Nursery. The seed had been planted with the intention of lifting the seedlings after one year's growth. With this research project in mind, these were left for three additional growing seasons. Since these seedlings had been severely crowded in the nursery bed, they varied greatly in size and vigor. During planting it was necessary to evaluate each seedling and discard those of low vigor. This practice is commonly referred to as "grading."

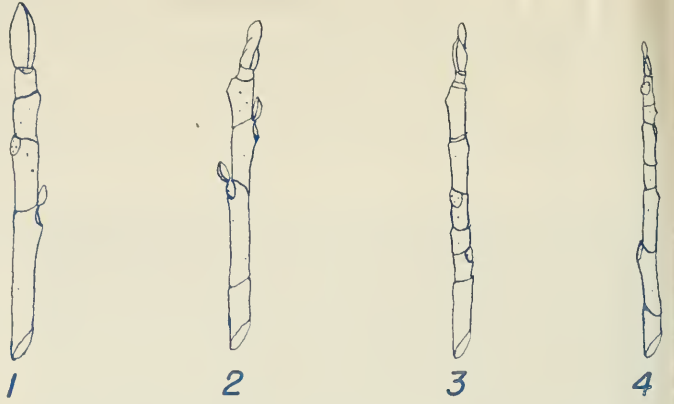


Figure 1. Four terminal bud conditions of yellow-poplar seedlings. The fleshy, duck-bill-shaped bud (1) indicates high vigor. Buds 2 and 3 show moderate vigor. The shriveled, paper-thin bud (4) signifies extremely low vigor. A seedling with a shriveled bud should be discarded during the planting operation.

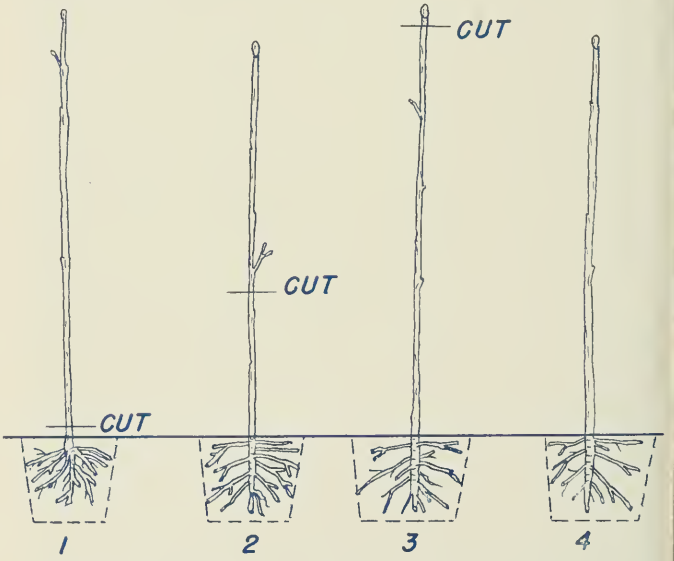


Figure 2. The four treatments tested in this experiment to determine their effect on the survival and development of larger yellow-poplar planting stock.

In grading, those seedlings that were less than the average height were discarded, since these had been crowded for light and moisture in the nursery bed and had low vigor and underdeveloped root systems. In addition, larger seedlings were discarded if they had dead, shriveled, or paper-thin terminal buds (Figure 1). Thus, all of the planted seedlings were at least 3 feet tall. Previous test plantings had demonstrated that this method of grading substantially increased the per cent survival of large poplar stock.

(*Continued on Page* 16)

Economic Outlook—1966

Homer C. Evans, *Assistant Director*
and
Vernon M. Sheppard, Jr.
State Extension Specialist
Agricultural Economics

THE national economy continued to perform exceptionally well in 1965. The nation's output of goods and services, as measured by Gross National Products (GNP), reached an annual rate of $677 billion in the third quarter of 1965, about $42 billion or 6½ per cent higher than the same quarter of 1964.

We have now completed the 19th quarter of continuous economic growth—the longest peacetime expansion on record. The growth in real output since the final quarter of 1961 has totaled 26 per cent.

Private domestic investment, government purchases, and personal consumption expenditures have all contributed to the 1965 advance. Gross private investment led the way with a $9 billion, or about 10 per cent, increase over the third quarter of 1964. The longest part of the dollar increase in GNP was in consumer expenditures estimated at $432 billion. This is nearly $28 billion—about 7 per cent—above the same period of 1964. Government expenditures rose about $6.4 billion, or 5 per cent, between the third quarter of 1964 and the third quarter of 1965.

The rise in total economic activity has been accompanied by increases in employment, wages, and consumer incomes.

Prospects for 1966 indicate a further increase in Gross National Product in line with the 6½ per cent increase that has taken place from 1964 to 1965.

There is some concern on the question of price stability which stems from such developments as increased wage rates, increased expenditures related to the conflict in Viet Nam, expansion of aggregate demand, and a rise in the utilization rate of manufacturing capacity.

Taking all factors together, 1966 looks like another year of vigorous and generally well-balanced economic growth.

