

# 2011 Washington State University Combined Research and Extension Annual Report of Accomplishments and Results

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## I. Report Overview

### 1. Executive Summary

The goals of the Washington State University Agricultural Research Center (ARC - the Agricultural Experiment Station of the State of Washington) and of Washington State University Extension are to conduct research beneficial to the citizens of Washington State and to deliver and apply relevant research results to the right target audiences within the state. These activities are designed to result in improved economic viability, environmental sustainability, and quality of life for the people of Washington State. The ARC and WSU Extension recognize their unique land grant research and outreach missions - to serve the people of Washington and promote their interests. The ARC provides leadership in discovering and accessing knowledge by carrying out high quality research that contributes to a safe, abundant food and fiber supply; promotes the well-being of individuals, families, and communities; enhances sustainability of agricultural and economic systems; and promotes stewardship of natural resources and ecological systems. WSU Extension creates outreach programs that leverage the research base of the University and the nation to address issues in ways that lead to improvements in agricultural productivity, efficiency, and sustainability; natural resource stewardship; economic development; health and well-being of our youth, families, and communities; and our energy security. The synergy provided by connecting the problem-solving skills of professionals with experience working from a number of different perspectives can be quite powerful and makes a valuable contribution to many aspects of Washington's quality of life.

This Combined Research and Extension Annual Report is the first joint report since the restructuring that merged Extension with the Washington State University College of Agricultural, Human, and Natural Resource Sciences in 2010. The two organizations have many natural and structural links, largely because all faculty members have responsibilities that include both Research and Extension with many having formal joint appointments, but there has historically been specialization in how Research and Extension have seen their missions. A number of years ago, as a result of decreasing state support to the University, the Agricultural Research Center narrowed the scope of its research emphasis in order to focus on the food systems of Washington and the needs of the various stakeholders in these systems. As part of this focus, the ARC has made significant commitments to both conventional and organic agricultural production systems by supporting research and extension programs that emphasize economic and environmental sustainability. While significant components of our Extension programs are aligned with research base of the ARC, Extension also delivers significant outreach related to energy security, natural resource stewardship, health and wellness, and youth, family and community development. The research foundation for these 'other' programs resides in WSU colleges and interdisciplinary centers, including the College of Agricultural, Human and Natural Resource Sciences (CAHNRS); the College of Engineering and Architecture; the College of Liberal Arts; the College of Pharmacy; the College of Veterinary Medicine; the Center for Environmental Research, Education and Outreach; and the William D. Ruckelshaus Center (a joint program with the University of Washington). Additionally, through close partnerships and collaborative agreements, our Extension educators also extend the research conducted by faculty at other regional centers of expertise, including the University of Washington, Oregon State University, and the University of Idaho.

The state of Washington is beautiful, rich in natural resources, and has a highly diverse topography and climate. This diversity is also reflected in our people, communities, industries, and natural resource bases. Our agricultural systems are among the most diverse in the US, including over 300 different crops

that are sold domestically or exported, largely to countries in the Pacific Rim. Washington is especially known for its apples, wheat, potatoes, livestock, milk and milk products, and produces a major share of many specialty crops, like berries and hops. Most of the state's farm and ranch lands are in Central and Eastern Washington but most of the state's population is located in a coastal zone on the west side of the Cascade Mountains in a corridor roughly following Interstate Highway 5 from the Canadian border south to Vancouver, Washington and the Oregon border. Western Washington is characterized by an expanding urban population, which values environmental quality and supports local food systems. As a consequence of the dense population in an area with good agricultural conditions, including a moderate climate, rich alluvial soils, and abundant rainfall, this region of Washington is home to an extraordinarily diverse agriculture. Eastern Washington is less diverse, and is characterized by larger farming operations, especially in the cultivation of wheat, potatoes and orchard crops. Our forestlands are in coastal regions, in the Cascade Range, and in northwestern and southwestern Washington and they contribute significantly to the state's economy and overall quality of life. Washington is also home to two great rivers, the Columbia and the Snake, which provide transportation, electrical power, irrigation, and important fish and wildlife habitat. Other river systems, coastal regions, and the Puget Sound support abundant yet fragile aquatic and marine species and provide a rich mosaic unique to the Pacific Northwest.

