

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Global Food Security and Hunger--Production/Sustainable Agriculture

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
133	Pollution Prevention and Mitigation			10%	
202	Plant Genetic Resources			5%	
205	Plant Management Systems			10%	
211	Insects, Mites, and Other Arthropods Affecting Plants			10%	
212	Pathogens and Nematodes Affecting Plants			10%	
216	Integrated Pest Management Systems			5%	
301	Reproductive Performance of Animals			15%	
302	Nutrient Utilization in Animals			15%	
303	Genetic Improvement of Animals			5%	
307	Animal Management Systems			10%	
313	Internal Parasites in Animals			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of professional FTE/SYs expended this Program

Year: 2010	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	0.0	10.5	0.0
Actual	0.0	0.0	7.4	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
0	0	625673	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	0	1210704	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	762808	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

This program was formerly called Production Agriculture. For 2010 and the future we have made it a sub-topic of the NIFA priority area "Global Food Security and Hunger: Production/Sustainable Agriculture." We feel the new program title provides a description of our work in this area fit because all the plant- and animal related projects in this area are focused on increasing the productivity and sustainability of agriculture thereby contributing both to food security and alleviating world hunger.

West Virginia agriculture is dominated by high intensity poultry production and low intensity pasture-fed ruminant production with a declining amount of acreage in tree-fruit production. Much of the land in West Virginia is characterized by steep slopes and high rates of erosion that are suitable to pasture but not to intensive row-crop production. Most intensive crop production, including some fruits and vegetables, is limited to those regions of the state that have relatively flat terrain and favorable soil characteristics. To be competitive, West Virginia producers typically must become competitive either by increasing the value of what they produce or by reducing transportation and production costs by relying on locally-marketed products, by taking advantage of the State's proximity to major urban markets or by developing niche products. Some examples of successful enterprises include encouraging markets and consumer acceptance of pasture-raised and pasture-finished beef; cool water aquaculture; focusing on higher priced products such as those with ornamental or recreational use; increasing real or perceived product value in specialty or out-of-season markets such as lamb and organic products; and by diversifying product offerings.

Progress continued to be made in an important integrated project concerned with enabling out-of-season lamb production and promoting the sheep industry in the region. The project has stabilized sheep numbers in West Virginia over the last 12 year period and contributed efficacy data that allowed US approval of the CIDR-G for market as an aid in out-of-season breeding in the US. It has provided data on late embryonic and fetal mortality in the ewe and begun to provide such data in the goat. These data will enable the ultimate development of management approaches to reduce or limit these losses. The project website has been updated in 2010 and continues to provide a significant resource for cooperating and other producers. The outreach/extension component of the project held the annual small ruminant short course in Randolph County in conjunction with the WV Shepherd's Federation. The program emphasized parasite control and management methods. Attendance approached 50 individuals. The project held and sponsored 3 shearing schools in 2010 in an attempt to facilitate the urgent need for more shearers within the region. The project conducted breeding soundness examination on over 50 rams for producers in advance of the breeding season. Focus on estrous synchronization out-of-season and pregnancy testing continues and was demonstrated at the annual performance tested sale as well as in numerous ewe flocks

and over 600 head of sheep and. Studies of late embryonic and fetal mortality in goats in conjunction with Lincoln University is being done in 5 goat herds in three states this year to add to data collected in 4 herds in 2009-2010.

In the pasture-based beef systems project higher fall pasture allowance for heifers resulted in higher body weight, which was maintained throughout the winter and following spring, indicating that input in the form of conserved forages can be reduced during the winter. Reducing the use and dependence on conserved forages can reduce cost of rearing replacement heifers and at the same time make the final product conform better to the label "Pasture Raised Beef". It is concluded that any kind of grassland may be used for winter grazing until it runs out or is covered with snow. Tall fescue is most suited and keeps its quality for a longer period. Maintaining animals all winter on the grassland reduces productivity of first cut hay and increases productivity of second cut hay, and also increases pasture herbage mass. Most grassland in WV is similar to the permanent grassland (PAS) and cannot readily be harvested for conservation. It can be used for winter grazing.

An experiment with mixed grazing (sheep and cattle) from May to July was initiated to manage botanical composition (increase legume and decrease weed percentage) on winter stocked grassland. Two steers/ac or 1 steer and 6 yearling lambs/ac can be carried on permanent grassland from May to July. A combination of techniques including stochastic analysis, econometric and optimization modeling, and financial engineering were used to assist producers, the industry and policy makers make better decisions. Results include identification of the production and market conditions under which pasture-based beef (PBB) could be more profitable, as well as specific risk-management strategies, information that can be beneficial to both existing producers and potential adopters of PBB technologies. Types of consumers were identified who exhibit a distinct preference and an associated higher willingness-to-pay for pasture-based beef, information that can be used in the development of marketing strategies.

A study in its fourth year on the benefits of alternative feed additives used to increase production and/or efficiency of production of lactating dairy cows concluded that no significant benefit exists with regard to feeding specific feed supplements, at least not under the limitations of the studies carried out under this project. The project provided needed scientific data to an area which is dominated by anecdotal and unpublished evidence.