State

The West Virginia economy moved forward last year to one of the most successful years in the State's history. Business activity continued a gradual improvement which began early in 1961. Also there was a substantial decrease in unemployment. In October, 1965, unemployment was 30,500 (5.5 per cent of the civilian labor force), compared to 38,200 (6.5 per cent of the civilian labor force) in October, 1964. Except for seasonal ups and downs the number of unemployed persons in the State has declined steadily since the early part of 1961. Between March, 1961, and October, 1965, the total number of unemployed decreased by approximately 56,300 or 63.3 per cent. Total employment in the State showed a slight increase from October, 1964, to October, 1965, of 10,100 persons or approximately 2 per cent.

In 1965 personal income in West Virginia increased slightly more than 6 per cent. The year ahead looks like another good one, with some qualifiers. Consumers, though, won't get as much mileage from their earnings as they did in 1965 because the maximum Social Security tax goes up from $174 to $277. Uncle Sam may turn out to be an "Indian giver" on the tax cut individuals enjoyed these past two years. Mounting costs of Viet Nam War and welfare programs raise the spector of a 1966 tax increase. Price increases are likely to trim buying power. Consumer prices rose nearly 2 per cent in 1965 compared to an average of 1.2 per cent in the previous three years; another 1.5 per cent to 2.0 per cent hike seems likely in 1966.

Agriculture

Agriculture fared well in 1965 and there are solid reasons for expecting another good year in 1966. Realized net farm income—income above production expenses—is expected to be about $14 billion in 1965, the highest since 1952. Realized net farm income in 1966 may top the 1965 figure by a quarter to a half billion dollars. This increase is expected to result from a favorable price and income outlook for livestock, new farm legislation, and expanding markets.

Net income per farm in 1965 is expected to be about $4,100 or 40 per cent above the 1960 figure. Per capita disposable income of farm people in 1965 is about 35 per cent above 1960. Prospects for a further rise in incomes in 1966, with declines in the number of farms and farm people, will push per farm and per capita incomes of farm people to new highs in 1966.

APPLES

For 1965, apple production in commerical areas was estimated as of October 1 at 134 million bushels,

1 per cent below 1964 but 9 per cent above the 1959-63 average. Late summer rains have helped sizing in many areas, and late September and early October cold weather has enhanced the color of unharvested apples.

The production potential of apple orchards for 1965 was not fully achieved because of unfavorable early-season weather, especially in some of the western states. If weather is generally favorable for the 1966 crop, then some increases in production can be expected. Present bearing trees, young trees not bearing (generally improved varieties) and continually improved cultural practices constitute the potential for apple production to continue to trend upward over the next 5 to 10 years.

For 1965, apple production in West Virginia was estimated to be 5,100,000 bushels, 10.5 per cent less than the 1964 production. This decrease was partially due to seasonal variation. After a year of heavy production, the following year was somewhat lighter because the blossom formations were reduced. Also, the abnormal hot spell caused a reduction in size and color. Total production is expected to trend slowly upward over the next few years, due mainly to increased bearing acreage, improved varieties, and better cultural methods. Production in 1966 is expected to increase approximately 15 per cent above 1965 production if weather and other growing and harvesting conditions are generally favorable.

BEEF

Beef cow numbers on farms in West Virginia on January 1, 1966, will be no higher, and probably lower, than the 172,000 head recorded on January 1, 1965. Likewise, beef numbers in the U. S. are expected to be lower than last year. This means that the 7-year expansion which began in 1958 has ended. The number of feeder calves going to market in the coming year will probably be lower and prices equal to or slightly above those of the past year. Fed cattle prices are expected to continue strong and average the same or slightly higher than in 1965.

HOGS

The number of sows farrowing in West Virginia in the December, 1965 - May, 1966 period is expected to be about 7,000—the same as for the corresponding months of 1965. For the same period, the number of sows farrowing in the U. S. is expected to increase from 5,960,000 in 1965 to 6,336,000 in 1966. The 1959-63 average was 7,192,000. An even greater increase in farrowings is expected to occur in the June-November, 1966 period. The increased number of December-May farrowings will result in increased numbers going to slaughter during the second half of the year. This will exert downward pressure on prices. When the June-November pigs go to slaughter in the late months of 1966 and in 1967, a sharp reduction in prices is expected.

DAIRY

The outlook for dairy producers seems somewhat more favorable for 1966 than during recent years. Regulations affecting prices were changed in 1965 and as a result prices to some producers were increased while others obtained lower prices. Overall, prices for milk sold wholesale were equal to or higher by as much as 5 to 25 cents per hundredweight during the first ten months of 1965 than during the same period of 1964. Milk cows decreased another 4.6 per cent during this period and despite an increase of about 3.5 per cent in production per cow total production was 1.1 per cent lower than during the same period a year earlier. These trends in production will proably continue but at a slower rate. The improved demand situation in the State should result in 1966 prices and incomes for dairy farmers slightly higher than in 1965.

BROILERS

Broiler chick placements in West Virginia totaled 17.4 million during the first 47 weeks of 1965. Total placements for the year are expected to be about 19.2 million chicks. This represents an increase of 1.6 million chicks over the 17.6 million placed in 1964. Broiler placements in West Virginia in 1966 will probably top 20 million chicks. This larger output is likely to be encouraged by the improved prices, financial condition of the industry, a build-up of broiler hatchery supply flocks, the prospect of lower feed prices, and reduced red meat supplies.

Broiler prices in 1966 are expected to average below those of 1965.

