

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

Global Food Security and Hunger

Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources		5%		0%
102	Soil, Plant, Water, Nutrient Relationships		10%		0%
111	Conservation and Efficient Use of Water		10%		0%
131	Alternative Uses of Land		10%		0%
201	Plant Genome, Genetics, and Genetic Mechanisms		0%		30%
202	Plant Genetic Resources		0%		26%
204	Plant Product Quality and Utility (Preharvest)		5%		2%
205	Plant Management Systems		5%		11%
206	Basic Plant Biology		10%		2%
211	Insects, Mites, and Other Arthropods Affecting Plants		5%		29%
302	Nutrient Utilization in Animals		10%		0%
403	Waste Disposal, Recycling, and Reuse		5%		0%
405	Drainage and Irrigation Systems and Facilities		10%		0%
721	Insects and Other Pests Affecting Humans		5%		0%
806	Youth Development		5%		0%
902	Administration of Projects and Programs		5%		0%
	Total		100%		100%

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2012	Extension		Research	
	1862	1890	1862	1890
Plan	0.0	1.5	0.0	7.8

Actual Paid Professional	0.0	2.5	0.0	10.4
Actual Volunteer	0.0	0.0	0.0	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	132345	0	981958
1862 Matching	1890 Matching	1862 Matching	1890 Matching
0	108292	0	78777
1862 All Other	1890 All Other	1862 All Other	1890 All Other
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

WVSU Research programming was focused on aquaculture, genetic mapping for vegetables, and field trials of many vegetables and cut flowers. Identification of molecular markers, association panels and genetic maps were continued for nutraceutical, pest and disease resistance, as well as yield and quality traits in melon, watermelon, squash, pumpkin, and peppers.

Advanced tomato lines from marker assisted selection were assessed for plant growth and organoleptic traits. Lines evaluated this year included crosses between lines with superior taste qualities and carrying the late blight resistance gene, Ph3. Seed was collected off superior lines. Work continues to identify the best or new markers to use for marker assisted selection. Generation of acyl sugars for tests with beneficial insects on tomatoes in protected culture was initiated by collaborating with an organic chemist to create acylsugars with one type of fatty acid esterified to the sugar moiety for testing.

An early dwarf cayenne pepper line is under development for release for both pot and field production. A seed increase was undertaken in 2012 to allow testing by growers as well as seed companies. In addition, it was also included in our hot pepper trials on campus.

Field trials of twenty eight peppers (sweet, hot and specialty) and cut flowers varieties were evaluated on plastic mulched beds with irrigation for use in state-wide recommendations. A two-year winter hardiness study with herbaceous ornamental perennials was initiated in 2012 and included mums, gladiolus, Monarda and Lamium.

The aquaculture program continued to analyze data from feeding trials, and included effects of protein and high fat diet on feed utilization and mitochondrial function in rainbow trout.

WVSU Extension personnel assisted in the development of alternative agricultural endeavors to aid farmers in increasing their revenues. Additionally, there is an emerging interest in the development of green spaces in our urban centers and municipalities. WVSU worked with these entities to maximize utilization of best practices in the field of cultivation, selection, and maintenance. WVSU Extension continues to target small-scale producers with education to increase knowledge levels in alternative

enterprises that may expand profits for small farm operators. Home landscape beautification and vegetable gardening are at the center of this heightened resurgence of interest in horticulture.

Commercial growers in the areas of greenhouse and nursery management, cut flower production, and fruit and vegetable production are also seeking marketing and production related advice in order to satisfy growing consumer demands. Some of the projects that are the most often asked about are the identification and/or eradication of plants and pests, the growing cycles of plants, plant maintenance, and alternative gardening techniques. WVSU offered youth from pre-K to age 18, a variety of opportunities for exposure to plant and animal education. Program emphasis was focused on the Junior Master Gardener program.

2. Brief description of the target audience

- Fish feed manufacturers, federal agencies (ARS) involved in rainbow trout breeding, fish farmers
- Horticulturalists, germplasm collectors, plant breeders, private seed companies, farm and volunteer organizations, farmers/growers, small-farm operators, minority farmers and landowners, underserved rural communities , agriculture professionals - WVU Extension agents, WVDA staff, etc, and students.
- Homeowners, consumers, volunteer organizations, various segments of the youth population, and other agricultural and natural resource focused entities.