A continuing project on the effect of diet formulation and manufacture technique on pellet production, nutrient and exogenous enzyme retention and broiler performance has concluded that diet formulation and manufacturing technique are, in fact, linked and must be considered when attempting to optimize pellet quality. To maximize broiler performance, the diet formulation and manufacturing technique must be considered. It is likely that increased mixer-added fat (MAF) improved exogenous enzyme retention and nutrient utilization by broilers. Subject to current fat prices, increasing MAF may reduce the total cost of broiler production, particularly when reduction of electrical energy usage is considered. Males had improved feed conversion and were larger than females, and those in the group with an equal male/female ratio were intermediate. Whole pellets in the diet improved FCR compared with ground pellets. Broilers fed high-quality pellets exhibited the greatest carcass weight.

The Davis College has developed its capacity to do conduct geospatial analysis at several levels: spatial statistics, geographic information systems and remote sensing. One facet of this program involves targeted pest management strategies. A new platform of unmanned aerial vehicle (UAV) was developed for the project by the collaboration with aerospace engineers at the Department of Aerospace and Mechanical Engineering at West Virginia University. The investigators have developed a miniaturized autopilot system (3 oz. total weight) which operates an Unmanned Aerial Vehicle (UAV) without a pilot or controller. Such UAV technology can be used for landscape-scale pest detection in a large geographic area, providing economical and effective landscape-scale pest detection. Other pest-related efforts involved measuring the spatial response of natural pest enemies (spined soldier bugs and lady beetles) to

a pheromone attractant (positive for the soldier bugs not effective for the lady beetles) and an effort to organize at the regional level to combat the marmorated stink bug.

A number of projects at the Davis College involve long-term organic farming research involving plant systems, animal systems and integrated plant and animal systems. One study examined the impact of composting organically grown potatoes and watermelon on pest and disease resistance. Organic growers struggle to maintain high levels of soil fertility, and are prohibited from using synthetic pesticides. Hence, use of tolerant cultivars and soil amendments create complex management interactions that greatly influence final yields and disease incidence. These results indicate that Keuka Gold is more tolerant of diseases than All Blue, but responses vary with the levels of fertility. Watermelon yields were not affected by compost levels, but disease response to compost in some tomato cultivars was observed. Brandywine tomato had relatively low levels of disease in compost amended plots, but had the highest levels of any cultivar in plots without compost. These results help organic growers identify optimum management alternatives for their particular cropping systems. These results confirm similar observations in field trials in organic farming systems research.

Information about the sustainability of winter grazing systems is required to assess the suitability of this production system in West Virginia environments. This project was started in March 2007 and includes a major field research component. Data collected reflect the spatial and temporal variation of soil properties in WV pasture soils, and its relationship with forage and pasture productivity and system sustainability. The project evaluation at this time indicates a relationship between soil properties and pasture development and yield. Spatial relationships between soil properties, forage productivity, and landscape attributes can be used to manage site-specific grazing. During the study period, biomass accumulation at lower landscape positions was more subject to weather extremes. Soil strength at 0 to 2 cm was related to biomass production in the high and medium, but not low, elevation zones. Temporal stability in biomass production was related to elevation. The data produced supports the hypothesis that soils in the Appalachian region have certain physical characteristics (e.g. Gilpin series) that might favor winter grazing and sustained pasture production. The risk of soil degradation is significantly less due to the presence of soil skeleton.

2. Brief description of the target audience

The target audience for this program area includes producers, processors, distributors, extension specialists, agricultural consultants, regulators, policy makers and other researchers.

V(E). Planned Program (Outputs)

1. Standard output measures

2010	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Plan	0	0	0	0
Actual	0	0	0	0

2. Number of Patent Applications Submitted (Standard Research Output)

Patent Applications Submitted

Year: 2010

Plan: 0

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2010	Extension	Research	Total
Plan	0	8	
Actual	0	14	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Presentation on research at professional meetings

Year	Target	Actual
2010	9	7

Output #2

Output Measure

- Popular press articles on research

Year	Target	Actual
2010	3	4

Output #3

Output Measure

- Completed graduate degree programs

Year	Target	Actual
2010	3	9

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Growth in state production of beef and lamb - % increase
2	Growth in state aquaculture industry - annual % increase
3	Growth in state number of farms marketing organically produced vegetables - annual % increase
4	Growth in state broiler, egg and turkey industries - annual % increase

Outcome #1

1. Outcome Measures

Growth in state production of beef and lamb - % increase

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	2	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Beef cattle and sheep production are important sectors of the WV agricultural economy, given the relative abundance of high quality pasture land and the relative shortage of prime farmland for intensive agricultural product production. Production of lambs out of the traditional season would give producers an economic advantage due to higher market prices for out-of-season lambs.

What has been done

We have a long-term integrated pasture beef program that has examined ways to increase the production quantity and quality of pasture grass and to enhance the market opportunities for pasture raised beef.