EGGS

During the first 10 months of 1965 egg production in West Virginia declined by 8 million eggs below the number produced during the first 10 months of 1964 (275 million in 1964 compared to 267 million in 1965).

Egg prices in West Virginia during 8 of the first 10 months of 1965 averaged at or below the levels for the same period of 1964. During 1965 West Virginia egg prices consistently averaged from 3 to 7 cents a dozen above U. S. egg prices. Prices received by farmers are likely to open the year substantially above the 1965 level and close the year below the 1965 level. Egg prices for all of 1966 may average close to the 1965 level. West Virginia producers may be expected to continue to receive prices that average about 5 cents a dozen above the U. S. average.

TURKEYS

The number of turkeys raised in 1965 by West Virginia producers is

expected to total 1,946,000, 15 per cent above the 1964 crop.

The turkey crop next year is expected to continue to increase, with production reaching about 2 million birds. Turkeys will have to face competition from larger broiler supplies in early 1966. And coming into the main marketing season, consumers will have been eating a record large quantity of poultry which may tend to temper the holiday turkey demand. Consequently, 1966 turkey prices to producers probably will average below 1965 levels.

FOREST PRODUCTS

In West Virginia during the first 10 months of 1965 lumber production increased 4.5 per cent over the same period of 1964. Production is expected to again increase in 1966.

Through the first ten months of 1965 the total value of building permits in West Virginia amounted to $77.5 million compared to $59.3 million during the same period of 1963.

Prospects for 1965 and beyond seem to indicate that timber and timber products will play an increasingly important role in West Virginia's economy.

These station projects are active in the year 1965-66

(Abbreviations of funds supporting projects and other abbreviations: AMS-Agricultural Marketing Service; ARS-Agricultural Research Service; CES-Cooperative Extension Service; CSRS-Cooperative State Research Service; ERS-Economic Research Service; H-Hatch Funds; MS-McIntire Stennis Funds; NE-Northeastern Regional Research; NEM - Northeastern Regional Marketing Research; S-State Funds; SCS-Soil Conservation Service; SM-Southern Regional Marketing; 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

The mechanism of action of hemicellulases and the structure of hemicelluloses (H 157)

Serum nutrient distribution following test meals of different composition (H 160; coop. College of Human Resources and Education)

Utilization of amino acids from proteins (H 174, NE 52; coop. College of Human Resources and Education)

Mineral metabolism in chicks using radionuclides calcium^{45} and sulfur^{35} (H 175)

The effect of gamma radiation on the genetic variation in turkeys (H 176; coop. Animal Industry and Veterinary Science)

Miscellaneous chemical investigations (S 5)

Radionuclide mineral metabolism of chicks which differ genetically (S 124)

Determination of the level of gamma irradiation and desired time to irradiate for controlled reproductive performance in chickens and turkeys (S 136; coop. Animal Industry and Veterinary Science)

Agricultural Economics

The economics of broiler production on West Virginia farms (H 85; coop. CES)

The effects of population change and migration upon agriculture and rural community life in West Virginia (H 102)

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

Input-output relationships of forage production on dairy farms in West Virginia (H 134; coop. Agronomy and Genetics)

Economics of reducing the frequency of retail milk delivery (H 138, NEM 25)

Adjustments needed to enhance the competitive position of West Virginia in marketing broiler products (H 151)

Analysis of trends pointing to future consumption and market potential for meats in West Virginia (H 162, NEM 28)

Economics of marketing floricultural products in non-florist outlets (H 163, NEM 8; coop. ERS, CSRS, USDA)

Evaluation of alternative enterprises for West Virginia farms and the determination of optimum livestock and crop systems and scale of operation (H 165)

Structure and development of the retail market for ornamental nursery products (H 177, NEM 15)

Alternative marketing systems for eggs in the Northeast (H 185, NEM 21)

Social and economic consequences of changes in employment upon selected Northeastern communities (H 186, NE 47; coop. College of Arts and Sciences)

Milk assembly, processing and distribution systems and practices (H 187, NEM 25)

Consumer analysis for hunting and fishing in West Virginia (H 188, NEM 35)

Evaluation of market structure performance in marketing Northeast fruits and vegetables (H 199, NEM 34)

Optimum location of livestock and meat marketing facilities in the South (H 200, SM 27)

Plans for economic development in the Upper South Branch Valley of West Virginia (CSRS grant)

Agricultural Engineering

Agricultural climatology of West Virginia (H 105, NE 35; coop. Reymann Memorial Farms, Ohio Valley Experiment Farm, Weather Bureau, U. S. Department of Commerce)

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

Hydrology of watersheds on shale soils (H 130; coop. Agronomy and Genetics, ARS, SCS)

Equipment for permanent hillside pastures (H 156)

Effect of temperature, humidity, and drying time on hay (H 158, NE 13; coop. ARS)

Influence of solar energy and light on poultry house environment (H 170, NE 8; coop. Animal Industry and Veterinary Science)

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

Agronomy and Genetics

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

Alfalfa breeding and genetic investigations (H 66)

Some chemical properties of the major soil types of West Virginia (H 81)

Nutrient availability in relation to soil structure (H 106)

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

The chemical nature of soil organic nitrogen (H 112, NE 39)

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

The life cycle of yellow rocket (*Barbarea vulgaris*) as related to its control as a weed (H 128, NE 42)