3. How was eXtension used?

Use of eXtension occurred through participation in three communities of practice (CoP): Plant Breeding and Genomics, eOrganic, and Consumer Horticulture. One of our staff is part of the executive committee for the Plant Breeding and Genomics from SoCAP and will be joining as a co-Leader of the community in 2013. "Ask an Expert" questions were answered for all three CoP.

V(E). Planned Program (Outputs)

1. Standard output measures

2012	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	853	4600	393	2500

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

Patent Applications Submitted

Year: 2012
 Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2012	Extension	Research	Total
Actual	0	10	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Identify breed of rainbow trout that has genetic potential for improved nutrient utilization
Not reporting on this Output for this Annual Report

Output #2

Output Measure

- Train undergraduate and graduate students in biotechnology and agricultural related fields

Year	Actual
2012	32

Output #3

Output Measure

- Identification of DNA markers, fruit related genes, association panels, and value-added progenies

Year	Actual
2012	2008

Output #4

Output Measure

- Develop vegetable varieties for small farm production
Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Both urban/rural clientele will receive information on research-based horticultural management.
Not reporting on this Output for this Annual Report

Output #6

Output Measure

- Adult volunteers and youth will receive training in horticulture and agriculture through JMG and other training opportunities.

Year	Actual
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2012 876

Output #7

Output Measure

- Workshops targeted at alternative agriculture endeavors will be held in targeted counties.

Year	Actual
2012	24

Output #8

Output Measure

- WVSU Extension Service staff will generate media articles and stories related to alternative agriculture.

Year	Actual
2012	6

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	New diet formulation for rainbow trout
2	Development of improved feed for rainbow trout will lead to reduction in aquaculture pollution
3	Development of value-added cultivars
4	Small farmer adoption of new vegetable varieties
5	Volunteers will exhibit increased knowledge of providing age-appropriate horticulture and agriculture programs to youth.
6	Extension clientele will implement best practices in agriculture and natural resources based on research-based knowledge.
7	Farmers/growers will utilize best practices with alternative agricultural enterprises to diversify their income portfolio.
8	Through the Agritourism initiative participants will create new or develop existing enterprises to increase their sustainability.

Outcome #1

1. Outcome Measures

New diet formulation for rainbow trout

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fish feed manufacturer, fish breeders, and farmers. Rainbow trout with improved nutrient utilization will reach market-size in less time with less nutrient input. Less nutrient input and higher nutrient retention have environmental implications by reducing pollution from aquaculture discharge.

What has been done

A 2 x 3 factorial experiment was conducted to determine effect of trout families (designated as low FE and high FE) and diets (40/10 or 40/20 or 40/30 percent crude protein/fat) on the growth performance characteristics, mitochondrial respiratory enzymatic activities and gene expression in the liver, muscle and intestine. Another 2 x 3 factorial experiment was conducted to determine effect of trout families (designated as low FE and high FE) and diets (45/10 or 45/20 or 45/30 percent crude protein/fat) on the growth performance characteristics, mitochondrial respiratory enzymatic activities and gene expression in the liver, muscle and intestine. Growth performance characteristics, mitochondrial respiratory enzymatic activities and gene expression in the liver, muscle and intestine have been completed for diets containing 40/10, 40/20, and 40/30 percent crude protein/fat.

Results

Results from the first factorial experiment showed no significance between the two families of rainbow trout for the feed intake expressed as percent body weight gain per day, WG, FE, SGR and HSI showed. Nutrient utilization efficiencies (PER, PPV, LER and LPV) were not affected by the family type. The fish fed diet 40/10 had a significantly better LPV and LER when compared to those fed diets 40/20 and 40/30 whereas those fed 40/20 diet had better PER and PPV than those fed 40/30 diet. Rainbow trout family had no significant effect on the respiratory chain enzyme complex activity except for complexes I, IV and V in intestine, complex III in liver; and complex III and V in muscle. Significant interaction occurred between family and diet in all the

genes analyzed except in muscle PPARbeta, PGC-1alpha and liver PGC-1alpha.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #2

1. Outcome Measures

Development of improved feed for rainbow trout will lead to reduction in aquaculture pollution

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Fish feed manufacturer, fish breeders, and farmers. High feed cost is problem and reducing the cost through optimal dietary composition will increase profitability to the farmers. If changes in dietary composition lead to improvement in nutrient utilization efficiencies, pollution from unused nutrients in effluent discharges from aquaculture production facility will be reduced.

