West Virginia State College

"Annual Report of Accomplishments and Results"
FY 2000

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WEST VIRGINIA STATE COLLEGE

DIVISION OF AGRICULTURAL, CONSUMER, ENVIRONMENTAL, & OUTREACH PROGRAMS
A.C.E.O.P
(a.k.a. LAND-GRANT PROGRAMS)

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SECTION I.

INTRODUCTION

Summary

The present report provides an update of the annual accomplishments for the research and extension activities conducted by the 1890 Cooperative Research and Cooperative Extension Departments at West Virginia State College during the second year of federal funding (FY 2001). This report is designed so it is congruent with the general themes suggested by the USDA. It also provides the time and financial allocations devoted to each of the five national mandated goals.

Background & Institutional Updates

On November of 2001, with the passage of the FY 2002 Agricultural Bill, West Virginia State College was reinstated as a full 1890 Land-Grant Institution. As such, WVSC has a genuine opportunity to fully reestablish cooperative research and extension programs that would benefit the Citizens of West Virginia and the United States. WVSC has begun the development an implementation phases of research and extension programs with the initial Federal funding received during FY 2000 and 2001.

The recent growth and success of the land-grant programs has resulted in increased responsibilities for the Division. The formerly West Virginia Sate College Department of Land-Grant Programs has recently been promoted within the institution as a "Division of Agricultural, Consumer, Environmental, and Outreach Programs" (A.C.E.O.P.). This change provides leverage to the land-grant mission and widens the scope of our programs.

The Department of Land-Grant Programs (now Division of ACEOP) was established on March 17, 2000 to serve as the administrative arm for the College's land-grant mission of research, teaching and extension. As previously stated, fiscal year 2000 was a capacity building year for the College. During FY 2001, several programs were fully implemented and delivered to our communities, and stakeholders. Some of these programs include after school programs for youth; 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 and soil.

Although too soon to provide a clear assessment of the impacts that these programs have produced, few of these established programs have already had positive effects. This annual report of accomplishments describes these programs and their impacts. Sections II and III, analyze in greater detail the accomplishments and impacts of the research, and extension programs. More specifically, section II assesses the current progress of the research programs that are in full effect, and explicates the next phases of those programs that are not yet fully implemented. Section III presents a similar analysis of the cooperative extension and community and economic development programs.

The fiscal support for FY 2001 stayed at the same level of funding as the previous year; $1 M for extension and $ 1 M for research. In addition to these funds, it is the goal of this Division to seek additional State and local funding to maintain, monitor, and to further expand the reach of such programs. Presently, ACEOP staff members are working in a number of research, extension and community related projects in the College's service area.

The Division of ACEOP is currently servicing a three county area and will expand to additional counties. 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 proposed to provide outreach services 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 currently working with WVU to assist in program delivery in those counties (the other 11 counties) in which we will both be co-located. Both institutions work diligently in collaborative efforts to avoid program duplication.

Merit Review & Faculty Appointment Policy

Each year, during the months of March and April, all programs are subjected to a review process. The process includes an internal and external evaluation. An oral presentation at the WVSC Annual Research Symposium is a key component the overall annual evaluation and 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 critically assess the research of fellow colleagues for developmental purposes only. A research advisory council conducts the external program evaluations. The research advisory council consists of local and national scientists with a wide variety of backgrounds, business leaders and other appropriate stakeholders. The evaluations from the council are utilized to help rank and allocate funds to specific land-grant programs. Forced ranking are done using instruments that 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 determines how funds are allocated to project during the next budget year.

The Divisions of Land-Grant Programs (ACEOP) and Academic Affairs have developed an appointment system that allows research faculty to participate in land-grant funded activities. This appointment in turn, allows land-grant staff members to participate in the College's teaching activities. The system operates on a mechanism designed to exchange appointment time between the Divisions of Land-Grant Programs and the academic Departments of the College.

Stakeholder Input and Environmental Scanning

WVSC ACEOP is expanding its presence in the State of West Virginia, particularly in the capital city of Charleston and the surrounding counties. During the first year of land-grant funding, the focus was building infrastructure within ACEOP. Time was devoted to staff recruitment and training. In the second year, the main goal has been to assess the needs and strengths of stakeholders in our area and begin to deliver educational programs to address the many challenges faced by the citizens in our region. As we are still in the program development stage, the impact or outcomes of many of the projects are still not known. It is anticipated that in the next six to twelve months, we will receive and assess the outcomes from our initial projects.

These meetings were essential in determining who the community stakeholders are. After the initial introductory meetings and information sessions, ACEOP extension staff held a series of community forums and town hall meetings to get feedback from the citizens. Ten such forums were held across the Kanawha valley. Citizens are concerned about high unemployment, illiteracy among adults, teen pregnancy, inadequate information regarding proper nutrition, lack of activities for children and youth after school and the digital divide. Given the input we received from these forums, programmatic efforts were directed toward these issues. WVSC ACEOP is addressing Goal 5 with teen pregnancy prevention programs, after-school programs, summer youth educational programs, entrepreneurial education, computer education and technology access in low-income areas, and economic research.

SECTION II.

1890 COOPERATIVE RESEARCH PROGRAMS

Research Overview

FY 2001 was a capacity building year for the research program at WVSC. The research funding budgeted for FY2001 has been used for facilities renovations and seed grants to scientists thus facilitating the development of research programs. Many of the projects are still acquiring equipment and finishing lab renovations. Scientists continue to collect preliminary data, develop their experimental plans, trouble-shoot the newly constructed facilities and recently acquired equipment. However, all of the projects are progressing and utilizing students in constructive research.

Goal 1

To strive for an agricultural system that is highly competitive in the global economy; through research and education, empower the agricultural system with knowledge that will improve competitiveness in domestic production, processing and marketing.

Several research projects are addressing issues to improve the competitiveness of WV agriculture. WVSC biotechnology research to determine the controls of plant cell division has been initiated. Understanding the role of plant hormones in this process and other phases of plant development will result in the identification of biochemical targets that modify crop growth and development – establishing the basis for improved agricultural products. WVSC aquaculture research on a trout yield verification trial has identified a more efficient and cost-effective feed ration for a local trout production facility. This one production change by High Appalachia, Inc. has saved money to the point of making the business profitable. Research developing new uses for livestock wastes is demonstrating the efficacy of fertilizers derived from anaerobically digested poultry waste. The third year of vegetable and blueberry field trials suggest that digested poultry litter is a viable organic fertilizer and performs as well as commercial fertilizers.

Key Theme: Biotechnology

Program 1.1

Title: Crop Plant Growth Modification and Development

Description:

The regulatory mechanisms that control the metabolism of cytokinins (a major plant growth regulator) affect all phases of plant development and conditioning. In addition, these mechanisms affect many of the physiological responses of plants to their environment. The nature of these regulatory mechanisms remains one of the major unsolved problems in plant hormone physiology. Understanding these mechanisms is essential for the identification of novel biochemical targets that modify crop/plant growth and development, and is vital for scientists working to recover genetically altered plants.

Initial biotechnology research at WVSC will include an assessment of cytokinin dehydrogenase gene expression and enzyme activity throughout the cell cycle of BY-2 tobacco suspension cultures. Novel DNA probes for tobacco cytokinin dehydrogenase (formerly cytokinin oxidase) and associated enzyme assays must be developed. Tobacco cultures have been selected because of the unique features of the BY-2 cell cultures and the extensive amount of accumulated cell cycle data already collected in this system.

a) Research results

A graduate student (Heather Reed) has been recruited to work on this project and complete her PhD at the University of Exeter, Exeter, U.K. However, her research work will be performed at WVSC. She has gone through a two-week orientation at Exeter and has been developing an exhaustive review of the literature associated with her project.

