West Virginia State College

Plan of Work
2000-2004

"Annual Report of Accomplishments and Results"
FY 2000

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Cooperative Extension Service
Cooperative Research &
Technology Development

WEST VIRGINIA STATE COLLEGE
DEPARTMENT OF LAND-GRANT PROGRAMS

"Annual Report of Accomplishments and Results"
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SECTION I.
INTRODUCTION

Summary

The present report provides information on the current progress and program development status for the research and extension components implemented by the offices of Cooperative Extension Service, Cooperative Research and Technology Development, and Community and Economic Development during the first year of federal funding, FY 2000, at West Virginia State College.

Background Information

Fiscal year 2000 was a capacity building year for the College, and more specifically for the newly established Department of Land-Grant Programs. The fiscal support of $1 M for extension and $ 1 M for research served as seed funds to establish cooperative research and cooperative extension infrastructure and program efforts. As these programs become established within our communities and the College, it is the goal of this department to seek additional state and local funding to maintain, monitor, and to further expand the reach of such programs.

Federal funds were made available to the College in March of 2000. Since then, the Department of Land-Grant Programs has worked diligently in getting all the proposed programs off the ground. The Department of Land-Grant Programs was established on March 17, 2000 to serve as the administrative arm for the College's land-grant mission of research, teaching and extension.

The College, as it relates to land-grant, is in an infrastructure-building year. Currently, the Department is about 75% fully staffed in the Offices of Cooperative Extension and Cooperative Research. Presently, land-grant staff members are working in a number of research,

extension and community related projects in the College's service area. Presently, a number of programs have advanced forward to the implementation stages. Some of these programs include initiating afterschool programs for youth by partnering with educational entities and community groups in order to increase the college going rate in the State, developing nutrition education curricula and programs for youth, adults and the elderly, and participating in cutting edge research projects aimed at decreasing the pollution of the State's waterways. The College is confident that such meaningful programs will enhance the quality of life for many citizens in the State.

This report is divided into four parts. This introduction section provides a general background and an overview of the current state of progress of the land-grant programs proposed in our plan of work. The following two sections analyze in greater detail the research, extension, and community and economic development programs. More specifically, section II assess the current progress of the research programs that are in full effect, and explicates the next phases of those programs that are not fully implemented. Section III presents a similar analysis of the cooperative extension and community and economic development programs. The last section regards the future vision of the program including an outlook of the program's future goals.

SECTION II.
COOPERATIVE RESEARCH AND
TECHNOLOGY DEVELOPMENT PROGRAMS

Goal 1
COMPETITIVE AGRICULTURAL SYSTEMS

Research Program 1.1: Crop/Plant Growth Modification and Development

The regulatory mechanisms that control the metabolism of cytokinins, a major plant growth regulator, affect all phases of plant development and conditioning. Additionally, these mechanisms affect many of the physiological responses of plants to their environment. The nature of these regulatory mechanisms remains one of the major unresolved problems in plant hormone physiology.

We are currently purchasing equipment and preparing greenhouses so that we can begin experimentation in the Spring.

Research Program 1.2: Rapid Crop and Soil Assessment Studies

Maximizing productivity in agriculture requires the maintenance of many environmental parameters within narrow ranges. In American agriculture this is primarily achieved through the application of chemical agents. If inadequate amounts of fertilizer or pesticide/fungicide are applied, crops may fail to thrive or succumb to pathogenic organisms, but if excess amounts are applied, money is wasted and the excess chemicals become an environmental problem. Plants contain numerous chromophores that change how they absorb and reflect light in response to chemical conditions such as pH levels and the presence or absence of minerals. These chromophores go unnoticed because chlorophyll strongly reflects light at wavelengths near the maximum sensitivity of the human eye. By the time a leaf becomes noticeably less green irreversible damage has often occurred. Important agricultural chemicals including nitrates, phosphates, pesticides and fungicides are colorless to the human eye. Thus, their presence or absence cannot be determined by sight.