What has been done

A 2 x 3 factorial experiment was conducted to determine effect of trout families (designated as low FE and high FE) and diets (40/10 or 40/20 or 40/30 percent crude protein/fat) on the growth performance characteristics, mitochondrial respiratory enzymatic activities and gene expression in the liver, muscle and intestine. Another 2 x 3 factorial experiment was conducted to determine effect of trout families (designated as low FE and high FE) and diets (45/10 or 45/20 or 45/30 percent crude protein/fat) on the growth performance characteristics, mitochondrial respiratory enzymatic activities and gene expression in the liver, muscle and intestine. Growth performance characteristics, mitochondrial respiratory enzymatic activities and gene expression in the liver, muscle and intestine have been completed for diets containing 40/10, 40/20, and 40/30 percent crude protein/fat.

Results

Dietary composition had significant ($P < 0.05$) main effect on all the growth performance responses measured except FI and VSI. The visceral fat and hepatosomatic index were significantly affected by diet and rainbow trout fed 40/30 had a significantly higher visceral fat when compared to those fed the other two diets. Nutrient utilization efficiencies (PER, PPV, LER and LPV) were affected by the dietary composition. The fish fed diet 40/10 had a significantly better LPV and LER when compared to those fed diets 40/20 and 40/30 whereas those fed 40/20 diet had better PER and PPV than those fed 40/30 diet. Diet had significant main effect on activities of mitochondrial complexes in liver for I and II, intestine for III and muscle for I, II, III and IV. There were significant interactions between family and diet for complex I in the liver, complexes II and IV in the muscle and complex V in the intestine. Results from gene expression showed that diets had clear impact on gene expression especially diet 40/20. Significant interaction occurred between family and diet in all the genes analyzed except in muscle PPARbeta, PGC-1alpha and liver PGC-1alpha. This is more observed in the fast family 120 fed diet 40/20 where there was better growth performance and feed utilization.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals

Outcome #3

1. Outcome Measures

Development of value-added cultivars

2. Associated Institution Types

- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Project 1: Protected culture production of tomatoes (*Solanum lycopersicum* L., formerly *Lycopersicon esculentum* Mill.) is best with varieties bred for this environment. In addition, the controlled environment conditions of protected culture production generates higher yields from varieties bred for this environment than the field varieties. Most of the varieties used in Europe for greenhouse production are bred for northern European conditions and palate with no breeding of tomato varieties specifically for high tunnel production. No public tomato breeder is focusing on breeding for the specialty market of tomatoes produced in protected culture. However, this is the

fastest growing production segment for tomatoes.

New varieties and strains of vegetables, fruit and ornamentals are constantly being developed throughout the world. WVSU has germplasm developed from prior partnerships that has been selected to develop varieties of interest for WV growers. Potential lines for both hot peppers and watermelons have been selected based on grower interest.

Project 2: The US cucurbit crop growers are seeking to diversify melon varieties and rotate them every season, while protecting this vulnerable crop from phytopathogens. Development of high quality disease resistant cucurbit crop varieties is critical to the economic prosperity of US cucurbit crop farmers. Due to complex inheritance of yield, resistance and stress related traits and their low heritabilities, breeding for yield in cucurbit crop is very difficult. This challenging objective is much more complicated as yield traits are controlled by quantitative loci. Understanding the genetic control of phenotypic variation is an important first step in order to utilize marker assisted breeding of yield components in cucurbit crop morphotypes.

What has been done

Project 1: Standard tomato varieties, advanced breeding lines and germplasm were put into a bato bucket hydroponic system following marker assisted selection for the late blight genes, Ph3 and Ph2. Plants were also assessed for plant growth/habit and organoleptic traits. Seeds were collected off superior lines. Plants from the crosses between lines with superior taste qualities and lines that should be homozygous for the late blight resistance gene, Ph3, were evaluated for plant growth and taste and seed to produce F2 populations were obtained. Sequencing of the amplicons derived from these markers are being analyzed for the set of varieties and lines available to assist in identifying better markers to use for marker assisted selection. A collaboration with an organic chemist began this year to create single types of acylsugar for testing on plants with beneficials ('Synthesis of Selective Esterified Monosaccharides'). Currently he is working with an undergraduate student to produce enough for testing.