The microclimate and soil moisture regime in forested soil as affected by topography and its effect on site productivity in mixed oak stands (H 140)

The performance of several alfalfa varieties grown under different climate conditions with emphasis on the influence of fall cuttings (H 141)

The influence of cutting and fertilization treatments on the productivity and persistence of orchardgrass and timothy (H 142)

Biochemical studies on cold resistance of alfalfa (H 152)

Rate and time of application of K fertilizer in relation to yield and longevity of alfalfa stands (H 153; coop. Ohio Valley Experiment Farm, Reedsville Experiment Farm)

Evaluation of improved varieties, synthetics and new forage species for the Northeast (H 154, NE 28)

Physiological responses of weed and crop plants to herbicides (H 161; coop. Horticulture)

The control of weeds for pasture and forage production (H 169)

Morphological and physiological responses of perennial forage grasses (H 173, NE 29)

Phosphorus fixation in West Virginia soils and its influence upon plant development (H 181)

Physiology and Heterosis: Correlation of differential rates of morphological development with germination and post-germination physiology in maize (H 190)

Laboratory and field studies of frost heaving (H 191)

Field crop variety testing (S 6)

Soil survey work in West Virginia (S 8)

The establishment, testing, observation and evaluation of grass and legume

(*Continued on Page* 14)

NEW FORESTRY CENTE

TEACHING

For the first time West Virginia University has a complete forest facility where teaching and research in all areas of forest land management, recreation, and wildlife can be conducted.

CULMINATING almost 34 years of extensive research and hard work the Forestry Center at the University was dedicated November 5, 1965. Appropriately, the dedication speaker was Governor Hulett C. Smith. The cermony was held in conjunction with a three-day conference of the Governor's Committee on Wood Utilization. The chairman of the conference was State Senator E. Hansford McCourt of Webster Springs.

Located on the University's Evansdale Campus, adjacent to the Agricultural Sciences and the Agricultural Engineering Buildings, the center contains 100,000 square feet —five times that previously available for forestry.

The ultra-modern building was built at a cost of $2.3 million, capping years of effort and planning on the part of many individuals and agencies.

Financing of the facility was initiated in 1962 when $1.2 million from the University's Capital Improvement Fund was appropriated. This grant was modest in terms of today's construction costs and research requirements for wood science, forest management, and forest recreation.

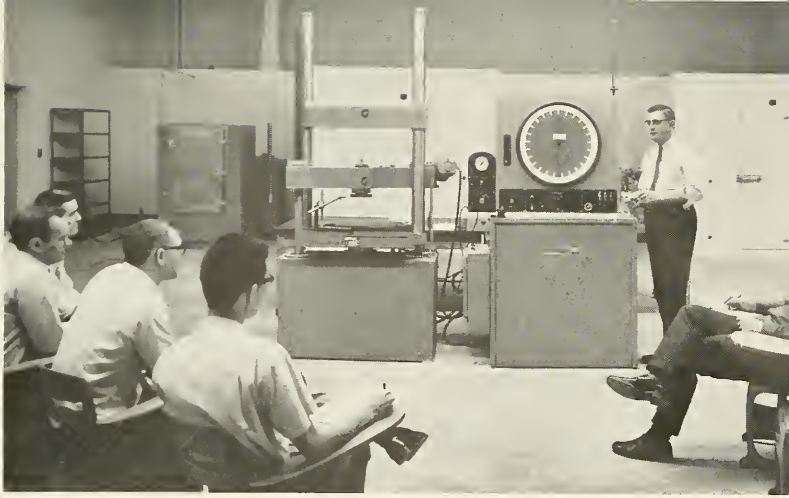
Conscious of this and of the vital role that wood science research could play in rejuvenating the State's wood-using industries—thus creating more jobs—the Area Redevelopment Administration was receptive to a proposal by then Governor W. W. Barron. The ARA granted $960,000 specifically to provide wood science facilities for basic and developmental research.

Later, the National Science Foundation made a grant of $100,000 to strengthen the facilities for basic research in all areas of forestry. These grants added to the University's orginal allocation for construction, plus allocations for equipment, provided adequate funding.

In addition, the West Virginia Sawmill Operators Association contributed attractive wood paneling and flooring for display in offices, corridors, and general use areas throughout the building. This treatment proved to be one of the Center's most attractive features.

The main entrance, facing southwest, is reached by a ramp which leads into a large lobby where built-in showcases offer exhibits of recent developments in forestry. The forest reading room, in this part of the building, contains a collection of

RESEARCH



Much research will be aimed specifically at the problems associated with Appalachian hardwood lumber. Research facilities, or contract research, will be available at a reasonable cost to even the State's smallest wood-using industries.

more than 25,000 books and pamphlets related to forestry and wood science and is especially complete in its store of West Virginia material.

The large wood science laboratories stand out prominently in the west. The largest of these labs, prominent from any angle of view, is designed specifically for assembling and testing large hardwood beams.

In the adjacent wood processing lab, logs, lumber and bolts can be brought directly indoors on trucks, unloaded and cut into test specimens for research. The processing lab also contains gluing facilities for laminating small units and for preparing veneer.