While there is often a temptation to think of agriculture as a stable and settled industry, it is more useful to think of it as metastable, with many destabilizing commercial, biotic and abiotic challenges that must be dealt with to maintain production. There are many pressures on our largest crops: new varieties take market share from our apples; changes in disease and pest pressure, input costs and per bushel prices affect how we grow our wheat; agriculture labor supply affects the timing and cost of our fruit harvests. The dynamics of our communities change as the result of demographics, changes in transportation, communication, the educational and health care opportunities, and the availability and stability of employment. As we examine how to adapt to these new constraints, we believe they also create opportunities. Examples include the possibility of using perennial wheat varieties in low rainfall areas of the state to decrease input costs and secure erosion prone soil or developing techniques suitable for local viticulture and enology. Washington has the second largest wine industry in the United States but there are issues related to local climate, soil, and management that need to be resolved in order to exploit the potential of this crop. Our natural resources are also at risk from conversion, wildfire, and pollution. Weather variability and climate change will have significant impacts on water availability and facilitate migration of new plant and animal diseases and pests into the state. Furthermore, our human populations and communities are undergoing unprecedented change. Demographics have shifted dramatically with rapid expansion of Latino populations in Washington (almost tripling statewide between 1990 and 2010), especially in Central and South-Central counties, and of Asian populations in Western Washington (doubling between 1990 and 2010). Additionally, large refugee populations now call Washington State home, with the Seattle metro area now the 5th most popular resettlement area for refugees nationally. While this newfound diversity is enriching the tapestry of the state by bringing a multitude of new cultures, foods, and arts, these demographic shifts also strain social services and challenge educational delivery systems. The health and wellness of our youth are also at risk with over 25% of our adult population categorized as obese and almost 30% of our youth categorized as overweight or obese. Our rural communities are struggling with increased poverty and with differential access to technology, health services, and educational opportunities.

Our role in dealing with these issues is to develop and deliver an excellent empirical and theoretical knowledge base and use this to offer advice and assistance to our constituents. The strategy is to use cutting edge technology to test new ways of doing things and then to make the best of the potential solutions available to our stakeholders. We have particular skills in areas like plant biotechnology and genomics and are leading in several efforts to apply these to issues like cropping systems research and cultivar development for specialty markets. As a result of studies on water management for multiple uses, our economists have been critically examining current and future water use for urban development, crop production, fisheries, and recreation. The biological systems engineers are working on precision systems

for delivering water at appropriate times for good crop yield. Our integrated pest management programs are developing techniques to minimize pesticide use while effectively controlling pests across the broad variety of agricultural crops and urban environments. And our energy extension programs have been pioneers in areas like building technology and plant operations efficiency.

Major changes in the structure and amount of the Washington State University budget over the last five years have complicated the development of an integrated vision, although at the same time these strained financial circumstances have meant that only those organizational concepts that can be defended strongly have been able to maintain themselves. Prior to 2011, Extension had a matrix form of management, with individuals having a "place" in both a geographically organized structure (East, West, South...) and a subject area (Family, Natural Resources...). The geographic structure has been phased out and only the subject area structure remains, a change that, while simplifying the guidance orientation given to individual faculty members, does not actually eliminate many local considerations in appointments and responsibilities since many Extension faculty work closely with county-based operations.

While the process has been less formal, Research has also been undergoing changes. It is increasingly obvious that direct state investments are not sufficient to support most research programs without significant additional funds obtained from grants given by local, regional, federal and international agencies and foundations that are interested in the work being carried out. This has led to increased emphasis on obtaining external support and on establishing the value of WSU contributions externally through publication and participation. Accomplishments in external funding have been particularly notable this year, with total awards to Research and Extension rising from ~\$80 million during 2010 to over \$105 million in 2011. There have been some notable grants obtained during 2011, but the increase is broadly distributed over our programs. It is also notable that the 2011 total does not include future endowment income anticipated as a result of activities of organizations like the Washington Tree Fruit Commission, which approved a check-off increase that will be worth \$27 million over the 8 years of the increased assessment in support of apple and pear research, or similar efforts by organizations like the Washington Grain Alliance and Washington Wine Commission.