Plans are being developed for a "spectroscopic diagnostic system" that can detect specific changes in plant health and soil chemistry and prescribe a measured response to restore the balance. Raman spectroscopy is currently the analysis tool to be included as part of the diagnostic package. We are currently negotiating the use of a laser Raman spectrometer from a local company, while concurrently looking to purchase a pre-owned unit from another institution or business. Analysis experiments are being planned for the Spring once the anaerobic digester begins producing fertilizer and the fertilizer trials begin at the State College farm.

Goal 2

SAFE AND SECURE FIBER SYSTEMS

Program 2.1: Development of Anti-Fungal Agents

A research effort aimed at preparing pyoluteorin and analogs as anti-fungal agents has been ongoing. These antifungal agents are effective against pathogens of cotton, among other crops. Work has been initiated on both parts of the target molecule having hydrogen atoms in place of the chlorines. Resorcinol has been protected as the bistetrahydro-pyranyl ether. Pyrrole has been converted into 2-trichloroacetylpyrrole with no trouble. This material had been converted into 2-pyrrolecarboxylic acid by treatment with sodium hydroxide but this result could not be repeated. 2-Pyrrolecarboxylic acid has been protected as the Boc derivative. This should allow easy coupling with the protected resorcinol, but this has not yet been done.

Goal 3

POLULATION HEALTH &NOURISHMENT

Program 3.1: Protein Replacement for Aquaculture Diets

The construction of the aquaculture wet laboratory for fish nutrition studies is 99.99% completed. There is minor adjustment to the acclimation tanks that is within the original work specification that needs to be completed. This wet laboratory for the rearing of fish has 36 twenty nine-gallon glass tanks, 900 gallon reservoir tank, 2 eighty nine gallon polyethylene tanks, a dechlorinator and an air blower.

The analytical laboratory is half completed. Equipment arrival delays have slowed the completion of the job.

For the research projects, preliminary studies on the trout yield verification trial have been completed. The results show that the use of high-energy diets containing 42 percent crude protein and 18 percent fat compared to low-energy diet (38% protein and 11% fat) significantly improves weight gain and reduces the cost of feed per weight gained by trout by 18 percent. The results were presented at West Virginia Aquaculture Forum 2001. The second phase of the project will start this summer.

The second project is in its infancy. It is concerned with the utilization of recovered protein from treated poultry wastes and development of low-pollution finfish feeds. The

starting date for trout feeding trials using recovered protein from poultry wastes depends on the completion date of the lab. After the completion of both laboratories, the first experiment will be conducted. This experiment will be the determination of the effects of different levels of recovered protein from poultry wastes on rainbow trout. The duration of this experiment is 10 weeks.

A proposal is also being written for submission to National Science Foundation. Another proposal submitted to United State Geological Survey (USGS) through West Virginia Water Resource Research Institute is pending approval by the USGS. These proposals will supplement the ongoing research program.

Goal 4

AGRICULTURE & THE ENVIRONMENT

Program4.1: Detection of Environmental Toxins in Soil and Groundwater Supplies

The Acid Mine Drainage (AMD) soil samples at Heizer-Manialla have been collected. The majority of the soils have been sieved and homogenized. The soil has been digested with acid and the determination of several metals with the Atomic Adsorption has been conducted. The metal concentrations of the soil samples have been determined for Al, Fe, Mo, Cr and Cu. The next series of metals that will be determined in the soil samples are Hg and As.

Requests for a fluorimeter were submitted last fall. The equipment was recently delivered and installation should be completed mid-February.

Research Program 4.2: Soil Remediation Studies

Determining and understanding the fate and transport of anthropogenic organic compounds and contaminants (either intentionally or unintentionally applied) in soil and humic materials is an ongoing research project. The organic matter of soil, humus, is an important constituent contributing to the increased sorption of organic contaminants. Thus far, on this project, one soil sample has been collected, sieved and homogenized. The soil sample has been treated with 0.1M NaOH, which is used to isolate the humin. The humin is currently being extracted using

Soxhlet-extraction. Other chemicals are currently being ordered to completely characterize the humin in the soil.