The wood seasoning and preserving complex contains two standard-size dry kilns and a loading area. Here, there are tanks, retorts, and pressure units capable of duplicating all known methods of impregnating wood.

Among other separate wood science research laboratories in the Forestry Center are wood properties, wood identification and lumber grading, wood seasoning and wood chemistry. In addition, the University's nuclear reactor has been relocated there to be used for research in changing wood through irradiation into wood-plastic combinations for developing polywood products.

Within the wood science complex, office space is provided for the use of visiting scientists, as well as for faculty from other units of the University, who may wish to utilize these facilities temporarily for special research projects.

In addition, members of the University's wood science staff will be available to carry on contract research for the small wood-using industries of the State on a cost basis whenever these industries request help in the solution of manufacturing problems.

The forest management section contains laboratories especially equipped to carry on teaching and research in forest ecology, silviculture, forest physiology, forest genetics, forest mensuration and photogrammetry, and areas for economics research.

There are additional facilities for teaching and research in wildlife management, fisheries biology, and forest recreation. All facilities will be directed toward more productive use of the State's forest land and forest products. Much of the wood

from West Virginia's 10 million acres of commercial forest land has previously been sent out of the State for remanufacture into finished wood products. Then some of the items are shipped back for sales. The goal of much of the wood science research will be to encourage the development of the State's own wood-using plants.

Other research will be aimed specifically at the problems associated with Appalachian hardwood lumber, and done under West Virginia conditions. These research facilities must be available at a reasonable cost to even the smallest wood-using industries in the State to help them solve their production problems.

For the first time West Virginia University now has a complete forest facility where teaching and research in all areas of forest land management, recreation, and wildlife can be conducted. Through expanded course offerings for full-time students, short courses for all interested persons, conferences and research facilities, the effects of the new Center cannot help being felt, in many instances with great impact, in every county of West Virginia.

The reading room (top) contains more than 25,000 books and pamphlets. Modern offices (left) are especially attractive. The offices, as well as the whole building, feature wood construction to display both the beauty and practicality of wood. Students can meet and relax in a spacious lounge (below). Dr. W. C. Percival, director of the Division of Forestry, talks with a visiting group of students.

new publications

Bulletins

505. C. J. Cunningham, B. W. Wamsley, J. A. Welch, and J. O. Heishman. A Comparison of Three Breeds of Rams as Sires of Market Lambs. April 1965.

506T. H. A. Wilson. The Microbiology of Strip-Mine Spoil. May 1965.

507. D. E. Nelson, W. W. Christensen, W. H. Reid, and N. D. Jackson. Marketing Practices of West Virginia Lumber Producers. June 1965.

508. A. D. Longhouse, J. O. Heishman, and C. J. Cunningham. West Virginia's New Housing and Management System for Raising Broilers. June 1965.

509. J. G. Leach and E. S. Elliott. Diseases of the Iris in West Virginia and Their Control. June 1965.

510. Robert L. Jack. Promotion of Nursery Products: Effects of Sales and Consumer Attitudes. June 1965.

511. N. D. Jackson, C. B. Koch, and W. H. Reid. A Method for Controlling the Dimension of Hardwod Lumber. June 1965.

512. R. L. Burke and R. L. Jack. Retailing Horticultural Specialties Marketed as Side-Line Products in West Virginia. June 1965.

513. J. L. McBee, Jr., C. C. Anderson, and D. W. Zinn. Carcass Composition and Growth Performance of Swine as Affected by Restricted Nutrient Allowance. June 1965.

514T. W. R. Guthrie and E. B. Collins. Factors Affecting Sorption Isotherms of Alfalfa. November 1965.

515T. C. K. Dorsey, J. O. Heishman, C. J. Cunningham, and H. E. Kidder. Cattle Grub Control Experiments Under Field Conditions Using Systemic and Other Insecticides, 1959-1965. November 1965.

516T. F. D. Whisler, C. F. Engle, and N. M. Baughman. The Effect of Soil Compaction on Nitrogen Transformations in the Soil. November 1965.

517. R. L. Burke and R. L. Jack. Small Greenhouse and Greenhouse-Florist Operations in West Virginia. December 1965.

518T. H. Patrick, R. E. Emerson, and H. M. Hyre. Design and Usage of a Cs^{137} Gamma Irradiator for Breeding and Physiological Studies. December 1965.

519. C. C. Anderson, J. O. Heishman, and J. A. Welch. A Comparison of Several Anthelmintics for the Control of Internal Parasites of Sheep. January 1966.

520. Science Serves Your Farm and Home. Annual Report of A. H. VanLandingham, Director. January 1966.

Circulars

114. Robert L. Jack. One Acre of Strawberries in West Virginia: Costs and Income. May 1965.

115. K. L. Carvell and H. P. Berthy. The Use of Herbicides in Forest Management Practices in West Virginia. June 1965.

116. Donald L. Kulow. Elementary Point-Sampling. December 1965.

Current Reports

41. R. O. Weedfall and W. H. Dickerson. Climatological Summary—The Climate of Morgantown, West Virginia. January 1965.

42. M. W. Johnson and F. J. Olsen. 1964 Hybrid Corn Performance Tests with Two- and Three-Year Averages. February 1965.

43. R. O. Weedfall and W. H. Dickerson. Climatological Summary—The Climate of the Canaan Valley and Blackwater Falls State Park, West Virginia. September 1965.