The ability to leverage funds externally is important in our operations and a relatively few positions at WSU often anchor larger efforts that are funded through grants from other agencies. We are generally reporting here on the total effort since the synergy between various components is important in the bigger picture and the formula fund contribution is not easily assignable. For example, the Washington State University Extension Energy program ([www.energy.wsu.edu](http://www.energy.wsu.edu)) is an important state and regional resource that functions in some ways like the state's Energy Department and is also supported by large grants from the U.S. Department of Energy. It has only a few WSU employees but these play a key role in its operation and the activity is managed under WSU personnel rules. Similar relationships exist in areas like food safety, nutrition, and child and community relations. Most of the operations money for research, including support for personnel and students, is obtained through external grants. The federal formula funds are a key part of this bigger picture since they have been relied on to support infrastructure and provide continuity. For this reason, we have altered how we are reporting FTE effort in Extension, using a more comprehensive definition that includes the leveraging of FTEs through the Extension programs. This change is responsible for the dramatic increase in FTEs reported under Extension relative to the targets in the previous Plan of Work. The new Plan of Work has been modified to take into account this way of accounting for the investments in the new Planned Programs.

There are aspects of this set of changes that are especially challenging in the context of Washington agriculture. While we celebrate the diversity of our cropping systems and geography, it is obvious that, if WSU Research and Extension are to serve all of these constituencies over the long term, we cannot just use "pay to play" to target those industries that are large enough to contract directly for our expertise.

Moreover, as the mix of crops and where they are grown shifts, levels of production can change very rapidly and this means that we must be positioned to support these changes. Defining how Research and Extension should operate under these conditions can be difficult but the historical value of Research and Extension activities has led to a very high level of expectation for success from all sectors of the industries.

There are some difficulties in reporting the information about our research and extension activities through the rubric that is imposed by this reporting structure. One obvious place is in assigning "credit" to one area when the activity fits partially in more than one area. Two benchmark numbers are affected very much by this, publications and graduate students. For publications, we assigned equal "credit" to two Planned Programs when this seemed appropriate. Thus the number of refereed journal article publications reported in a Planned Program is lower than the number of actual publications making a significant contribution to the area of the Planned program. Under state-defined outcomes, we have separately counted refereed Extension publications. For the graduate students, we asked their major department to indicate whether individual students had a significant part of their studies focused on the Planned Program and allowed them to assign effort to multiple programs to the nearest tenth. The number associated with a Planned Program represents graduate student Full Time Equivalency and a larger number of students may have partial effort in this Planned Program. For the expenditures in a Planned Program, we asked the administrator with responsibility for each Hatch project to classify the project to Planned Program, then proportionately allocated total expenditures in this project to the Programs. Administrators were given the option to assign some of the project to "other", to represent the effort that does not fit into the new classification scheme, but the money associated with this choice was small.

As we report on both the accomplishments of the past year and the processes we are using to try to sustain our productivity, we realize that our activities are affected by many changes that are occurring outside of our traditional spheres of influence. Whether the cool and extended spring we had this year is some sort of signal about the form that climate change will take in the region or not, it does tell us that we need to adjust how we plan for the range of conditions our farming stakeholders will need to be able to cope with. Whether the changes in state and federal allocation processes will continue to change as they have in the near term, we need to be able to define how our ability to solve problems can have impact locally, regionally and nationally. These patterns are affecting not just the type of work we can do but also how we do it and the career patterns we are likely to see in our faculty members as we move forward. To use our past to succeed in the future, we must be able to succeed in the present, using a definition of success that is meaningful to our stakeholders both within and outside of the land-grant university context.

There are numerous societal challenges that can be addressed by cutting-edge research and through the application of that research to the practical issues that drive production. We carefully prioritize our efforts to ensure the greatest impact is derived from both our research and extension programs. As a result, we will be able to continue to deliver important outcomes including economic benefits to agricultural and natural resource-based industries, communities, and individuals. Additionally, our research and outreach helps ensure that the people of Washington State maintain a high quality of life by limiting the negative impacts of chronic disease, food insecurity, and obesity. Finally, our programs help ensure that the beauty of the state and its natural resources are sustained for future generations. This annual report endeavors to summarize the inputs, outputs, and impacts of our work conducted during 2011.