WVSU has selected several early dwarf cayenne peppers lines showing promise as a long thin cayenne pepper for production. Selected lines are early and dwarf as well as exhibiting prolific greenhouse production without bumble bees for pollination. Plans are to develop the first line as an open pollinated variety for use in both pot or field production. Additional pepper lines exist in our seed stock that could also be considered for release in the future. The first line is a cayenne pepper line which was trialed at WVSU AERS with four commercially available lines. Two blocks of six plants per variety were grown on irrigated raised beds covered in plastic mulch following standard production practices. Plants were grown from seed and hand transplanted into the field. Fruit were harvested by plant into marketable and cull classes following USDA standards. Seed were also harvested of the cayenne line being considered for release.

Project 2:

Thousands of SNP markers were used to build association mapping panels and QTLs and linked markers for various traits have been identified.

500 cucurbit crop collections (melon, watermelon and pumpkin) and 96 pepper collections were screened with 15,000 SNPs and 500 SSR primers for LD (Linkage Disequilibrium), structure and association mapping studies.

SNPs linked to various nutraceutical traits were also identified and advanced breeding lines have been evaluated in farmers fields

LD patterns were estimated across the melon genome by using 500 mapped SSR markers from the published literature, EST based SSRs and 15,000 SNPs.

Results

Project 1: continues to have problems with the Ph2 and Ph3 markers for late blight resistance. In some cases the amplicons or the restricted products are not the correct size based on information from our collaborator. In some cases estimating the size of the restricted products is difficult when there is less than a 30 bp difference between bands. Additional techniques are necessary to verify the markers and determine if they are appropriate to use. Sequencing of the amplicons from varieties and lines with and without the markers is underway. The two markers for Ph2 colocalize and thus only one of the two will be informative in marker assisted selection. We are working to determine if one of these is the best markers to use for Ph2 and to identify additional markers. The three markers listed for Ph3 cover a large genomic region (25Mbp). Problems persist with amplification of one of the three and sizes of the restricted products not aligning with information provided by the collaborator. Preliminary sequencing data identified a problem with homology between the amplicon sequence and the region it is proposed to be located for Ph2. Work analysis of sequence data from Ph3 amplicons is ongoing.

The early dwarf cayenne pepper line performed well against other commercially available cayenne lines. In 2012 it was one of the three earliest lines trialed and was second in producing the average fruit per plant (58 fruit/plant). In addition, the line transplanted well even in the hot dry summer of 2012.

Project 2: Various levels of QTL with high to moderate stringency were detected for fruit shape, fruit weight, soluble solids, and rind pressure and a majority of them was found to be in agreement with the previously published data, indicating that association mapping can be very useful for cucurbit crops and pepper molecular breeding.

Common markers are identified for fruit yield and soluble solids that can be used for marker-assisted selection to simultaneously improve yield and quality. Seven markers were identified to be linked with the resistance to powdery mildew.

Graduate students and undergraduate students associated with the research activities of this program have been exposed to various field and lab techniques like selfing, crossing, molecular marker development and marker analysis etc.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #4

1. Outcome Measures

Small farmer adoption of new vegetable varieties

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The number of farms in West Virginia has increased in the ten years with the majority being owned by a family or individual. The number of vegetable farms has almost doubled in the last five years but with only a small change in the acreage. This suggests that new small farms are on the increase focusing on high density production of horticultural crops.

Small farm growers in the state are interested in recommendations for the best or new varieties of sweet, hot and specialty peppers. In addition, there is interest in adding cut flower or ornamental production to their farm operations or crop rotation. Grafting vegetable plants in particular tomatoes has received a large amount of press and WV growers are interested in trialing the plants to see if it is worth the extra effort to produce the plants or purchase them. Expertise exists at WVSU in grafting tomatoes from a prior research project which has led to a stakeholder driven research project.

What has been done

WVSU ran yield trials on hot and specialty pepper varieties in 2011 and 2012. Varieties were chosen for three types: Cayenne, Jalapeno and Specialty. Two blocks of six plants per variety were grown on irrigated raised beds covered in plastic mulch following standard production practices. Plants were grown from seed and hand transplanted into the field. Fruit were harvested by plant into marketable and cull classes following USDA standards.