44. Leonard M. Sizer. Provisional Estimates of the Population of West Virginia Counties, July 1, 1964. September 1965.

Numbered Scientific Articles Published During Fiscal Year 1964-65

705. The Mechanism of Action of Malt B-Glucanases. V. Separation of the B-Glucanases of Germinated Barley by Dialysis and Ion-Exchange Chromatography on Phosphorylated Cellulose. W. W. Luchsinger and A. W. Richards. *Arch. Biochem. Biophys.* 106:65-70. 1964.

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The influence of genetics and environment on milk and meat production in Ayrshire cattle (H 7)
Comparison of young bulls with proven bulls in artificial breeding (H 27; coop. W. Va. Artificial Breeder's Coop., CES)
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Factors influencing the digestion of hemicelluloses and the utilization of nonprotein nitrogen by ruminants fed low-quality roughages (H 45) Revised
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Respiratory diseases of poultry (H 53, NE 5; coop. Reymann Memorial Farms)
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The influence of density on productive traits in laying hens on wire, slats and litter (S 140)

Forestry

Efficient forest management practices for West Virginia cut-over and burned-over hardwood forest lands (H 36; coop. W. Va. Conservation Commission)
Timber management for the market demands in southern West Virginia forests (H 56; coop. Island Creek Coal Co.)
Factors affecting natural regeneration in upland oak types (H 67; coop. Plant Pathology, Bacteriology, and Entomology)
Production of plantation-grown Christmas trees in West Virginia (H 119; coop. W. Va. Conservation Commission, W. Va. Christmas Tree Growers' Association, Maryland Departments of Research and Education and Forests and Parks)
Revegetating spoil banks with forest tree species (H 120; coop. SCS)
Population studies for forest small mammals in West Virginia (H 147)
Forest fire protection through public interest in game management in southern West Virginia (H 149; coop. Island Creek Coal Co., W. Va. Conservation Commission)
Selection, propagation, and silvicultural regeneration of superior genotypes of valuable Appalachian hardwood tree species (MS 1)
Wood characteristics of hardwood species which may be susceptible to genetic change (MS 2)
Utilization of sprout black cherry (MS 3)
Efficiency of alternative methods of lumber handling in West Virginia sawmills (MS 4)
Plantings of forest trees and shrubs at Greenland Gap (S 56)
Determination of optimum growth of West Virginia hardwoods (S 60)
Silvicultural management of Virginia pine in West Virginia (S 126)
Growth and yield of West Virginia hardwoods as affected by stand density and site quality (S 139)
The elastic and inelastic behavior of thin barrel vault shell roofs fabricated from stressed skin panels (S 141)

Horticulture

Nutrition of apple trees in West Virginia (H 16; coop. University Experiment Farm)
Selection, breeding and propagation of nursery crops (H 59; coop. Reedsville Experiment Farm)
Effects of herbicides on tree fruits and small fruits (H 116)
Post-harvest physiology of pomological fruits (H 180, NEM 27)
Post-harvest physiology and handling of strawberries (H 184)
Miscellaneous horticultural investigations (S 27)
Variety test of tree and small fruits (S 29)
Variety of strain studies of vegetables (S 31)
Lily bulb production trials (S 61; coop. ARS)
Propagation and selection of edible nut-bearing trees suitable to West Virginia (S 98)
Turf trials for home lawns (S 116)
Geranium production and improvement (S 121)
Studies of the effect of certain cultural practices on the cost of production for commercial strawberries in West Virginia (S 137; coop. Ohio Valley Experiment Farm)

Plant Pathology, Bacteriology, And Entomology

Decay as a factor in sprout reproduction of yellow-poplar (H 14; coop. Forestry, U. S. Forest Service, W. Va. Dept. of Natural Resources)
Factors influencing losses from root rots of forage legumes (H 51, NE 45)
Biology and control of tree-wilt pathogens (H 57, NE 25; coop. W. Va. Dept. of Agriculture, U. S. Forest Service, W. Va. Dept of Natural Resources)
Biology and control of nematodes affecting fruit trees and forest seedlings (H 72, NE 34)
Diseases of forage grasses (H 78)
The control of livestock pests in West Virginia (H 79; coop. Animal Industry and Veterinary Science, Reymann Memorial Farms)
Cereal and forage crop pests—their distribution, incidence and control in West Virginia (H 80; coop. Agronomy and Genetics)
The microbiology of farm ponds and other fresh water systems (H 132)
The physiology of microorganisms important in food and dairy science (H 178)
The physiology and genetics of fungi (H 192)
Host-parasite interrelationships of disease of vegetable crops with emphasis on those caused by species of *Phytophthora* (H 193)
The biology and control of insects and nematodes affecting forest tree plantations in West Virginia (H 194)
Chemical and non-chemical measures for the protection of perishable food commodities in marketing channels (H 195, NEM 33)
Attractants for insect control and survey operations (H 196)
Miscellaneous plant disease investigations (S 19)
Miscellaneous insect and insecticide studies (S 24)

University Experiment Form

Apple and peach insect control (S 91; coop. Bureau of Entomology and Plant Quarantine)
Delicious budsport evaluation test (S 115)