**Total Actual Amount of professional FTEs/SYs for this State**

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	166.0	0.0	450.0	0.0
Actual	532.9	0.0	439.0	0.0

**II. Merit Review Process****1. The Merit Review Process that was Employed for this year**

- Internal University Panel
- External University Panel
- External Non-University Panel
- Combined External and Internal University Panel
- Combined External and Internal University External Non-University Panel
- Expert Peer Review

**2. Brief Explanation**

Merit evaluation takes place at more than one level. In 2008, CAHNRS participated in the university-wide Academic Affairs Program Prioritization (A2P2) process. While this activity focused primarily on graduate and undergraduate education, these are linked to Research and Extension through the participation of most of our researchers and many Extension personnel in graduate and undergraduate student training. This A2P2 process and a second project in which WSU undertook a university-wide prioritization activity during fall 2010 to collect "Big Ideas" for showcase programs and ideas for reorganization, were used to guide changes implemented in 2009-2011. The continuing decline in state general revenues sent to WSU and a relative increase in revenues based on tuition has resulted in a serious examination of all departments and programs, including their research, instruction, extension and outreach priorities and capabilities. Since 2008, all programs have been examined, a department was closed and many structural changes have occurred, including the replacement of most of the senior leadership of Research, Academic and Extension units. Merit, as demonstrated by referring to benchmarks and priorities, has been central in determining what has survived.

Prioritization for specific programs is manifested by allocations of effort and limited funds. Support for research projects generally begins with discussions between stakeholders, administrators and researchers. Agricultural Research Center (ARC) project proposals are then written by individual faculty members or by faculty teams. These proposals are submitted to the chair of an appropriate academic department, who reviews the proposal, and ascertains that the topic of the research is consistent with the previous discussions. If so, the project proposal is circulated to internal and/or external reviewers. These reviewers are asked whether the research represents solid science, is directed to topics of current interest, will advance the field of study, and whether the research plan is appropriate. Reviewers are invited to offer written suggestions for improvement and asked to identify the strongest and weakest points of the proposal. After comments are received from the reviewers, the chair assembles the commentary and submits it to the faculty member. If necessary, the faculty member then revises the project proposal. After

examining these changes, the Chair submits the project proposal to the Agricultural Research Center where it is reviewed by either the Director or the Associate Director. If they approve the project and proposal, the proposal is sent to USDA and reviewed by the appropriate National Program Leader. When approval was final, the approved project was entered into our database and into the CRIS system. This system is also used as a way of tracking most projects funded by external funds in order to be able to track the majority of our research activity in one database. In addition to review of individual projects prior to their establishment, the programs are evaluated on a yearly basis and may also be reviewed in the context of various university planning and evaluation priorities. In parallel, proposals for funding that may overlap these projects may be submitted to federal or state agencies or to commodity commissions. We also make use of the NIFA system that arranges for expert external review teams to examine specific departments or activities.

The process in Extension is somewhat different. During 2011, the structure of Extension was changed to decrease the regional significance of Extension appointments and increase the programmatic component. A major reason for this restructuring was the decreased number of appointments in Extension, particularly as a result of vacancies in senior management positions: the Associate Director retired in January 2011; the Associate Dean for Extension took another position in June 2011; and several senior district managers retired during the year. A core committee of faculty and administrators evaluate WSU Extension programs for their fit into the general Extension portfolio. This discussion includes the work to be done and the context of funding that work. Discussions with county representatives have often been a major part of these discussions since many Extension appointments have a component of county-level support and responsibility. Individual WSU Extension faculty program plans are developed through statewide planning processes informed by the WSU Extension Strategic Framework, the NIFA Plan of Work, the College of Agricultural, Human and Natural Resource Sciences Strategic Plan, and the WSU Strategic Plan. Extension faculty members prepare annual plans of work that are reviewed by Program Directors. In addition, WSU Extension faculty receive over 60% of their total funding from extramural sources, including USDA grants, grants from other agencies, foundation grants, and commodity commission grants. These funders subject our proposals to expert peer review by scientific panels and by industry professionals and farmers. All faculty report into our electronic system called WORQS (WSU Online Reporting and Query System). Their work is reviewed by Program Directors, Department Chairs, and Deans and Associate Deans as an integral part of the annual performance review process and these documents can be accessed quickly at any time during the year that the information is needed. All WSU Extension publications undergo a double blind peer review. Reviewers include faculty at WSU or other Land Grant Universities, state and federal agencies, or research faculty at other non-Land Grant universities.