The BY-2 tobacco suspension cultures have been established in the WVSC lab and total RNA & DNA have been isolated from this material. The first step in making a tobacco cytokinin dehydrogenase gene probe was to design degenerative nested primers from a consensus of corn, rice and Arabidopsis cytokinin dehydrogenase sequence. These primers were used in PCR with BY-2 tobacco genomic & cDNA templates and Arabidopsis genomic DNA. The DNA gels from these PCR reactions contained two to four DNA bands (amplicons). We are currently cloning and sequencing these amplicons in an effort to identify which one represents the authentic, tobacco, cytokinin dehydrogenase.

In a related project, an image analysis lab containing a research microscope system is under construction. This resource will be used to perform numerous BY-2 tobacco cell assays. These assays will include mitotic indices to assess cell cycle synchronization and DNA fluorescent assays to evaluate endoreduplication.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The WVSC Associate Director of 1890 Research (Dr. Chatfield) is responsible for assessments. Dr. Chatfield is also responsible for this research project. He feels it is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445); WV Higher Education Policy Commission (HEPC) Research Challenge Grant for $60,812 ("Development of new technologies for Microbial Detection at the Institute of Applied Microbiology")

Scope: State Research

Key Theme: Aquaculture

Project 1.2a
Title: Trout Verification Yields

Description:

WVSC Land-Grant Research and WVU Research and Development have collaborated to better understand ways of increasing production efficiency and minimizing wastes that are discharged from aquaculture systems into the environment.

a) Research results

Field trials took place at High Appalachia, Inc, a local trout-rearing farm, comparing the currently used diet (control) to a modified higher energy diet. Results demonstrated that using a high-energy diet did significantly improve weight gain and reduce feed cost. Compared to the control diet, the feed conversion rate of the test diet was 30% lower dropping from 1.69 to 1.17. The cost per kilogram gained was reduced by 18% from $1.03 to $0.84 per kilogram gained. Production efficiency increased 40% from 38 kilograms of gain per gallon per minute to 63 kilograms of gain per gallon per minute. In addition this project has provided research opportunities for two students.

b) Successes resulting in change (Outcomes): High Appalachia, Inc. has changed their trout ration formulation to the high-energy diet used in the verification trial.

c) Benefits to clients and stakeholders (Impacts): The trout yield verification trial has resulted in a permanent modification in the feed-formulation for High Appalachia. This one production change has converted a financially troubled operation [floundering trout business into a financial barracuda] into a profitable business.

d) Assessment of accomplishments: Excellent. A keystone example of what we are trying to accomplish with all programs.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445); USGS; USDA/CSREES Cooperative Agreement with West Virginia University.

Scope: Integrated Research and Extension

Key Theme: Diversified/Alternative Agriculture

Project 1.2b
Title: Alternative Crop Studies

Description:

West Virginia farmers and landowners are in need of high value cash crops, which require minimal space. Of the 18,000 farms in the state, 67% are less than 180 acres, mostly in woodland, and 80% sell less than $10,000 of products per year. Crops such as culinary herbs and ginseng could gross as much as $10,000 per acre. Research and extension will focus on marketing strategies of alternative crops, such as herbs and organic produce, as well as economic analysis of different herb production systems.

a) Research results

This project is currently under development. Results of the alternative crop marketing research will help current growers identify and develop direct marketing strategies for their produce and provide information for farmers interested in starting an alternative crop enterprise. Results of the economic analysis study will provide growers with information regarding the feasibility, profitability and return on investment of different production practices, such as greenhouse vs. outdoor and conventional vs. hydroponics.

b) Successes resulting in change (Outcomes):

This work is not sufficiently mature to show outcomes.

c) Benefits to clients and stakeholders (Impacts):

This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments:

The project is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: Integrated Research and Extension

Key Theme: New Uses of Agricultural Products/Organic Agriculture

Project 1.2c
Title: Alternative Crop Methods

Description:

West Virginia has different regional fertilizer needs. The Eastern Panhandle of the state produces more chicken litter than can be applied to and sustained by crops and pastures because of excess phosphorus in the litter. In the central and southern regions of the state, soil tests for phosphorus can be as low as 20 lbs. per acre in hayfields. Transporting the litter from regions that have a surplus of phosphorus to regions in need of phosphorus is the obvious solution to both problems. Therefore, research is focusing on the use of poultry litter as an alternative fertilizer in the south central region of the state. West Virginia State College is processing poultry litter using a thermophilic anaerobic digester to produce methane and provide a pathogen free (99.9%) high nitrogen and phosphorus organic fertilizer. Field trials comparing liquid and solid effluent from the digester to commercial fertilizers and raw poultry litter are being conducted. One study compares the effects of two rates of the digester solid effluent with commercial organic fertilizers on the yield of fruit and vegetable crops (potatoes, tomatoes, sweet corn, and blueberries) in raised beds. The other study compares the effects of the digester liquid effluent, commercial fertilizer, and raw poultry litter on the yield of a grass and legume hay. A third study, using a greenhouse hydroponics system with the digester liquid effluent, will be conducted in the spring of 2002.

a) Research results

Determining Organic Fertilizer Efficiencies in Crop Growth Experiments. The raised bed fertilizer trials in year 2001 included blueberries, tomatoes, potatoes and corn. Four fertilizer treatments and a control (no added fertilizer) were compared. Blueberry yields did not show significant differences between treatments. A late frost during fruit set may have impacted this experiment. Corn, potato and tomato fresh weight yield showed clear responses to fertilization compared to the untreated controls. In corn and tomatoes the mean fresh weights for the various fertilizer treatments were not significantly different from each other. However, in potato all fertilizer treatments were significantly different from the control and each other. This suggests potatoes may discriminate nutritional factors in all three-fertilizer treatments.

These results suggest that digested poultry litter is a viable organic fertilizer/soil amendment for certain vegetable and fruit crops. Several years data will be needed to rank the performance of this material with existing fertilizers. However

the current data suggest that digested poultry litter performs as well as commercial organic fertilizers.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact. However, the use of digested poultry litter liquids and solids can result in a low cost pathogen-free alternative to commercial fertilizers and raw manures. Several farmers have expressed interest in the use of the digester effluents on hay, row, and vegetable crops and in the construction of small on-farm anaerobic digesters. Extension specialists plan to disseminate research results and information on small-scale digester construction and operation to regional farmers.

d) Assessment of accomplishments: The WVSC Associate Director of 1890 Research (Dr. Chatfield) is responsible for assessments. Dr. Chatfield is also responsible for this research project. He feels the research is progressing well.

e) Expenditures by source:

Source of Federal Funds: Federal Administration Grant

Scope: State Research

Total SY & Program Costs for Goal 1: SY = 0.875; Program Costs = $215,895

Goal 2

A safe and secure food and fiber system to ensure and adequate food and fiber supply and food safety through improved science based detection, surveillance, prevention, and education.