Program 4.3: Waste Energy Recovery Studies

A thermophilic anaerobic digester has recently been given to West Virginia State College by the WV Department of Agriculture. The re-construction of the unit has been carried out in phases. During Phase 1, the site was prepared and a cement-supporting pad was poured for the unit; this phase was successfully completed in November of 2000. In Phase 2, the assembly of skids 1, 2 and 3 including the plumbing and mounting of components together with the fence installation was completed; this phase is now largely completed with the fence installation taking place towards the end of biological commissioning to allow for access to feed tanks. Phase 3 allowed for electrical wiring and telephone hook-up for offsite computer monitoring and flare assembly hook-up. This phase was completed in February 2001. Phase 4 includes the commissioning of the mechanical equipment and operation of the instrumentation for digester control. This phase has largely been completed. However, there are some minor modifications to the instrumentation that are still required. The biological commissioning began on February 27th, and this effort will continue through April to optimize the control conditions in terms of temperature, feeding and mixing parameters required to provide microbial efficiencies.

The fish growth experiments have been planned, particularly with regard to feeding the palletized digester solids to trout. It is expected that these trials will begin in May and will include heavy metal monitoring and influence on fish growth.

The fertilizer trials for 2000 were completed successfully with good growth outcomes for the solid fertilizer produced from the digester. The crops used in the trials varied differentially and these trends are to be further investigated with crop trials in 2001. Advanced experimental designs are underway and the crop beds are being prepared for the current season fertilizer trials. These changes include permanent supports for the tomatoes, repositioning the pressure valves in the irrigation system and mulching the aisles between the raised beds.

The greenhouses have been purchased and will be erected on the two campus sites during the spring of 2001. The experimental trials for these facilities are being designed and the first greenhouse crops, using both hydroponics and conventional means, are planned for fall 2001. However, unanticipated construction delays and commissioning problems may push the greenhouse work to the spring of 2002.

A fermentation laboratory (that will contain the laboratory digesters) and a general microbiology/biochemistry laboratory (for the microbial community dynamics & pathogen diagnostics work) have been constructed. The fermentation lab still requires an exhaust hood for biogas generated by the digesters. Except for the exhaust hood, these labs are operational. Cryptosporidium PCR diagnostic work is in progress in the microbiology lab and the 5 laboratory digesters are under construction in the fermentation lab. We anticipate that both the exhaust hood installation and the digesters will be assembled in March & April 2001.

Program 4.4: Microbial Degradation of Waste

The past few months have been spent developing the research goals and experimental plans to investigate the microbial community dynamics in the thermophilic anaerobic digester that is currently being re-commissioned and in the laboratory bioreactors that are presently being constructed. Expanded research plans have necessitated additional equipment purchases; we are working on these now. None of the laboratories are yet completely outfitted to begin this type of experimental work. The experimental design plans and equipment purchases will continue at least through March. Experimental work may begin this summer if the laboratories have the proper equipment and the bioreactors have been constructed and function properly.

Program 4.5: Characterization of Invasive Species in West Virginia Forests

Last summer, we conducted an experiment that demonstrated that Ailanthus altissima (tree of heaven) increases toxin production (ailanthone) in response to, and proportional to, aboveground injury. We will be presenting this study at the American Botanical Society meetings this summer and are

currently preparing a manuscript for a peer-review journal. We are currently constructing an experiment that will test susceptibility to ailanthone among important native and invasive species typical of disturbed forest habitats in central Appalachian forests. Both studies will provide valuable information for assessing the impact of tree of heaven on native forests and developing effective management programs to minimize its negative effects.

Currently, manuscripts are being prepared for publication on this work, and we are gearing up for the Summer 2001 experiment campaign by purchasing equipment and materials and designing and planning experiments.

Program 4.6: Remediation of Industrial Wastewater and Acid Mine Drainage

Laboratory work has been initiated preparing the Polyacrylic Acid/Polyvinyl Alcohol mixture. Films have been cast from this mixture and treated with $CaCl_2$ and with a $CaCl_2$/Propanal mixture. The former produced a film with little or no integrity whereas, the propanal-treated film was opaque and white and significantly stronger than the original film. Current work involves preparation of films with solely the polyacrylic acid and Glycerol; the resulting film will be heated at high temperatures to effect esterification with concomitant linking.