Trials of grafted tomato plants against non-grafted was initiated in 2012 with grafted plants produced at WVSU AERS with 2 rootstocks and 3 scions. Plants were delivered to three farmers for trialing in late May. However the plants all died due to an unknown disease. Plans are underway to repeat this project with five farmers using either high tunnel or field production in

2013.

Ornamental trials have been conducted at WVSVU since 2003 in conjunction with the University of Minnesota. These trials have focused on mums as well as a few other herbaceous ornamentals and even resulted in the release of a new Gaura line (Anderson et al. 2009) and two mum releases in 2012 (Anderson et al 2012 a and b).

Cut flower trials with zinnias and sunflowers were undertaken at the AERS in the late summer of 2012. However, we had poor germination and as such did not take any data on the plants. The poor germination was probably due to poor irrigation across the planting surface as only one irrigation line is used for production of the majority of crops at our location as it is only one plant across the bed instead of several as it done with cut flower production.

Results

The growing environment in the two years differed dramatically and affected the pepper fruit yield as well as weeks to first harvest. In 2012 only 77% of the peppers transplanted produced peppers unlike 99% in 2011. This is likely due to the high temperatures experienced in 2012 as well as the change to dark green mulch. Concho was an early jalapeno variety with the highest average fruit weigh reliably over both years, but did not meet the high production per plant in number and weight that El Jefe exhibited. Recommendations would be to plant both varieties to get both early and high production. Joe's Long Cayenne produced the heaviest fruit both years, but the highest production varied between varieties in both years for both number and weight. Variation in weeks to first harvest occurred only in 2011 and with the lines producing the smaller average fruit weight. No clear recommendations can be made at this time.

In 2012 we initiated a two year winter hardiness study of 24 mum lines/varieties, 14 gladiolus lines, 4 Monarda lines/varieties and 2 Lamium varieties. Most of the Lamium lines were lost during the unusually hot summer either thru problems with transplant shock or during their initial growth. The remainder of the plants did well and the majority of them flowered. In the spring of 2013 we will assess what survived over the winter and take data as necessary during the summer.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources

Outcome #5

1. Outcome Measures

Volunteers will exhibit increased knowledge of providing age-appropriate horticulture and agriculture programs to youth.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	24

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

With an increased emphasis on mathematics and reading at the elementary school level, resulting in a lesser focus on science, it has become increasingly apparent that our youth are becoming disconnected from nature. Research shows that in 4th grade 68% of boys and 66% of girls enjoy science. But by 5th and 6th grade, that interest starts to drop off, and it drops off at a greater rate among female students. According to the National Science Foundation, although women represent 46 percent of the workforce, only 25 percent of the jobs in science, engineering, and technology are held by women. In an attempt to educate youth of the importance of horticultural and agricultural practices as well as a means to keep them engaged in science throughout adolescence, agricultural education has been intertwined with community building programs. Findings from the Junior Master Gardener National Teacher/Leader Evaluation indicate that JMG has encouraged students to perform community service projects outside the classroom. Through the creation of intergenerational gardening opportunities, WVSU Extension Service hopes to ensure that a legacy of information can be conveyed to our younger populations and the next generation of agricultural scientists cultivated.

What has been done

In order to prepare adult volunteers to interact with youth on agricultural and horticultural based topics, West Virginia State University has utilized the Junior Master Gardener (JMG) Program curriculum and conducted hands-on trainings for interested individuals. Working directly with the National Headquarters for the JMG Program, West Virginia State University Extension Service serves as the State Coordinator for the program. Twelve JMG trainings/presentations were facilitated around the state as well as an additional nine Community and Adaptive Gardening Workshops to educate both the youth and adults on proper gardening techniques to develop sustainable gardening opportunities for years to come. Thirteen youth and adult based gardening programs have been implemented and sustained in central and southern WV with gardening activities conducted in classroom and after school settings, as well as facilitated in conjunction with numerous community organizations.