WVU has been studying means of inducing estrus out of season to extend the production season for lambs.

Results

In the pasture-based beef systems project higher fall pasture allowance for heifers resulted in higher body weight, which was maintained throughout the winter and following spring, indicating that input in the form of conserved forages can be reduced during the winter. Reducing the use and dependence on conserved forages can reduce cost of rearing replacement heifers and at the same time make the final product conform better to the label "Pasture Raised Beef". It is concluded that any kind of grassland may be used for winter grazing until it runs out or is covered with snow. Tall fescue is most suited and keeps its quality for a longer period. Maintaining animals all winter on the grassland reduces productivity of first cut hay and increases productivity of second cut hay, and also increases pasture herbage mass. Most grassland in WV is similar to the permanent grassland (PAS) and cannot readily be harvested for conservation. It can be used for winter grazing.

Cattle sales were again down about 10 percent in 2010. Sheep sales, while up in 2009, fell by 17 percent. The declines are due to increased costs of production, depletion of the breeding stock due to unusually high prices, and in the case of sheep, increased predation from coyotes.

4. Associated Knowledge Areas

KA Code	Knowledge Area
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #2

1. Outcome Measures

Growth in state aquaculture industry - annual % increase

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	1	100

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Cold water aquaculture, particularly trout production for sale as a meat product, represents an economic opportunity for farmers in West Virginia and the region. The region has an abundance of fresh cold water and is close to Eastern Seaboard markets.

What has been done

We have research and extension projects to help develop species, small scale aquaculture systems and help farmers learn about opportunities. We have also assisted the State in developing regulations for the aquaculture industry that reduce the regulatory burden on small farmers.

Results

Production figures were not available for 2010 at the time of this report, but in 2009, trout sales doubled in value over 2008. This represents significant growth in the industry and growing

importance of the industry to the agricultural sector of the WV economy. There is some doubt about the accuracy of data on the aquaculture industry, given that it is a growing industry and all producers may not have been counted in the past.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
307	Animal Management Systems

Outcome #3

1. Outcome Measures

Growth in state number of farms marketing organically produced vegetables - annual % increase

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Organic farming represents a potential economic opportunity for WV farmers. It is crucial that organic farming decisions be based on sound science and proven methods.

What has been done

A number of projects at the Davis College involve long-term organic farming research involving plant systems, animal systems and integrated plant and animal systems.

Results

One study examined the impact of composting organically grown potatoes and watermelon on pest and disease resistance. Organic growers struggle to maintain high levels of soil fertility, and are prohibited from using synthetic pesticides. Hence, use of tolerant cultivars and soil amendments create complex management interactions that greatly influence final yields and disease incidence. These results indicate that Keuka Gold is more tolerant of diseases than All Blue, but responses vary with the levels of fertility. Watermelon yields were not affected by

compost levels, but disease response to compost in some tomato cultivars was observed. Brandywine tomato had relatively low levels of disease in compost amended plots, but had the highest levels of any cultivar in plots without compost. These results help organic growers identify optimum management alternatives for their particular cropping systems. These results confirm similar observations in field trials in organic farming systems research.

Data on growth in the organic farming industry in WV were not available for 2010 and this state-defined outcome will be dropped from future reports.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

Outcome #4

1. Outcome Measures

Growth in state broiler, egg and turkey industries - annual % increase

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Quantitative Target	Actual
2010	1	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The poultry industry in WV (broilers, eggs and Turkeys) is the single largest agricultural industry in the State. There is considerable pressure on this industry due to increasing costs of production, regional competition and pressures to reduce phosphorus pollution in the Potomac Watershed.

What has been done

A continuing project on the effect of diet formulation and manufacture technique on pellet production, nutrient and exogenous enzyme retention and broiler performance. Other studies

have examined ways to reduce the phosphorus content of poultry litter through diet modification and to better utilize the litter as a fertilizer to reduce phosphorus pollution of water.

Results

The study has concluded that diet formulation and manufacturing technique are, in fact, linked and must be considered when attempting to optimize pellet quality. To maximize broiler performance, the diet formulation and manufacturing technique must be considered. It is likely that increased mixer-added fat (MAF) improved exogenous enzyme retention and nutrient utilization by broilers. Subject to current fat prices, increasing MAF may reduce the total cost of broiler production, particularly when reduction of electrical energy usage is considered. Males had improved feed conversion and were larger than females, and those in the group with an equal male/female ratio were intermediate. Whole pellets in the diet improved FCR compared with ground pellets. Broilers fed high-quality pellets exhibited the greatest carcass weight.

Data are not available for 2010, but for 2009 the combined production of broilers, eggs and turkeys was down 10 percent from 2008.

4. Associated Knowledge Areas

KA Code	Knowledge Area
133	Pollution Prevention and Mitigation
302	Nutrient Utilization in Animals
307	Animal Management Systems

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Economy
- Appropriations changes
- Competing Public priorities

Brief Explanation

V(I). Planned Program (Evaluation Studies and Data Collection)

1. Evaluation Studies Planned

- Before-After (before and after program)
- During (during program)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}