Additional work is being done with Pumice. The very porous material has been treated with polyacrylic acid and glycerol with the intention of forming an ester linkage. This material could not only be used to treat oil spills but also at the same time remove heavy metal ions from solution. Neither of these projects has been evaluated as to its effectiveness as an Ion Exchange Material. The project is ongoing.

Goal 5

ECONOMIC OPPROTUNITIES AND QUALITY OF LIFE

Program 5.1: Regional Economic Forecasting Model Development

West Virginia has been particularly hard-hit by the changing economic structure from an industrial based to a knowledge-based economy. The loss of several major

industries has left the state with the highest unemployment rate in the country.

Key Program Components

1) Conduct needs assessments and data collection to develop forecasting models

WVSC is working with the West Virginia Research League to develop a comprehensive economic model for Southern West Virginia. The first project is to develop and "employability index" for each county, based on the asset mapping studies. Econometric forecasting models will then be developed for each county and/or region. This will enable researchers to determine what effect, if any, improvements in education, infrastructure and incentives will have on future development in the state. Projected Completion: Fall, 2003

2) Perform a gaps analysis to highlight disparities in perceived industry need and the current workforce skill set.

Community Needs Analysis of the Charleston metropolitan area. In an effort to bring key stakeholders together, we are in the process a conducting a study to determine what services and skills are lacking in certain sectors of the metropolitan area. Using surveys and community forums, we will gather information about current labor skills and the needs of industries in this area. Upon completion, WVSC will be able to focus our attention on those areas where there are gaps in services and employment possibilities. Projected Completion: April 2002

Clay County Asset Mapping Program. In a similar study, WVSC and West Virginia University are partnering to study the demographic makeup, community and labor assets in Clay County, West Virginia. Clay County is extremely rural, with the highest unemployment rate in the state and the lowest per-capita income. Infrastructure is poor. In order to attract new business and industry, we must first determine the needs of the area and the reason for the chronically high unemployment in the area.

Putnam County Labor Survey. In a situation, quite opposite of that in Clay County, Putnam County (neighboring

counties) is experiencing the highest growth rate in the state. A study is beginning that area to determine the assets leading to growth.

3) Create programs to reconcile and link skill sets to industry needs

The current studies are in the planning or developmental stages. After we have gathered the necessary data, appropriate workforce and community development programs will be instituted.

Program 5.2: Improving the Quality of Life

The WVSC Family Development Specialist has conducted training sessions in Internet safety, geared toward parents, throughout the state. In addition, the program "Baby Think it Over" has been made available for groups to stress pregnancy prevention. To date, over 100 youth have participated. These current parenting programs are yet to be evaluated. A parenting brochure is in the developmental stages as well. In the next six to nine months, we will develop and test parenting education programs based on assessment and modification of existing program models.

Merit Review

Annually in March/April all programs will undergo a thorough review process. The process includes an internal and external evaluation. An oral presentation at the WVSC Annual Research Symposium will be a key component the overall annual evaluation. It is required for Land-Grant sponsored researchers. The internal evaluation consists of an Office and/or Departmental appraisal by the executive staff. Additionally, all participants in Land-Grant sponsored research will critically assess the research of fellow colleagues for developmental purposes only. A research advisory council established by the Office will conduct the external program evaluations. The research advisory council will consist of local and national scientists with a wide variety of backgrounds, business

leaders and other appropriate stakeholders. The evaluations from the council will be utilized to help rank and allocate funds to specific land-grant programs. Forced ranking will be done using instruments that will assess the relative strength of a given research program based on the research output per unit time and the research dollars spent per unit time. This forced ranking will determine how funds are allocated to project during the next budget year.

SECTION III.

COOPERATIVE EXTENSION, AND COMMUNITY AND ECONOMIC DEVELOPMENT PROGRAMS

Goal 1

COMPETITIVE AGRICULTURAL SYSTEMS

Program 1.1: Trout Yield Verification

Researchers from the cooperative extension programs of West Virginia University and West Virginia State College, in concert with the private and state aquaculture related groups, have initiated feasibility studies for the production of trout in West Virginia. The purpose of this research is to assess the nutritional, ecophysiological, structural and mechanical requirements necessary to effectively and efficiently produce a highly marketable trout crop. The collaborative have identified sites to carry out the initial phases of this project, and scientist from both institutions have almost completed setting up laboratories which will be used to perform preliminary nutritional studies.