Results

Through the Junior Master Gardener efforts 393 youth have been directly impacted, but the number of youth indirectly impacted through programs generated from the trainings and additional outreach are well over 2500. West Virginia has a total of 19 active registered Junior Master Gardener Groups around the state, with eight of these established within this past programmatic year. This represents nine counties across the state, with four new counties coming on board this year alone. During this timeframe grant appropriations in support of these programmatic efforts

have totaled \$659,992. The Community and Adaptive Gardening efforts have impacted a total of 483 adults directly while indirectly impacting more than 4000 through programs developed and information conveyed based on education received through our outreach efforts. Attendance at the workshop series alone represented 14 organizations across the state seeking education on program development, management and sustainability. Of the participants, 85% were looking to implement new garden programs this past year. Grant funding for these programmatic efforts during this timeframe totaled \$22,128.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
206	Basic Plant Biology
806	Youth Development

Outcome #6

1. Outcome Measures

Extension clientele will implement best practices in agriculture and natural resources based on research-based knowledge.

Not Reporting on this Outcome Measure

Outcome #7

1. Outcome Measures

Farmers/growers will utilize best practices with alternative agricultural enterprises to diversify their income portfolio.

2. Associated Institution Types

- 1890 Extension
- 1890 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	663

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Traditional agriculture production in West Virginia has been steadily decreasing due to high overhead operational costs, lack of suitable cropland, increased restrictions by the EPA on concentrated animal feeding operations as well as an aging labor force. When it comes to farming in West Virginia, even the largest farms are small when compared to statistics nationwide. Reports from the WVU Small Farm Center indicate that the residents report spending \$7.2 billion on food each year, but our farmers only capture 19 cents of every dollar spent in the state. With this trend, alternative agricultural practices targeting small farm and backyard gardeners have become a focus of the WVSU Extension Service. Through development of educational workshops illustrating how to best cultivate, manage and market a specialized crop, farmer's looking to optimize their farmland have been educated on how to make the most out of their small acreage.

What has been done

In an effort to educate small farmers and backyard gardeners how to cultivate, manage and market a specialized crop through alternative agricultural practices, 24 workshops were delivered around the state. Eleven workshops were conducted on the topic of small fruit production concentrating on brambles, strawberries, blueberries, grapes and tree fruits. Two workshops on seasonal crop extension through the use of cold frames were delivered educating the general public on ways to increase productivity and be the first and last to the market with fresh, quality produce. Water conservation practices were targeted as a topic with two hydroponic/aeroponic production workshops as well as two separate workshops on the implementation of rain barrels. Four urban forestry workshops were delivered on the topics of small orchard management as well as alternative woodlot management through specialty mushroom cultivation. Two workshops focusing on weed identification and alternative weed eradication methods were held as well as results the of a cut flower production project presented as a potential value added product for established farm enterprises.

To educate small farmers and backyard gardeners how to cultivate, manage and market a specialized crop through alternative agricultural practices, 24 workshops were delivered around the state. Eleven workshops were conducted on the topic of small fruit production concentrating on brambles, strawberries, blueberries, grapes and tree fruits. Two workshops on seasonal crop extension through the use of cold frames were delivered educating the general public on ways to increase productivity and be the first and last to the market with fresh, quality produce. Water conservation practices were targeted as a topic with two hydroponic/aeroponic production workshops as well as two separate workshops on the implementation of rain barrels. Four urban forestry workshops were delivered on the topics of small orchard management as well as alternative woodlot management through specialty mushroom cultivation. Two workshops focusing on weed identification and alternative weed eradication methods were held as well as results the of a cut flower production project presented as a potential value added product for established farm enterprises.

Results

Eleven Small Fruits Workshops were delivered covering production methods for brambles, strawberries, blueberries, grapes and tree fruits. These workshops were attended by 410 participants ranging from backyard gardeners, amateur wine makers as well as small farm operators. During these workshops, approximately 85% of the participants have indicated an increase in knowledge of small fruit production techniques. Approximately 60% of the participants indicated that they would be including small fruits in their operation during that growing season. A