Two research projects are answering fundamental questions associated with a safe and secure food and fiber supply. WVSC organic chemists are developing synthesis routes for natural compounds including pyoluteorin - an antifungal agent. This antibiotic is particularly effective against pathogens of cotton. Upon maturity this project should identify more efficient routes to the synthesis of a family of antibiotics and semi synthetic compounds that are effective in controlling cottonseed pathogens. Microbiologists at WVSC are developing methodologies to monitor and reduce the presence of microbes in process waters and food products. The proposed approaches will use physio-chemical means and bioluminescence for detection of microbial removal. More effective protocols are being developed to permit greater speed, sensitivity and selectivity

for the detection of microbes in milk and orange juice. Also new technologies are being applied to the detection of specific coliforms in drinking waters.

Key theme: Integrated Pest Management

Program 2.1
Title: Development of Crop anti-fungal agents

Description: WVSC organic chemists are developing synthesis routes for natural compounds including pyoluteorin - an antifungal agent. This antibiotic is particularly effective against pathogens of cotton. A useful preparation of this compound will allow more extensive testing against a wider range of pathogens and this may reveal an even more impressive array of biological activities and novel crop uses. In addition, analogs of pyoluteorin may be more effective protective agents. Collaborators at the USDA Horticulture Crops Research Laboratory in Corvallis, OR and in Europe are interested in doing the extensive testing necessary to give us potential leads for effective analogs of pyoluteorin that should be synthesized.

a) Research results

Pyoluteorin can be broken into two pieces by retrosynthetic analysis. The one part is the substituted resorcinol ring. This is easily prepared from resorcinol as 2,6-dihydroxycarboxylic acid derivatives. Specifically, this compound was prepared both as the dimethyl ether and as the bistetrahydropyranyl ether. Both of these compounds are now available as the carboxylic acids and the acid chlorides should be easy to prepare.

The other part of pyoluteorin includes the pyrrole ring. Rather than trying to prepare dichloropyrrole, the efforts here have focused on acylation and protection of pyrrole. Over 50 reactions were run in trying to combine pyrrole and various acylating agents such as benzoyl chloride, substituted benzoyl chlorides, benzonitrile, and the mixed carbonate derived from benzoic acid and methyl chloroformate. Some reactions were run simply varying the temperature and catalysts were added to others. About a fourth of these attempts gave some of the desired product as determined from NMR analysis. Column chromatography was used to isolate 2-benzoylpyrrole from the product of one reaction and the structure was confirmed with mass spectroscopy in addition to NMR analysis. Comparison of the structure with pyoluteorin shows that this material is a not too distant analog. Another approach will use an N-acylated pyrrole for attempts to carry out C-acylation. One of these is N-tert-butoxycarbonylpyrrole (N-Bocpyrrole), which has been made after several attempts.

The first year of work on this project has provided a better understanding of the chemistry and problems of preparing this compound. A simple analog, 2-

benzoylpyrrole, was made and fully characterized. Additional analogs as well as pyoluteorin itself should be prepared this coming year.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The project is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: State Research

Key theme: Food Safety; HAACP

Program 2.2
Title: Improved Detection of Microbes in Food Products

Description:

Producers, processors, and consumers of food products in the United States have become increasingly aware of food safety issues over the past decade. Millions of food related illnesses attributable to microbial contamination are documented every year. Food may be contaminated during production, processing, storage or preparation. We are developing new applications for bioluminescence-based technologies that will permit greater speed, sensitivity and selectivity in the detection of microbial contaminants, such as *E. coli* and *Salmonella*. The methodology depends on being able to break microbial cells and release the contained ATP and mix the extract with a cocktail of luciferin and firefly luciferase. The yellow-green light having a maximum absorption spectrum of 562 nm can then be measured with a chemiluminometer (Pallcheck Bioprobe). The amount of light measured thus depends upon the amount of ATP present and represents the number of microbes in the sample. The extractants used will also release ATP from non-microbial cells and selective extractants have been developed which allow for the determination of non-microbial cells (with somatic extractants), and microbial cells (with microbial extractants).

a) Research results

The overall goal of this research is to improve microbial detection techniques in foods and food products by utilizing the Pallcheck Bioprobe luminometer. In order to use the Bioprobe for diverse food products, specific protocols need to be developed for those products. During summer 2001, we utilized a student researcher for developing protocols for using the Bioprobe to detect bacteria in milk and fruit juice. The detection of bacteria in milk worked well. We found that the luminescent signal was obscured by undiluted milk, but appropriate dilutions of a milk sample resulted in a reproducible correlation with bacterial cell numbers. The milk protocol was found to be ineffective for orange juice. The acidity of the orange juice may be interfering with the luciferase. Development of a protocol for orange juice has not been completed.

A second goal of this research is to use the Bioprobe luminometer for developing rapid hygiene monitoring methods that do not rely on growth and can quickly identify pathogens even in a stressed condition. The main deficiency in existing techniques is the inability to rapidly pinpoint pathogenic micro-organisms in samples with a relatively high concentration of naturally resident bacteria, e.g. potable water or ward floor or wall surface. Ideally, we would wish to detect one pathogen, or indicator organism, in a sample containing thousands of other microorganisms. The sensitivity to detect one to ten pathogens or indicator organisms per volume of sample will mean that we have a useful system.

The third goal of this research is to develop a rapid method to specifically detect pathogens or indicator organisms in liquid products such as potable water through investigation of filter discs. The most frequently performed test on potable water samples is to detect fecal coliforms. We have begun to develop protocols to couple bioluminescence detection to polyclonal and monoclonal antibodies specific to particular microbial food contaminants. We have conducted a preliminary experiment using anti-*E. coli* antibodies that are reactive with all O and K serotypes, coupled to the BioRad Immun-Star Chemiluminescent Detection System. Optimisation of the protocol, including such variables as substrate incubation time, and sample filtration method, will need to be determined empirically. We will also extend the antibody-based detection to at least one other bacterial species that is important in the food or health care industries.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The work is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: State Research

Total SY & Program Costs for Goal 2: SY = 0.75; Program Costs = $161,000

Goal 3

A healthy, well-nourished population through research and education, on nutrition and development of more nutritious foods, enable people to make health-promoting choices.

Key Theme: Human Health & Nutrition

Program 3.1
Title: Nutrition Education Study in West Virginia

Description:

West Virginia is one of the most impoverished and least healthy states in the country. Positive correlations between poverty and inadequate nutrition raise concerns for the health of the state's children and families. The Center on Hunger and Poverty report that 175,000 individuals in West Virginia were food insecure on average in 1996-1998, meaning they were hungry or at risk of hunger. Many of these individuals are children. Proper nutrition is crucial for sound health and normal development. Inadequate food energy intake can cause problems with attention, concentration, learning and other essential daily activities. Seniors who experience hunger are at risk for serious health problems such as a higher risk of stroke and increasing the incidence of depression as well as possibly limiting the efficacy of many prescription drugs.

The perception of nutrition related issues have an impact on the delivery and utilization of nutrition education programs. For instance, if a legislator holds the perception that hunger is not an issue in West Virginia he/she is unlikely to propose policy that will increase availability of food. In the same way, a single mother may perceive her malnourished child to be "small for his age" and not seek assistance in securing proper nutrition. These perceptions must be identified in order to develop appropriate nutrition education programs to meet the needs of our community and state. It is also imperative to look at existing programs in the state and across the nation to determine what is successful and what can be expanded or replicated in West Virginia. For instance, community gardens often provide a food source to a local area, but it hasn't been

determined that availability of vegetables actually impacts the nutritional diets of those living in that community.

a) Results

Surveys to evaluate existing nutrition education programs and assess current perceptions of nutrition in West Virginia are under development in partnership with West Virginia University Extension Service. Nutrition education programs are being designed with a built-in means to assess their effectiveness. In the future new models for nutrition education will be delivered, evaluated for effectiveness and ranked for further development.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The work is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: State Research

Total SY & Program Costs for Goal 3: SY = 0.125; Program Costs = $27,779

Goal 4

A greater harmony between agriculture and the environment by enhancing the quality of the environment through better understanding of, and building on, agriculture and forestry's complex links with soil, water, air and biotic resources.