Program 1.2: The Expansion of Horticultural Activities in West Virginia

A partnership between the University of Illinois (U of I) and West Virginia State College was established with the goal of developing a program which emphasis the basic fundamentals of Home Horticulture. This program will be used as both a teaching and outreach tool within the programs of both institutions. Currently, the College is contracting with Dr. Bob Skirvin, a Professor of Horticulture at the U of I, to scan in slides that will be used for horticulture lectures and distance learning

activities. The material ranges from basic horticulture definitions to frost prevention of non-hardy crops to landscape architecture. About 33% of the approximately 2000 slides, which makes up the full Horticulture 100 course, have been scanned into a database.

Goal 2

SAFE AND SECURE FIBER SYSTEMS

Program 2.1: Food Allergy Awareness

Up to 5% of children suffer from serious food allergies in the state of West Virginia. Knowledge and awareness of food allergies and their potential severity, however, is limited. The goal of this program is to increase awareness and prevention among patients, parents, health care providers, school nurses and education providers.

Brochures with information about food allergies and sources for support have been printed. They are being distributed to pharmacies, pediatricians and allergist in the area. These brochures are meant for children/parents a way to find further information about allergy control and anaphylaxis prevention.

A conference will be held in the summer of 2001 for healthcare professionals and school nurses, in partnership with the National Food Allergy And Anaphylaxes Network. This two-day conference will be held in Charleston and will be available to those interested persons within the tri-state area (Ohio, Kentucky and West Virginia).

Goal 3

POLULATION HEALTH &NOURISHMENT

Program 3.1: Nutrition Education and Wellness System

Nutritional Education has been a major focus of the West Virginia State College/Charleston Housing Authority after-school programs. Approximately 120 children have participated in the program.

Programs geared toward seniors are also being developed. Extension specialists are traveling to senior centers in

the region to educate seniors on their special nutritional and wellness needs.

A strong partnership has been formed between WVSC and the WVU Office of Cooperative Extension in the area of nutrition education. In order to meet the needs of this state, it has become clear the two institutions must work together.

Goal 4

AGRICULTURE & THE ENVIRONMENT

Program 4.1: Biotechnology Forum

As biotechnology becomes more integrated into the agricultural, human and animal science arenas of our society, there will be an increasing need to inform the public about the specifics of genetic engineering, and more importantly, how genetic modification of animals and plants can positively Impact the way of life for mankind. West Virginia State College Department of Land-Grant College has proposed to set up and deliver a number of bioforums to address concerns and questions of the citizens about biotechnology, and its impact or non-impact on their livelihood. Currently, scientists and agriculture extension specialist are developing a format in which to deliver this public forum. We will work in collaboration with West Virginia University and West Virginia Department of Agriculture.

Goal 5

ECONOMIC OPPROTUNITIES AND QUALITY OF LIFE

Program 5.1: Youth Development

The Office of Youth Development has been actively developing programs this year. The existing efforts are as follows:

After-School Programs- WVSC, in partnership with Charleston Housing Authority and the City of Charleston, is providing after-school activities for youth in grades K-6 at six public housing sites in Charleston. The program focuses on academic and social enrichment, drug prevention and

elimination and nutrition and wellness. One hundred twenty (120) children are enrolled in this year-round program.

Sponsored by the U.S. Department of Transportation, WVSC will host its third Summer Transportation Institute in the summer of 2001. This four-week residential program will offer twenty-five 8th and 9th graders the opportunity to learn about the transportation industry.

The Health Sciences and Technology Academy is a partnership between WVU, WV Rural Health Education and Appalachian communities. Seventy-five minority and disadvantaged students and their teachers will spend one week on campus for clinical, laboratory, and classroom training. WVSC will host its first academy in the summer of 2001.

Programs in the area of Youth Entrepreneurship are being developed. A summer symposium is scheduled to train-the-trainer in entrepreneurship curricula. Sixteen teachers will receive continuing education credit for participating in this conference. Kidsway, Inc. will provide the training.