SPECIAL RESEARCH GRANTS

Agricultural Biochemistry

Hy-Line Poultry Farms, "Genetic Biochemistry and Biophysics," 1-year period $1,500.00
National Science Foundation, "The Mechanism of Action of the Beta-Glucanases," 3-year period $42,400.00
National Science Foundation, "The Synthesis of Taurine from Sulfate by Chick Liver," 2-year period $10,000.00

Agricultural Economics

Cooperative State Research Service Grant, "Plans for Economic Development in the Upper South Branch Valley of West Virginia," 1-year period $30,000.00

U. S. Department of Agriculture, Economic Research Service, "The Dynamics of Changes in Resources Use in Different Types of Areas," 1-year period . $9,000.00

Agricultural Engineering

U. S. Forest Service Cooperative Agreement #7, "An Engineering Research Study to Ascertain the Feasibility of Utilizing Gas Generators as Sources of Power for Portable Logging Tools," 3-year period $39,940.00

U. S. Forest Service Cooperative Agreement Supplement #6, "An Engineering Research Investigation into the possibility of Adapting Revolutionary New Internal Combustion Engines as Either Sources of Power for Portable Tools or as Centralized Power Sources. Modifications of Existing Engines will be Included. An Investigation into the Feasibility of Employing Portable Centralized Power Sources in Wooded Areas. This Study will Include Engines, Fuel Cells, Solar Cells, Electric Generators and Similar Devices," 2-year period $19,610.00

U. S. Forest Service Cooperative Agreement Supplement #4, "Identify, Objectively Determine, and Describe the Hydrologic Environmental Factors which Affect Operating Conditions in the Forest," 2-year period $8,600.00

Agronomy And Genetics

The Consolidated Tobacco Company, "To Determine the Feasibility of Growing and Curing Shade Grown Tobacco Under the Soil and Climatic Conditions in the Ohio Valley," 1-year period .. $4,000.00

American Potash Institute, "To Determine Maximum Economic Yield, Feeding Value, Costs of Production and Profit from Corn Grain, Corn Silage and Alfalfa Hay," 1-year period $900.00

National Science Foundation, "Physiological and Biochemical Studies of Cold Resistance in Plants," 2-year period $27,600.00

Animal Industry and Veterinary Science

International Minerals and Chemical Corporation, "Magnesium Studies in Plants and Animals," 1-year period $500.00

Cobb's Pedigreed Chicks, "Eradication of Infectious Synovitis," 1-year period $1,500.00

National Institutes of Health, "Pathogenesis of Avian Arthritis," 1-year period $19,000.00

Forestry

Atomic Energy Contract, "Characteristics of Xylem Tissues Exposed to Ionizing Radiation," 1-year period $9,980.00

Horticulture

U. S. Department of Agriculture, Agricultural Research Service Cooperative Agreement, "Research on Breeding and Selection of Native Ornamental Plants," 3-year period $30,000.00

Upjohn Company, "To Study the Effect of Enide on Barnyard Grass and to Determine Whether Activated Charcoal will Protect Sensitive Plants from Enide," 2-year period $1,500.00

National Science Foundation, "Metabolic Role of Boron in Plants," 3-year period $10,448.00

Plant Pathology, Bacteriology, And Entomology

Geigy Agricultural Chemicals, "Control of Livestock Pests," 1-year period . $1,000.00

ITT Marlow Pumps, "Forage Corp Insect Control with Econ-o-mist-type Sprayer," 1-year period $1,000.00

Shell Chemical and Development. "Livestock and Forage Corp Insect Pest Control," 1-year period $1,000.00

American Cynamid, "Control of Livestock and Forage Crop Insects and Helminths," 1-year period $500.00

Sun Oil Company, "Research on the Use of Horticultural Spray Oils in Alfalfa Weevil Control," 1-year period . $1,000.00

Chemagro Corporation, "Livestock Pest Control Investigations," 1-year period $500.00

National Science Foundation, "Action of Visible Light on Carotene-Light on Carotene-Producing Fungi," 2-year period $30,000.00

National Science Foundation, "Parasitism of Biotrophic Fungi on Other Fungi," 3-year period $26,100.00

National Science Foundation, "Physiological Comparison of Species of Phytophthora," 2-year period $35,000.00

National Science Foundation, "Evolution in the Genus Phytophthora," 3-year period $33,500.00

National Science Foundation, "Undergraduate Research Participation Program," 1-year period $11,200.00

National Institutes of Health, "Relation of Age of Fungus Cells to Mycoparasitism," 1-year period $4,105.00

National Institutes of Health, "Age of Host and the Development of Bean Anthracnose," 1-year period .. $3,720.00