### **III. Stakeholder Input**

#### **1. Actions taken to seek stakeholder input that encouraged their participation**

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Targeted invitation to selected individuals from general public
- Survey of traditional stakeholder groups
- Survey of traditional stakeholder individuals
- Survey of the general public
- Survey specifically with non-traditional groups

- Survey specifically with non-traditional individuals
- Survey of selected individuals from the general public

**Brief explanation.**

Stakeholders in Washington recognize WSU as a major asset for their industries and activities and are often very forthcoming with suggestions and critiques. We have web pages, our phone numbers are in plain sight and our stakeholders are used to giving both formal and informal input to the administrators and scientists in the ARC. We also reach out to a broad array of stakeholders, preparing WSU project-related information through our Marketing and Information unit for distribution through various channels. Electronic media (email, websites, and blogs) are used to solicit information but we recognize that many individuals do not have access to these 'new' media, so more traditional approaches are also used. These include the use of radio, direct mail, telephone contacts, and personal visits, including Spanish language radio (especially in Latino communities), local access television, newspapers (English and other languages), electronic (web site, email lists, and targeted emails), newsletters, posted announcements in high volume areas (often in multiple languages), group meetings, and targeted direct mail. As indicated by the target audience, we develop materials that are both culturally sensitive and are designed to engage a variety of stakeholder groups and populations. So, for example, multiple language materials are common for the nutrition education program. Electronic surveys are increasingly used to capture rapid feedback from program participants, advisors, and the general public. These are generally conducted via media such as Survey Monkey or through Microsoft SharePoint. These permit rapid assessments that are extremely valuable since their response rates are generally much higher and the data are delivered in a 'pre-analyzed' format. These rapid assessments are often critical in the development of projects with short timelines as is often the case when responding to federal, state, and foundation calls for grant proposals.

Our many advisory councils and committees are kept abreast of activities within the College of Agricultural, Human, and Natural Resource Sciences and WSU Extension through newsletters, telephone calls, emails, blogs, and direct meetings. These groups meet at regular intervals. During these meetings, they are briefed about new initiatives, on-going work, and issues related to the College and WSU Extension. Feedback is also solicited at these events. This feedback is key to developing new initiatives and outreach programs. One major mechanism of interaction is through various State commodity commissions, which support research and extension at WSU through competitive processes that tend to be biased toward projects that address relatively immediate problems. In addition to researchers, the ARC Director or his representative is often present at these sessions to help the groups understand the context of the WSU activity and to get their input into the strategic planning done at WSU related to their industry. Stakeholder input is also received by the use of various advisory committees to advise departments, centers, and programs. There is a College level advisory committee as well as a college level agricultural kitchen cabinet. Both of these interact with the dean, the experiment station director, and other associate deans helping to define priorities, identify emerging research issues, and provide feedback on the quality and relevance of our research and extension activities. Individuals who serve on these advisory panels are frequently identified through our various formal and informal networks. These individuals typically represent specific knowledge about target audience needs or about specific subject matter that we believe will help advance program design, delivery or impacts. These individuals are contacted directly by the appropriate party (County Director, District Director, Program Director, Associate Dean, Dean etc.) to invite their participation.

Finally, web content delivery and web conferencing is being increasingly used to both communicate with the public and to present research results. WSU Extension continues to adapt its

web capabilities to enabled greater ease of use and access to information. Web conferencing is generally delivered via Adobe Connect or Skype. This allows ARC scientists and Extension educators to communicate broadly and simultaneously collect feedback from these audiences through online chats and polls.

**2(A). A brief statement of the process that was used by the recipient institution to identify individuals and groups stakeholders and to collect input from them**

**1. Method to identify individuals and groups**

- Use Advisory Committees
- Use Internal Focus Groups
- Use External Focus Groups
- Open Listening Sessions
- Needs Assessments
- Use Surveys