WVSC is building a dormitory to provide transitional housing and an opportunity to go to college for up to 14 high-risk youth a year. This project is funded by the U.S. Department of Housing and Urban Development (HUD).

Program 5.2: Family and Community Development

The Department of Land-Grant programs is conducting a needs assessment to identify gaps in existing social services. This information will be used to develop and expand existing projects that address issues including domestic violence, homelessness, adult illiteracy, teen pregnancy, substance abuse, and Internet safety. Working through neighborhood and community centers, programs will be developed and delivered. Current projects include:

Baby Think it Over – Pregnancy prevention program that uses life-like computerized "infants"' to discourage teens from having babies.

A series of community forums are being held to provide information on family issues to parents, teachers and community agencies.

WVSC-YWCA Transitional Living Community: Funded by the U.S. Department of Housing and Urban Development, WVSC will build a structure enabling formerly homeless and/or battered women (and their children) and opportunity to live on campus and attend college.

Program 5.3: Community and Economic Development

The Department of Land-Grant Programs has opened three Community Connection Centers in Charleston. State-of-the-art computers and equipment have been installed to allow citizens access in convenient locations. The Community Connection Centers will allow WVSC to offer programs to:

Train or re-train workers,
Enhance the skills of youth and their ability to become self-sufficient, and
Begin or continue lifelong education through GED courses, College 101 and basic literacy.

In addition to the computer centers, WVSC Department of Land-Grant programs is assisting in the development of community/neighborhood centers throughout the valley. The Booker T. Washington Community Center should be ready for the public in the fall of 2001. The Office of Community Programs and Economic Development is seeking additional funding to assist in refurbishing other community centers.

SECTION IV
PLANNING FOR THE FUTURE

Last July, the College submitted its first five-year plan of work. After we had an opportunity to review the comments from CSREES, it is apparent that some revisions and amendments to the WVSC Plan of Work are necessary. One major area of revision or clarification deals with the development of an appointment policy. The Department of Land-Grant Programs and the Division of Academic Affairs are currently developing an appointment system that would allow research faculty to participate in land-grant funded activities. Inversely, the appointment system will also allow land-grant staff members to participate in the

College's academe. The whole system will operate on a mechanism designed to allow time to be purchased between the Department of Land-Grant Programs and the academic departments of the College.

As suggested in the attached document from Dr. Cooper (see attachment), administrators and relevant staff members are working to develop process for soliciting Stakeholder input, as well as seeking advice on setting up merit review panels for both research and extension programs. The Department will also setting up its internal evaluation of programs in order to assess whether we are meeting the goals set forth in the initial development of the respective programs. In addition, researchers are assisting in the rewrite of the research section of the plan of work to make sure that the College would not be so restricted in program development in the future.

The Department is servicing a three county area. In the future, with the assistance of state funding, the College expects to extend its boundaries to serve the 11 southern counties of West Virginia. The 14 counties we are proposing to provide outreach services to represent the most urban, rural and ethnically diverse populations in the state. There are already collaborative projects between the College and West Virginia University (WVU), the 1862 Institution in the State, taking place in the counties we currently serve. We are further proposing to work with WVU to assist in program delivery in those counties (the other 11 counties) in which we will both be co-located. The idea would be to place a person in those sites or counties that would compliment the WVU staff member(s), not duplicate expertise.

The research component is heavily focused in environmental issues such as waste management and invasive species. However, there will be some interest in the future of developing research in the plant sciences, such as horticulture (e.g. fruit crop production and turf management), and plant pathology, physiology and genetics (e.g. *in vivo* microbial classification via molecular methods, molecular mapping and studies of endogenous plant hormones, and plant tissue culture optimization studies).

The College is poised to assume its role as a major and key outreach and research entity in the State. The Department of Land-Grant Programs has been and will continue to be the lead administrative area of the College that focuses on fulfilling the USDA mandated mission and goals. The hope is that as the Colleges research and outreach programs grow and develop, the function and philosophy of the land-grant status will not be totally confined to the Department of Land-Grant Programs, but it will evolve to become institutionalized within the entire College community.