West Virginia's natural resources are very important to the state's economy. Research efforts underway at WV State College (WVSC) are exploring efficient and economical methods to lessen and remediate the impact of extractive and agricultural industries. The development of novel, real-time methods of heavy metal detection in soil and groundwater will increase chances of identifying potential pollution hazards. The synthesis and utilization of diaminonapthalimide dye (ED-4) for detection of copper and other trace metals is one of the methods being studied.

A second project addresses a major issue surrounding the mining industry – the cleanup of mine drainage containing heavy metals. A new metal-binding polymer synthesized by WVSC chemists, may provide a novel, cost-effective alternative to conventional methods of heavy metal remediation.

Studies by WVSC microbiologists on thermophilic anaerobic digestion are demonstrating how to significantly decrease pollution associated with livestock wastes. The goal of this work is to determining the microbes responsible for efficient mineralization of organic wastes during the digestion process ultimately identifying ways to make the process more stable and efficient.

Soil chemists are characterizing the sorption mechanism of xenobiotics found in agricultural pesticides, on both soils and humic materials. Understanding this mechanism will allow development of more effective detoxification procedures.

Approximately 90% of West Virginia is hardwood forest. The environmental impact of invasive plant species on these native forests has profound economical effects. One such species being studied is the invasive Tree-of-Heaven, from Asia. Studies are currently underway, by forest ecologists, to determine the primary mechanism of competition during early establishment of this tree. Understanding how the invasive competes will provide a target to better control it's spread into native forests.

Key Theme: Hazardous Materials; Water Quality

Program 4.1a
Title: Detection of Toxins in Soil and Groundwater Supplies

Description:

The specificity of metal-binding compounds is often high enough to allow quantification of specific metals found in complex mixtures such as soils. The goal of this work is to make and characterize metal-binding compounds that can be used to indicate/report when they have adsorbed a specific metal. Thus assays could be developed to measure various metals from complex soil mixtures. The metal binding compound diaminonaphtalimide (ED-4) is one compound being studied because of its high specificity for copper. The evaluation of ED-4 will lead to compounds and procedures to evaluate heavy metals in industrial sites and brown fields.

a) Research results

ED-4 has been synthesized and is currently being chemically characterized. Once the structure has been confirmed, the ED-4 studies will commence using a soil collected from Putnam County. An ED-4 analog has also been synthesized.

Both ED-4 and the analog will be tested in studies for determination of copper utilizing a characterized WV soil. Other analogs of the parent compound have been designed and their respective routes of synthesis have been planned.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The project is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: State Research

Key Theme: Hazardous Materials/Water Quality

Program 4.1b
Title: Novel Methods for Heavy Metal Removal in Mine Drainage

Description:

Soil and water near areas with mining, industry, and agriculture are susceptible to contamination due to acid mine drainage, release of industrial wastewater, and pesticide use. Metals such as copper and aluminum, as well as some pesticides not only threaten plants and animals in streams and rivers, but also threaten the productivity of soils. This research will evaluate metals in streams impacted by acid mine drainage and novel methods for remediation.

a) Research results: Utilizing Polymers for Heavy Metal Remediation

A pumice based polymer was investigated as a remediation tool for acid mine drainage. The large particle size pumice was generally ineffective in capturing the Fe+3 and Cu+2 ions from lab-prepared standard solutions. Thus, all work continued on the smaller particle size pumice materials (i.e., @ 325 mesh). Additional effort was geared toward improving the process for addition of the polymer to the pumice. All initial work involved the use of a polymer with a molecular weight of @450,000. This molecular weight polymer is extremely viscous and difficult to mix with the pumice. A polymer with a much lower viscosity was secured and the application was improved considerably.

Unfortunately, the lower molecular weight polymer was basic and caused the Fe3+ and Cu2+ ions to precipitate as the hydroxides rather than being exchanged on the resin support.

A second phase was the detection of metal contamination at Heizer Creek in Poca, WV. The site was sampled over a ten-week time period analyzing water, soil, and plant material. Future plans will continue this study for the testing of the polymer's ability to remediate this contaminated site.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The project is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: State Research

Key Theme: Soil Quality

Program 4.1c
Title: Determining the sorption mechanism of atrazine and 2,4-D on soil and humin

Description:

Over application of pesticides can cause toxins to run-off into streams or leach into groundwater. Pesticides such as 2,4-D and atrizine not only threaten plants and animals in the streams and rivers, but also threaten the productivity of soils. Better estimates of the amounts of these chemicals are needed. Also a clearer understanding of the way pesticides react with soil components will facilitate more effective land mangement plans. This project will evaluate the interaction of 2,4-D and atrizine with the soils.

a) Research results

This project utilized two student workers during the summer. The project utilized two soils that needed to be fractionated into several fractions. Once fractionated, the soils and the organic matter were incubated with 2,4-D and atrazine. The

work was presented at the recent SSSA meeting and the abstract is included. The work presented was conducted with one soil buffered with 0.1 M phosphate pH 7.0. The collected isotherms were typical of soils and the various fractions comprising soil. Future work will include incubating these soils at other pH values of 3, 6, 9, & 10. Some of this data was presented at the National ACS Meeting. Titles of presentations associated with the work are:

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The project is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)
Scope: Research

Key Theme: Agricultural Waste Management

Program 4.2
Description:
The "Bioplex" project at West Virginia State College (WVSC) is comprised of four research projects involving the utilization of agricultural waste and thermophilic anaerobic digestion.

1. The incorporation of thermophilic, anaerobic digestion as an integral part of farm waste treatment has been shown to be highly effective in reducing the organic pollution associated with the farming industry. The pilot plant digester located on campus will be studied as to its capacity to be controlled using biochemical parameters known to be effective. We propose to redesign the control system by simplifying the hardware and software. These controls will also be applied and studied in three types of laboratory-scale digesters where automated data acquisition, sampling and monitoring will be developed.
2. Pathogen reduction is an important function of waste treatment systems and thermophilic anaerobic digestion has provided an effective method of complying with public health requirements. In this project, the viability of several *Cryptosporidium & Giardia* species will be determined. Novel methods of oocyst and cyst detection will be reviewed and evaluated for both *Cryptosporidium & Giardia respectively*. *Salmonella* and *E. coli* will form part of the viability study of pathogens found in farm manures.
3. The feasibility of using microbial protein from anaerobically digested poultry litter as a substitute for fishmeal in trout feeds will be established. Since

heavy metals are often added to livestock feeds it is possible that digested manures may concentrate metal micronutrients. Studies will determine if heavy metal biological magnification and/or immunosuppression will make using digested poultry litter an untenable feed additive for trout.