Financial Statement for the Year July 1, 1964 to June 30, 1965

Classification of Receipts and Disbursements	Hatch	Hatch RRF	Title II	McIntire-Stennis	Non-Federal Funds	TOTAL
RECEIPTS						
Received from the Treasurer of the U.S.	$667,387.00	$120,303.00	....	$ 19,972.00	....	$807,662.00
State appropriations:						
Main Station	....	....	....	....	$450,961.78	450,961.78
Special:						
Oak Wilt Research	....	....	....	....	8,673.42	8,673.42
Forest Products Development	....	....	....	....	59,997.64	59,997.64
Special endowments, fellowships and grants:						
Private corporations ..	....	....	....	....	10,735.00	10,735.00
Fees	....	....	....	....	11,967.39	11,967.39
Sales	....	....	....	....	207,290.39	207,290.39
Balances forward July 1, 1964	....	....	$ 1,500.00	14,396.82	116,782.93	132,679.75
Total Available	$667,387.00	$120,303.00	$ 1,500.00	$ 34,368.82	$866,408.55	$1,689,967.37
DISBURSEMENTS						
Personal services	$530,160.32	$ 70,824.98	$ 1,500.00	$ 22,139.75	$458,273.72	$1,082,898.77
Travel	15,441.86	2,651.67	....	1,285.18	9,972.86	29,351.57
Equipment	46,357.07	31,918.68	....	7,058.68	66,254.42	151,588.85
Personnel benefits	10,221.75	....	....	384.32	3,378.57	13,984.64
Supplies and materials	47,374.02	10,486.09	....	1,935.03	112,492.02	172,287.16
All other	17,831.98	4,421.58	....	249.27	84,743.29	107,246.12
Total Disbursements	$667,387.00	$120,303.00	$ 1,500.00	$ 33,052.23	$735,114.88	$1,557,357.11
Unobligated Balances Available for 1965-66	....	....	....	$ 1,316.59	$131,293.67	$132,610.26

Herbaceous Competition

(*Continued from Page 4*)

Because of the large root systems, a mattock rather than a planting bar was used for planting. It was necessary to prune the largest roots on many of the seedlings to avoid cramping the roots in the planting holes.

To discover a way to further increase survival when using large stock, various methods of cutting back these seedlings were tested. Immediately after planting each seedling, one of the following treatments was applied (Figure 2): (1) cut back to the root collar; (2) cut back to a height of 1½ feet; (3) removal of the terminal bud by clipping the stem approximately 2 inches below the bud; (4) control—the seedling was not cut back.

These treatments were selected since it was thought that some method of reducing the length of the stem would increase survival by bringing the length of the shoot into better balance with the size of the root system. Cutting back would also delay leaf development, thus giving the roots more time to become established before excessive demands for water-uptake were imposed by water loss from the foliage.

Results

In 1964, seven growing seasons after the test planting, the heights of the saplings were measured, and the effects of each treatment on stem form were observed. The results of these measurements are presented in Table 1.

Discussion

Statistical analysis of the survival data showed that the only treatment that gave significantly higher survival than the Control was that in which the terminal bud was removed. This was attributed largely to the delay in leafing out after the seedling had been clipped in this way. Unfortunately, many of the seedlings had a severe crook in their stems at the point where a lateral branch had taken over as leader following remo of the terminal bud. This deformity so reduces the value of this treatment that the number of straight boles produced is nearly the same as the number of straight stems produced by the Control.

Within a month after planting, many of the seedlings cut back to the root collar had sprouted. Although more than one sprout usually developed, at the most only one usually survived. These sprouts, however, were frequently smothered by the herbaceous competition and matted down during the late fall and winter.

Stem deformities were common in those seedlings that had been cut back to 1½ feet in height. Most of these crooks were just above the ground level, and thus were not considered major defects because of their location.

Over the seven growing seasons, total height growth of those seedlings on which the terminal bud had been removed was significantly greater than the height growth for the Control or the other treatments. The average height growth of those cut back to the root collar was somewhat less than that of the Control, and reflects the handicap in height imposed on these seedlings by the severity of the cut back.

When planting on a 6 by 6-foot spacing, 60 to 70 per cent survival would give between 726 and 847 seedlings per acre. This would provide adequate regeneration for establishing productive poplar stands, if the seedlings are evenly-spaced throughout the planting area. If, after one year, large gaps occur in the plantation, replanting of these open areas would be advisable.

Summary

On those moist planting sites where a deep mat of rank herbs and annual vines carpets the ground during the summer, establishing yellow-poplar with one-year-old nursery stock often results in heavy mortality, since many of the seedlings are smothered or crushed to the ground by the dense herbaceous growth. Four-year-old planting stock will stand above these herbs and can withstand the matting of the surrounding vegetation. If seedlings of this age are graded at the time of planting, survivals of between 60 and 70 per cent can be obtained.

Cutting the graded yellow-poplar stock back to the root collar or to a height of 1½ feet did not increase survival, and does not seem to be justified on this account. Removing the terminal bud to delay leafing-out did increase survival significantly, but resulted in severe deformity of the stems. These deformities occurred approximately 4 feet above the ground and appeared to be permanent.

It is therefore recommended that when large yellow-poplar planting stock is required, the seedlings be carefully graded for vigor, and that no method of cutting back be employed. Survivals of 60 to 70 per cent may require some replanting the following year to assure even stocking.

TABLE 1. EFFECT OF EACH TREATMENT ON HEIGHT GROWTH, PER CENT SURVIVAL, AND STEM FORM, SEVEN GROWING SEASONS AFTER PLANTING.

	Treatment			Control
	Cut Back to Root Collar	Cut Back to 1½ Feet	Terminal Bud Removed	
Average height (feet)	10.7	12.0	14.3	11.2
Per cent survival	51.5	65.9	81.8	68.2
Per cent of stems with major deformities	5.8	6.9	16.7	5.9
Per cent survival for straight stems	45.7	59.0	65.1	62.3