poster titled Small Fruit Demonstration Gardens: Educating the Public about Growing Their Own Small Fruits was also presented at the 2012 AEA/ARD Land-Grant Conference in Memphis, TN, on June 24-28, 2012 in regards to the Small Fruit Program. Two Cold Frame Workshops were attended by 20 people and 75% of the participants surveyed illustrated that they had increased their knowledge of season extension and felt comfortable constructing a cold frame. The Hydroponic/Aeroponic Workshops were delivered to 33 people in conjunction with the FFA Program at a local High School. Water conservation and rain barrel workshops were also presented to an additional 54 participants. Four urban forestry workshops were delivered to 60 individuals on the topics of small orchard management as well as alternative woodlot management through specialty mushroom cultivation. During these workshops, approximately 80% of the participants have indicated an increase in knowledge of mushroom production and/or the health benefits of mushroom production. Multiple participants have shown an interest in marketing their mushrooms at a local farmers market, which will begin to open up a local niche market in the area. Two Alternative Weed Management classes were offered to the general public with 12 participants as well as a Cut Flower Production seminar at the 2012 International Master Gardener Conference in Charleston, WV which drew interest from 74 conference attendees. This same topic was also presented during the poster session at the 2012 AEA/ARD Land-Grant Conference in Memphis, TN, on June 24-28, 2012.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land
205	Plant Management Systems
206	Basic Plant Biology
302	Nutrient Utilization in Animals
403	Waste Disposal, Recycling, and Reuse
405	Drainage and Irrigation Systems and Facilities

Outcome #8

1. Outcome Measures

Through the Agritourism initiative participants will create new or develop existing enterprises to increase their sustainability.

2. Associated Institution Types

- 1890 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2012	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Traditional agriculture production in West Virginia has been steadily decreasing due to high overhead operational costs, lack of suitable cropland, increased restrictions by the EPA on concentrated animal feeding operations as well as an aging labor force. When it comes to farming in West Virginia, even the largest farms are small when compared to statistics nationwide. Reports from the WVU Small Farm Center indicate that the residents report spending \$7.2 billion on food each year, but our farmers only capture 19 cents of every dollar spent in the state. With this trend, alternative agricultural practices targeting small farm and backyard gardeners have become a focus of the WVSU Extension Service. Through development of educational workshops illustrating how to best cultivate, manage and market a specialized crop, farmer's looking to optimize their farmland have been educated on how to make the most out of their small acreage.

What has been done

In an effort to educate small farmer's and backyard gardener how to cultivate, manage and market a specialized crop through alternative agricultural practices, 24 workshops were delivered around the state. Eleven workshops were conducted on the topic of small fruit production concentrating on brambles, strawberries, blueberries, grapes and tree fruits. Two workshops on seasonal crops extension through the use of cold frames were delivered educating the general public on ways to increase productivity and be the first and last to the market with fresh, quality produce. Water conservation practices were targeted as a topic with two hydroponic/aeroponic production workshops as well as two separate workshops on the implementation of rain barrels. Four urban forestry workshops were delivered on the topics of small orchard management as well as alternative woodlot management through specialty mushroom cultivation. Two workshops focusing on weed identification and alternative weed eradication methods were held as well as results the of a cut flower production project presented as a potential value added product for established farm enterprises.

Results

Though 663 small farmers and backyard gardeners have participated in the various workshops mentioned above, it will take at least three years or more to determine the overall impact of these endeavors. The short term goals of outreach have been far exceeded, but the long term goals will not be able to be quantified until follow up surveys are administered. This will allow us to determine how many of these individuals were successful not only in the implementation of the alternative agricultural crops, but also in the development of a market via an Agritourism perspective such as an roadside stand, u-pick farm or interaction at a local farmers market to sale their specialty products.

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
131	Alternative Uses of Land

403	Waste Disposal, Recycling, and Reuse
902	Administration of Projects and Programs

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

Limited field and greenhouse space has impacted the ability of the projects to achieve the intended outcomes. Additional field sites are being identified through contacts with farmers and other agencies.

Aquaculture feeding trials were terminated early because water temperature issues. This may have affected expected outcomes.

Laboratory and office space for one of the scientists was moved and renovated which has delayed the project, but the new facilities are larger and provide a better workflow to assist with improved activity in the future.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Two major initiatives were started: a review of physical facilities to conduct greenhouse and field work, and realignment of extension personnel to better coordinate with research efforts. A new 5-year facilities plan was developed to provide more greenhouse and headhouse space to support both research and extension programming efforts. Also, new laboratory and office space was leased at the WV Regional Technology Park to accommodate more research efforts.

Key Items of Evaluation

Two major initiatives were started: a review of physical facilities to conduct greenhouse and field work, and realignment of extension personnel to better coordinate with research efforts. A new 5-year facilities plan was developed to provide more greenhouse and headhouse space to support both research and extension programming efforts. Also, new laboratory and office space was leased at the WV Regional Technology Park to accommodate more research efforts.