4. The relationship between the biochemical control parameters and the resident microbial populations is an important one to determine. Experiments will be designed to examine the link between microbial community structure and bioreactor function by testing: **a)** The effect of bioreactor environmental structure on the development of microbial community composition. **b)** The relationship between microbial community structure and community function. **c)** The effect of environmental stress on bioreactor microbial community structure and function.

a) Research results

1. Operational Parameters of the Pilot Thermophilic Anaerobic Digester. Construction of the fermentation lab is complete. The lab-scale, continuous stir tank (CSTR), anaerobic filter and fluidized bed reactors have been built. These lexan reactors are ~50 liters in size and their volumes were matched for easy performance comparisons. In November 2001, the 50-liter CSTR was seeded with digested poultry litter to establish a microbe population that will be transferred to the other reactors. Experiments on the genetic composition of microbial consortia will proceed once the procedures and protocols to control the reactors have been established and the stability maintained.

2. Monitoring the Loss of Viability of the Pathogenic Protozoan, Cryptosporidium. A 20-day oocyst removal study was performed in a 1-Liter anaerobic digester. The calculated daily percent removal of C. muris oocysts after Day 2 ranged from 77 to 97. Final oocyst removal on Day 20 was 97 percent. As for genomic detection, PCR signal was recovered from the positive control sample with oocyst DNA concentration of approximately 12,000 oocysts. PCR signal was not detected from the positive control samples with oocyst DNA concentration from approximately 23300 oocysts, nor in any of the digester samples, with calculated oocyst DNA ranging from approximately 1,340-34,200. A fuller description of the results can be found in the attached manuscript (Appendix I). Experiments on oocyst removal of Cryptosporidium parvum are ongoing.

3. Formulating Aquaculture Feed from Digested Poultry Litters. The aquaculture experiments have been delayed until the water temperature control system is adequate. An experiment was set up with trout using ambient water and it failed when oxygen levels dropped too low to support the fish. To correct the design flaw an engineering firm was contracted to design a system with adequate temperature and air-cooling facilities that will maintain water temperature in the range of 10 –18 degrees C. Both air

and water chillers have been purchased and a local contractor is currently installing the designed system to correct the problem. No funds from the Bioplex grant were used to support these design and construction activities. A preliminary experiment will be set up in March to test the efficacy of the aquaculture system. It is estimated that the first feed trial will be set up in June.

4. Linking Microbial Community Structure to Function in Thermophilic Anaerobic Digesters. This research is aimed at further understanding of the microbial degradation processes that occur in thermophilic anaerobic bioreactors. The first phase of this research program has been underway during the first year of the grant. The characterization of microbial community structure in the pilot plant reactor requires an assessment of both species diversity (richness) and species abundance (evenness). We are first analyzing species diversity using three molecular approaches as well as culturing methods to identify the principal bacteria. Two culture-independent molecular approaches are currently being used to characterize community diversity. Bacteria and Archaea identification is being done using 16S rRNA gene sequences and the Ribosomal Database Project (RDP) database. Using Bacteria-specific and Archaea-specific primers, we have PCR-amplified 16S rDNA from extracted total community DNA. These PCR amplicons were used to construct two 16S rRNA gene libraries using TA cloning (Invitrogen). One 16S rDNA library represents the Bacteria and the other represents the Archaea. Two hundred clones have been collected for each library. We are in the process of screening these libraries to identify unique 16S rRNA gene clones using restriction fragment length polymorphism (RFLP) analysis. RFLP analysis is being done with the enzymes MspI and HaeIII. The next step will be to sequence each unique 16S rRNA fragment to determine the species or phylotype. An initial sequencing of three Bacteria clones has already been done in order to test our protocols for large scale sequencing of the libraries. One of the Bacteria sequences is similar to the genus Coprothermobacterium. We have also begun a culture collection of bacteria from the liquid effluent of the pilot plant that includes both aerobic and anaerobic species. We have been collecting aerobic bacteria from colonies growing on trypicase soy agar and R2A agar. This ongoing culture collection is stored at $^{-}80^{\circ}$ C for later identification using PCR amplification of 16S rRNA genes and subsequent sequence analysis.

We have also begun to use denaturing gradient gel electrophoresis (DGGE) as a second molecular approach for characterizing community diversity. DGGE will provide community diversity profiles of the dominant species. This approach also uses PCR to amplify 16S rRNA genes from extracted total community DNA. The PCR amplicons are then separated on a DGGE gel which can separate DNA molecules that have the same length but differ in base sequence. This provides a complex community pattern or profile where the diversity and abundance of

species are represented. The successful use of this technology requires an empirical approach for determining the correct electrophoresis conditions for a given sample. We have successfully separated complex populations of 16S rDNA PCR amplicons derived from total community DNA. We anticipate that DGGE analysis will provide a useful and relatively quick measure of community diversity in the model reactors.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show outcomes beyond research results.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The WVSC Associate Director of 1890 Research (Dr. Chatfield) is responsible for assessments. Dr. Chatfield is also research director for this project. He feels it is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445) & USDA/CSREES
Scope: Research

Key Theme: Invasive Species

Program 4.3
Title: Predicting Effects of *Ailanthus altissima* Invasion on West Virginia Hardwood Forests

Description:

The objective of this project is to predict the effect of an *A. altissima* invasion on succession and subsequent composition of deciduous forests. Toxin production by *Ailanthus altissima* (Tree-of-Heaven) seedlings may be the primary mechanism of competition during early establishment. Rapid growth and acquisition of above and below ground resources may be the primary mechanism of competition in mature *A. altissima*.

a) Research results

Data acquired in 2000 was analyzed and prepared for presentation on the effect of above ground injury on the ability of *Ailanthus altissma* to influence neighbors via soil properties, at the Botany 2001 conference in Albuquerque, NM, by research student Natalie Ashley. An experimental garden was developed consisting of ten raised beds. Germination was delayed due to late construction

of the greenhouse and additional equipment continues to be installed in the ecology lab.

b) Successes resulting in change (Outcomes): This project was the subject of an article by a major state newspaper. This exposure has triggered interest in invasive organisms throughout the state. The primary investigator, Dr Gary Greer, was invited to present to the Senate Forest Management Review Committee, of the WV Legislature; regarding threat of invasives to West Virginia forests and economy, with emphasis on tree-of-heaven. Five students were provided research opportunities with this project and the capacity for ecological research for the institution has increase significantly.

c) Benefits to clients and stakeholders (Impacts): This work is not sufficiently mature to show an impact.

d) Assessment of accomplishments: The project is progressing and should be continued.

e) Expenditures by source:

Source of Federal Funds: Evans-Allen (Section 1445)

Scope: State Research

Total SY & Program Costs for Goal 4: SY = 5.375; Program Costs = $489,000 (Evans-Allen (Section 1445)) + $379,000 (USDA/CSREES) = $868,000

Goal 5

Enhanced economic opportunity and quality of life for Americans. Empower people and communities, through research-based information and education, to address economic and social challenges facing our youth, families, and communities.

Key Theme: Community Development

Title: Improving the quality of life in WV communities

Description:

WVSC is working to identify community strengths and areas of need in urban and rural parts of West Virginia. WVSC worked with the West Virginia Research League to develop and economic forecasting model and employability study which can be applied to the West Virginian economy.

a) Research Results

Assessments and asset mapping activities were conducted in FY 2001-2002. Findings will be available in the Spring of 2002. A working draft of the forecasting model is now being evaluated.

b) Successes resulting in change (Outcomes): This work is not sufficiently mature to show an outcome.

c) Benefits to clients and stakeholders (Impacts): Scope of Impact –State specific

d) Assessment of accomplishments: The project is progressing and should be continued.

e.) Expenditures by Source:

Source of Funds: Smith Lever, Department of Labor and USDA in partnership with West Virginia University.