**Brief explanation.**

Established relationships tend to be with formal partners who designate individuals with the expertise and interest that they believe will be appropriate to represent their constituents. The ARC and WSU Extension use local and statewide advisory committees to provide input the leadership and to faculty and staff. These include the College of Agricultural, Human and Natural Resource Sciences (CAHNRS) Advisory Council, the Dean's "Kitchen Cabinet," the Center for Sustaining Agriculture and Natural Resources Advisory Committee, advisory committees at the four Research and Extension Centers, and county, departmental, and program-specific advisory committees. So, for example, the ARC and some parts of Extension work closely with the numerous commodity commissions in the state to clearly understand the needs of their clientele. These interactions are with a combination of staff and volunteers who are engaged in the process and accountable to their membership. Joint work with the commissions often involves collaborative project design and follow-up presentation of results. Our county-based programs are closely aligned with the needs of county government and their constituencies, and we confer with local officials frequently to understand needs and to effectively define WSU Extension's role within key local partnerships. In addition, the leadership of CAHNRS and WSU Extension sit on several statewide boards and numerous statewide committees and councils. These venues provide opportunities for soliciting and receiving input from numerous segments of society including tribes, state and federal agencies, the private sector, and the general public.

The situation is more complex in interacting with emerging issues. We seek to identify emerging needs within communities through searches of the literature and review of demographic (census) data followed by in depth discussions with local or industry decision makers, with the process extending to the state or regional level as needed. Often the contacts with these groups are made through specific contacts, like dealing with land use issues, resource management, or community needs. While these are often phrased initially in terms of a particular locale, we attempt to assess the general scope of the problem and find appropriate people within our staff or in the groups who are affected by the problem to help define the issues and determine a plan of action for dealing with them. Once a problem and the groups affected are broadly defined, care is taken to understand the most effective mechanisms of engagement. When appropriate, feedback is sought through designed focus groups and designed surveys. This form of feedback is critical for evaluating new approaches, technology applications, and new outreach methods. Additionally, technical surveys are often designed by the Division of Governmental Studies and Services or the Social and Economic Sciences Research Center to assess public attitudes. Needs assessment is an



expectation of all WSU Extension faculty members. These processes are deeply engrained in program development processes. Language or culture is factored into the program design as part of phrasing solutions that are seen as locally appropriate. Culture and language issues also often determine how we staff for future programming. This has led extension to employ individuals from various cultural and ethnic groups to help frame problems and explain potential solutions.

**2(B). A brief statement of the process that was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them**

**1. Methods for collecting Stakeholder Input**

- Meeting with traditional Stakeholder groups
- Survey of traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Survey of traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Survey of the general public
- Meeting specifically with non-traditional groups
- Survey specifically with non-traditional groups
- Meeting specifically with non-traditional individuals
- Survey specifically with non-traditional individuals
- Meeting with invited selected individuals from the general public
- Survey of selected individuals from the general public

**Brief explanation.**

Stakeholder input is gathered through numerous formal and informal processes. Our faculty, staff, and administrators are members of many key organizations at local, statewide and national levels. We go to meetings. We answer phones and we read email. We listen. Additionally, membership is legislatively required on many boards and committees, including some that were created and maintained specifically for the purpose of garnering stakeholder input. As needed these groups are often able to reach out through surveys or studies to help define those stakeholders who would be important to consult on specific issues. Our formal advisory structures include the statewide "Friends of Extension", the College of Agricultural, Human and Natural Resources Dean's "Kitchen Cabinet," the Center for Sustaining Agriculture and Natural Resources advisory committee, statewide and local Master Gardener Leadership Council, State 4-H Advisory Council and local leader organizations, county advisory committees, and advisory committees for research and extension centers and units. Those who serve on these groups are chosen in part for their networks and ability to speak for subgroups and to reach out to gather more input as needed. In addition, each WSU Research and Extension faculty member and administrator is encouraged to develop and maintain informal networks that permit them to garner input from key officials, industry representatives, and advocacy groups. Surveys are frequently used to garner input about the effectiveness of individual programs; and focus groups are also used to test new approaches, web site designs and materials. Most hiring also includes extensive stakeholder input. Generally this is accomplished by asking stakeholders' advice on position descriptions and by asking them to serve on search and screening committees.

Annual assessments are undertaken to determine general population characteristics, agricultural trends, natural resource-related issues, human health trends, and business dynamics. These assessments are largely based on analysis of data for the US Census Bureau, National

Agriculture Statistics Service, Washington Department of Natural Resources, Washington Department of Health, and the Washington Department of Commerce but can be supplemented by internally or stakeholder commissioned studies at greater depth. These data help WSU faculty and staff identify target audiences and to develop appropriate research and outreach to address these needs.