Total SY & Program Costs for Goal 5: SY = 0.375; Program Costs = $81,326

TABLE 1. SUMMARY OF RESEARCH RESOURCE ALLOCATION BY GOAL

1890 COOPERATIVE RESEARCH								
NATIONAL GOAL / PROGRAM		FINANCIAL / TIME ALLOCATION						
		FY 2001						
GOAL	PROGRAM DESCRIPTION	FEDERAL			STATE		OTHER SOURCES	
		SECTION 1445	*OTHER*	*SYs*	*MATCH*	*SYs*	*OTHER*	*SYs*
GOAL I								
Program 1.1	Agricultural Biotechnology	35,000		*0.125*				
Program 1.2	Alternative Agriculture							
	Project 1.2a	100,000	69,000	*0.500*				
	Project 1.2b	40,895		*0.125*				
	Project 1.2c	40,000		*0.125*				
	TOTAL	**215,895**	**69,000**	***0.875***	**0**	***0***	**0**	***0***
GOAL II								
Program 2.1	Plant and Animal Pathology	112,000		*0.500*				
Program 2.2	Food Quality and Safety	49,000		*0.250*				
	TOTAL	**161,000**		***0.750***	**0**	***0***	**0**	***0***
GOAL III								
Program 3.1	Human Health and Nutrition	27,779		*0.130*				
	TOTAL	**27,779**		***0.125***	**0**	***0***	**0**	***0***
GOAL IV								
Program 4.1	Environmental Conservation and Remediation							
	Project 4.1a	75,000		*0.400*				
	Project 4.1b	85,750		*0.450*				
	Project 4.1c	75,000		*0.400*				
Program 4.2	Microbiology							
	Project 4.2b	153,250	379,000	*3.625*				
Program 4.3	Forest Management and Ecosystem Preservation	100,000		*0.500*				
	TOTAL	**489,000**	**379,000**	***5.375***	**0**	***0***	**0**	***0***
GOAL V								
Program 5.1	Regional Economic Forecasting	59,326		*0.250*				
Program 5.2	Improving the Quality of Life	22,000		*0.125*				
	TOTAL	**81,326**		***0.375***	**0**	***0***	**0**	***0***
	GRAND TOTAL	**975,000**	**448,000**	*7.50*	**0**	*0*	**0**	*0*

SECTION III.

1890 COOPERATIVE EXTENSION PROGRAMS

Goal 1

An agricultural system that is highly competitive in the global economy. Through research and education, empower the agricultural system with knowledge that will improve competitiveness in domestic production, processing, and marketing.

West Virginia is in need of marketable alternative agricultural crops. These crops could provide income for small farms unable to compete with large agribusinesses in traditional crop production and marketing. In recent years, there has been growing interest in the development of alternative agriculture in West Virginia, especially in the area of aquaculture. West Virginia's state and congressional delegates are now seeking funds for various aquaculture research activities geared toward increasing the capacity of West Virginia to develop a competitive fish market. Organic farming practices and the production of plants and animals not sold in North America on a large-scale commercial basis are also considered viable alternative agricultural options for small farmers in West Virginia. Appropriate species and management practices for the region, as well as the potential for the development of new and niche markets created by alternative agricultural crops, are currently being investigated.

West Virginia State College (WVSC) is in the process of developing a sustainable community facility that will provide a year-round nursery for growing vegetables, plants and tress, a composting facility for leaf and grass clippings, location of science (research) to be conducted by junior/high school students and a job training center. Plants will be grown to beautify the Charleston Housing sits and areas surrounding local community centers. A youth garden component will be developed to provide local schools with the necessary gardening materials, tools and leadership to start and maintain gardens especially suitable for children. The goal of this program is to teach children about the importance of protecting the environment, the value of working together, the power of science and the mystery of nature.

Key Theme: Aquaculture

a. Description:

WVSC Land-Grant Research and WVU Research and Development have collaborated to better understand ways of increasing production efficiency and minimizing wastes that are discharged from aquaculture systems into the environment.

Field trials took place at High Appalachia, Inc, a local trout-rearing farm, comparing the currently used diet (control) to a modified higher energy diet. Results demonstrated that using a high-energy diet did significantly improve weight gain and reduce feed cost. Compared to the control diet, the feed conversion rate of the test diet was 30% lower dropping from 1.69 to 1.17. The cost per kilogram gained was reduced by 18% from $1.03 to $0.84 per kilogram gained. Production efficiency increased 40% from 38

kilograms of gain per gallon per minute to 63 kilograms of gain per gallon per minute. In addition this project has provided research opportunities for two students.

High Appalachia, Inc. has changed their trout ration formulation to the high-energy diet used in the verification trial.

b. Impact

The trout yield verification trial has resulted in a permanent modification in the feed-formulation for High Appalachia. This one production change has converted a financially troubled operation [floundering trout business into a financial barracuda] into a profitable business. This is an excellent example of what we are trying to accomplish with all programs.

c. Source of Funding: Evans-Allen (Section 1445); USGS; USDA/CSREES Cooperative Agreement with West Virginia University.

d. Scope of Impact: State Specific, Integrated Research and Extension

Key Theme: Urban Gardening

a) Description

WVSC extension specialists and staff piloted a Community Eco garden in the capital city of Charleston as a partnership with the Charleston Housing Authority. Master Gardener's from West Virginia University assisted with maintaining the garden with the residents of the Housing Authority.

An Extension Specialist created a workbook for children to help explain how "A Plant Begins". Hands-on learning activities, such as potting flowers, were provided to schoolchildren as a way to get them interested in gardening.

b. Impact

20 families in two housing authority locations participated in designing the layout, preparing the field and planting and maintaining the pilot garden. The response to this pilot program was very positive indicating a need to replicate this project in other neighborhoods. In the spring of 2002, WVSC extension personnel will kick-off the garden project with a six week introductory course in gardening. In addition to gardening basics, nutrition information will be given so residents will be knowledgeable on the nutritional value of the vegetables they decide to grow. Square foot gardening techniques will also be highlighted.

Home gardening and introductory horticulture classes have also been conducted in the WVSC after-school programs and senior living centers in Charleston. Individuals participating in these classes have requested additional courses be offered. A children's workbook was produced called "A Plant Begins" and has been used as a learning tool and distributed to 300 school children at fairs and after-school programs.

The community garden helped to bring a neighborhood together and provided a mechanism for collaboration between the residents and the housing authority administration.

This project was well received by participants. WVSC has received requests to have the programs replicated in other communities.

c. Funding: Source: Smith-Lever Section 1444

d. Scope of Impact: State Specific

FTE's and Program Cost for Goal 1
FTE - .5
Program Cost - $125,000

Goal 2

A safe and secure food and fiber system. To ensure an adequate food and fiber supply and food safety though improved science based detection, surveillance, prevention, and education.

It is estimated that up to 10% of children suffer from serious food allergies in the state of West Virginia. Up to 5% of the total population continue to have severe allergic reaction to food even into adulthood. Knowledge and awareness of food allergies and their potential severity, however, is limited. Professionals in the food preparation industry are only just beginning to understand the consequences of cross-contamination of food products. In West Virginia, the awareness is extremely limited due to the rural nature.

Key Theme: Food Safety

a. Description

The goal of this program is to increase awareness and prevention among patients, parents, health care providers, school nurses and education providers.

b. Impact

Brochures with information about food allergies and sources for support have been printed. They are being distributed to pharmacies, pediatricians and allergists in the area. These brochures are meant for children/parents a way to find further information about allergy control and anaphylaxis prevention. A short follow up phone survey was done after 30 physicians reviewed the brochure about the content and effectiveness. Nine responded and indicated they would inform patients about the WVSC program and have the brochures available. Three indicated they would be willing to participate in the program. A larger survey to determine the successfulness of this campaign will be done in the fall of 2002. We will also attend a series of local health fairs to deliver information and discuss issues with stakeholders.

A conference will be held in the summer of 2002 for parents, health care professionals, school nurses and those in the food preparation industry 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).

c. Funding: Smith Lever Section 1444

d. Scope of Impact: State Specific

FTE's and Program Costs for Goal 2
FTE- .25
Total Program Cost – 50,000

Goal 3

A healthy, well-nourished population. Through research and education on nutrition and development of more nutritious foods, enable people to make health-promoting choices.

Training individuals to value good nutrition and commit to a healthy lifestyle is a necessary goal as society recognizes the monetary and health benefits associated with practicing good nutrition.

West Virginia is one of the least healthy and poorest states in the country (per capita income is the lowest in the country). Positive correlations between poverty and inadequate nutrition raise concerns for the health of the state's children, their readiness to learn and the health of the population in general.

In 1992 West Virginia participated in the Centers for Disease Control Behavior Risk Factor Surveillance System (BRFSS). The report focused on health behaviors that are associated with preventable illness and death. Several behaviors/factors included in the study have nutrition-related implications: hypertension, obesity, sedentary lifestyle and alcohol abuse. Of the 37 states that participated in the study, West Virginia ranked first in the overall measure on unhealthy behaviors. According to the BRFSS study, 35.7% of adult West Virginians were considered obese and another 20.2% were found to be overweight.

In 1993, the State Health Education Council (SHEC) conducted the West Virginia Nutrition Survey to identify the dietary patterns of adults and potential interventions related to chronic disease prevention. This statewide survey of 1,205 adults revealed that:

a) native West Virginians had distinctly less healthful food behaviors than did non-native West Virginians, with the former using less low-fat foods.

b) as education levels increased, so did the consumption of more healthful foods, i.e. skim milk, fruits and vegetables, and whole grains; less than one fifth of respondents had food behaviors characterized as "healthful".

These data provide evidence of a strong need for better nutritional education programs throughout the state. Providing nutrition training to parents will help break the cycle of poor choices and poor health for our children.

Key Theme: Human Nutrition

a. Description

The WVSC Nutrition Education Specialist has working to deliver programs in the Kanawha valley to begin to address some of the problems discussed above. WVSC has put emphasis in youth health and nutrition and has focused on the special nutrition needs of our ever-increasing senior population.

WVSC has joined the Families First: Nutrition Education and Wellness System (FF:NEWS) consortium. FF:NEWS is a curriculum developed by six 1890 Institutions to meet the nutrition education needs of minority families.

WVSC also participated in the Summer Food Program providing lunches to low-income children during the summer months.

b. Impacts

WVSC purchased the FF: NEWS curriculum and trained a state specialist to used the curriculum. 221 participants completed portions of this

curriculum. Approximately 40 children, teens and elderly have participated in other nutrition related classes during the past year.

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. A joint planning committee called Family Nutrition Program Advisory committee (FNPAC) has been created to help make extension nutrition education seamless throughout the state.

6,807 meals were served at 25 sites during the summer food program.

c. Funding-Smith: Lever 1444, State of West Virginia

d. Scope of Impact: Multistate Extension (FF:NEWS) –TX, AR, LA, AL, VA, SC, OK, MI and WV
State Specific (Other Nutrition Education and Summer Food Program)

FTE's and Total Program costs for Goal 3
FTE - .75
Total Program costs - $150,000

Goal 4

Greater harmony between agriculture and the environment. Enhance the quality of the environment through better understanding of and building on agriculture and forestry's complex links with soil, water, air, and biotic resources.

Researchers are working with extension staff to develop forums, workshops and other avenues of outreach to address community concerns related to the use of environmental sciences. We expect this effort to develop in the next year.

FTE's and Total Program Costs for Goal 4
FTE- .13
Total Program Costs – 25,000

Goal 5

Enhanced Economic Opportunity and quality of life for Americans. Empower people and communities, through research-based information and education, to address economic and social challenges facing our youth, families and communities.

West Virginia has been particularly hard-hit by the changing economic structure from an industrial based to a knowledge- based economy. The state also experienced severe flooding in the summer of 2001, which devastated fourteen counties, most already were already suffering from extreme poverty. West Virginia has the highest state unemployment rate in the country. WV ranks last in terms of per-capita income and median household income as well. The loss of several major industries has left the state with the highest unemployment rate in the country.

Before effective programs could be developed, WVSC ACEOP had to educate people in what being an 1890 Land-Grant Institution is. We held numerous community meetings to educate area people on the Land-Grant mission. Staff also visited local chambers of commerce, school boards, civic and faith based organizations and other community based groups to explain the ACEOP mission, garner support and develop partnerships. Because of the media coverage that was given to the college after Land-Grant status was reinstated, there was a misconception in the state about what that meant.

WVSC ACEOP will continue to expand programming in the Kanawha valley in the next year. We have developed partnerships with the City of Charleston, Charleston Housing, Kanawha County Commission, Putnam County Chamber of Commerce, local Workforce Investment Boards and numerous community development and faith-based organizations. WVSC is working closely with West Virginia University to determine the most effective way to collaborate in our effort to avoid duplication.

Key Theme: Children, Youth and Families at Risk

a. Description

WVSC partnered with West Virginia University through the Children Youth and Families at Risk Grant Initiative. WVSC is operating a CYFAR site as part of a statewide literacy and capacity building program. The partnership with WVU has led to the development of a county wide collaborative to have a greater impact on community capacity building as well as a state wide initiative to increase the use of technology in extension. This partnership has brought nationally recognized speakers to our state to increase awareness of poverty related issues and begin a train the trainer program.

b. Impacts

WVSC CYFAR sites serves on average 50 students a day. Providing after-school tutoring, homework assistance and educational programs such as character development.

Community assessments have been completed to determine the literacy needs of the surrounding community and will be used to develop further programming.

c. Funding Source: Sub-contract from WVU/CYFAR

d. Scope of Impact: State specific

Key Theme: Community Development

a. Description

WVSC is working to identify community strengths and areas of need in urban and rural parts of West Virginia. WVSC created needs assessments, asset mapping and economic forecasting projects to determine direction for program development. Three "Community Connection Centers" were opened, with six computers in each center. Located in limited-resource areas, the computer centers allow access to technology to help bridge the digital divide. We anticipate opening additional centers in the next year.

b. Impact

Assessments and asset mapping activities were conducted in FY 2001-2002. Findings will be available in the Spring of 2002.

20 public housing residents have participated in introductory Internet classes at the WVSC Community Connection Centers. 100% have expressed interest in additional computer training.

c. Funding Source: Smith-Lever 1444, Department of Labor and USDA in partnership with West Virginia University.

d. Scope of Impact: State specific

Key Theme: Parenting

a. Description

WVSC has identified two main areas of parenting education to begin our outreach efforts. A curriculum is being developed and piloted in workshops on the Dangers of Internet Use. Some Internet Safety Issues covered include: Sexual Predators Online, Hate Group Recruitment through the Internet, Identity Theft, Credit Card Fraud, Email Hoaxes, Online Chatting and Dating.

Adolescent pregnancy prevention is another area addressed by WVSC Cooperative extension. The Baby Think It Over Program ® uses computerized infant simulators to demonstrate the responsibilities associated with parenting. Teens are assigned a simulator that cries and needs life-like care (bottle feeding, diaper changing, burping, rocking etc.) The goal of the program is to increase awareness among teens of the time and effort required to raise an infant and encouraging teens to wait to become parents until they are older and able to care for them financially and emotionally.

b. Impacts

277 youth and adults participated in parenting related programs. Topics covered include Internet safety, adolescent pregnancy prevention, dating violence and reporting child abuse and neglect.

Pre and post data indicate that the daylong or camp type adolescent pregnancy prevention program is not adequate time to cause a significant change in attitude toward the responsibilities of parenthood. Future programs will include overnight and longer periods of time for the youth to be responsible for the simulators.

c. Sources of Funding: Smith-Lever 1444

d. Scope of Impact: State specific

Key Theme: Workforce Preparation – Youth and Adult

a. Description

The Community and Economic Development Office (CED) has promoted leadership skill development among the local citizenry by teaching basic leadership skills to youth in schools and community centers. The Young Entrepreneur Associates (YEA) was created to give youth opportunities to learn theory and experience entrepreneurial activities.

In September 2000, the Department of Land-Grant Programs entered into a collaborative multi-state agreement with the Alabama Cooperative Extension System (focused at Alabama A&M University-AAMU), to establish a national website promoting workforce development, financial literacy, and training opportunities as per the Workforce Investment Act of 1998. This website, the Workforce Education and Career Assistance Network for You (www.wecan4u.net), was founded in June 2001.

b. Impact

Thirty-five youth have participated in leadership classes on topics such as, conflict resolution, responding to authority, and treating others with respect. Through the Young Entrepreneur Associates (YEA) 15 youth have been provided opportunities to participate in the Multi-Cultural Festival and also to attend the national Youth Entrepreneur Symposium.

A summer symposium was held using a train-the-trainer format in entrepreneurship curricula. 16 participants received continuing education credit for participating in this conference. All of the participants stated they would use the entrepreneurship curricula in their own teaching. Curriculum from Kidsway, Inc. was used. Furthermore, this led to the establishment of the Appalachian Network for Entrepreneurial Youth Empowerment, Inc., a non-profit organization.

To date, the WECAN4U website has had over 2000 hits. The Workforce Preparation, Education, and Development Office anticipate the opportunity to maintain and promote WECAN4U in conjunction with its 1890 Land-Grant partner, AAMU.

c. Source of Funding: Smith-Lever 1444

d. Scope of Impact: State Specific (Leadership and YEA)
Multistate Extension, WVSC and AL A&M (WECAN4U website)

Key Theme: Youth Development/4-H

a. Description

WVSC offers many youth oriented programs geared toward helping young people by giving them opportunities to develop skills that will assist them in career choices, education attainment and personal development. Youth participate in career and education focused summer camps, after-school and literacy programs.

b. Impacts

WVSC hosted its third annual Summer Transportation Institute in the summer of 2001. This four-week residential program offered 23 8th and 9th graders the opportunity to learn about the careers available in the transportation industry and experience a small taste of a college environment. In addition to students from the state of West Virginia, two students from the Bahamas and one from Florida and one from California attended this program. The addition of these students proved to be a

positive way to introduce the students in an informal manner to cultural diversity.

In partnership with WVU Health Sciences, WVSC hosted a one-week residential camp focused on forensic science and leadership development. 52 low income and minority 10th grade students participated in solving a mock murder through the use of current forensic science techniques, leadership and teambuilding activities. Students were exposed to various cultural and recreational activities they may not normally be able in their neighborhoods.

WVSC operated six K-6 after-school programs in partnership with local housing authorities. On average 85 students a day participate in tutoring, homework assistance, social enrichment, drug prevention and elimination, nutrition and wellness, nutrition education, character development and other educational activities. Each center is equipped with computers with Internet access bridging the digital divide.

c. Source of Funding: Smith-Lever (Section 1444), City of Charleston, Charleston Housing, US Department of Transportation-Federal Highway Administration, Subcontract WVU/Health Science Technology Academy Grant

d. Scope of Impact: State Specific

Key Theme: Other, WVSC Transitional Living Programs

a. Description

WVSC is building a facility on campus with funding from the U.S. Department of Housing and Urban Development to provide transitional housing and an opportunity to go to college for up to 14 high-risk youth each year. This will allow students who have the grades to enter college but not the life skills to remain there and opportunity to receive additional The building is near completion and will be ready for occupancy in the fall of 2002. A second project was designed with additional funding from the U.S. Department of Housing and Urban Development, WVSC is building a three-unit building to enable formerly homeless and/or battered women (and their children) and opportunity to live on campus and attend college.

b. Impact

Began community revitalization by demolishing blight and building two new facilities adjacent to campus. Held community meeting and received

overwhelming support from the neighborhood for this project. The first students will enter the program in the Fall of 2002.

c. Source of Funding: US Department of Housing and Urban Development
State of WV
Kanawha County HOME funds

d. Scope of Impact: State Specific

FTE's and Total Program Costs for Goal 5
FTE – 10.38
Total Program Costs (Section 1444) – $650,000

TABLE 2.SUMMARY OF EXTENSION RESOURCE ALLOCATION BY GOAL

1890 COOPERATIVE EXTENSION

NATIONAL GOAL / PROGRAM		FINANCIAL/TIME ALLOCATION						
		FY 2001						
		FEDERAL			STATE		OTHER SOURCES	
GOAL	PROGRAM DESCRIPTION	SECTION 1444	OTHER	FTE	STATE	FTE	OTHER	FTE
GOAL I								
Program 1.1	Alternative Agriculture Extension and Education	50,000		*0.250*				
Program 1.2	The Expansion of Horticultural and Forestry Activities in West Virginia	75,000		*0.250*				
	TOTAL	**125,000**		***0.500***	**0**	*0*	**0**	*0*
GOAL II								
Program 2.1	Food Safety and Allergy Awareness	50,000		*0.250*				
	TOTAL	**50,000**		***0.250***	**0**	*0*	**0**	*0*
GOAL III								
Program 3.1	Nutrition Education and Wellness System	150,000		*0.750*				
	TOTAL	**150,000**		***0.750***	**0**	*0*	**0**	*0*
GOAL IV								
Program 4.1	Biotechnology and Environmental Science Outreach	25,000		*0.125*				
	TOTAL	**25,000**		***0.125***	**0**	*0*	**0**	*0*
GOAL V								
Program 5.1	Youth Development	250,000	126,000	*5.500*			150,000	*3.5*
Program 5.2	Family and Community Education	200,000	10,000	*1.875*				
Program 5.3	Community And Economic Development	200,000		*3.000*				
	TOTAL	**650,000**	**136,000**	***10.375***	**0**	*0*	**150,000**	*3.5*
	GRAND TOTAL	**1,000,000**	**136,000**	*12*	**0**	*0*	**150,000**	*3.5*