Stakeholder input from groups and individuals identified by these processes is collected through a multitude of processes that includes individual meetings with individuals and groups, surveys, and other forums. Information from these venues is generally summarized and shared broadly. Additionally, key WSU personnel are invited to participate in these venues to receive input directly on both on-going and planned research and outreach.

### **3. A statement of how the input will be considered**

- In the Budget Process
- To Identify Emerging Issues
- Redirect Extension Programs
- Redirect Research Programs
- In the Staff Hiring Process
- In the Action Plans
- To Set Priorities

#### **Brief explanation.**

Stakeholder input has been valuable to the development of long-range plans involving our application of resources, including developing priorities for research and outreach, project design, and program delivery. Virtually every program we deliver involves engagement with both program participants and advisors. This helps ensure that we reach the appropriate audiences; that these individuals are able to achieve their goals; and that we are able to achieve the desired outcomes from the program. With the Washington State Association of Counties, Extension used information gained from an online survey to restructure and refine the delivery of program and the geographic distribution of faculty and staff. This consultative process was important in obtaining input from stakeholders and in convincing the stakeholders that they had a voice in the results of the process.

Input from stakeholders also enters our research programs at several levels. Through direct funding decisions and the participation of the ARC administrators or their delegates in the funding process, we see stakeholders state their priorities as they allocate their money to research at WSU and elsewhere. Sometimes a project may be structured in order to separate objectives that are more easily supported by the ARC from those that are supported by the stakeholders. The ARC takes stakeholder prioritization into account in allocating resources, such as space or faculty and technical positions, and we communicate our limitations to groups that often are better placed to obtain additional resources. As an example, we began in 2006 to strengthen our tree fruit horticulture programs at the encouragement and with the support of the industries involved. This led to filling several positions and to a significantly increased profile for WSU tree fruit research and extension. In 2011 the apple and pear growers voted a new, increased assessment of \$27 million to support additional strengthening of the program over the next 8 years. In 2007, we also began an internal grants program to direct resources toward Emerging Issues in Agriculture (<http://arc.wsu.edu/info/eri/index.html>). The priorities of this program were articulated with stakeholder input and stakeholders participated in the review process. In addition to the research accomplishments of the teams, the team building and preliminary data generated through this process were able to leverage considerable (>10X) external funding, a development that was

stakeholders.

**Brief Explanation of what you learned from your Stakeholders**

Stakeholder input is routinely used in numerous decision processes. Many stakeholder recommendations and views on major issues were incorporated into our planning processes and guided our priorities for both extension and research work as reported in this document. We learned that the highest priority for agricultural stakeholders was the innovative research and extension to address important production issues that were critical to their profitability and sustainability; enabling them to adjust to new pests, diseases, and other production and market conditions. Other stakeholders identified natural resources concerns related to water quality, water quantity, forest health, rangeland health, and stewardship of our state's resources. Local food systems and the desire for community connections with our food supply was another reoccurring theme, as was the desire for investigation into new methods and practices for organic food production. Concerns over human health and diet, along with the growing incidence of obesity in our population were clearly stated with a desire to implement educational outreach to change behaviors. Consumer food safety education, positive youth development, and outreach to sustain rural communities were among several other stakeholder-defined issues addressed by our work.

Since about 2008, budget challenges have confronted WSU Research and Extension at all levels. Stakeholders helped us evaluate the feasibility of various reduction scenarios and proved extremely valuable in helping us understand the impacts of our decisions. One overwhelming message is that stakeholders want more help in research and extension but are having trouble figuring out how to pay for this. Problems arise when this broad need meets the limited resources available. Specifically with regard to programs like SCRI, our stakeholders whose industries were able to obtain funding through the SCRI matching mechanism were pleased with the growth of their investment in research. Moreover, they have adapted to some extent how they allocate their own dollars to leverage more general and generalizable research that can benefit their industries. Over the last year we have seen various groups, including the Washington Grain Alliance, the Washington Tree Fruit Research Commission, the Washington wine industry and others vote to support specific enhancements of their programs. This is extremely significant, in particular by showing their evaluation of the importance of our activities in a way that can be used as evidence of support in other arenas. However, if we are to be most effective, this type of support must also come from other groups and be used to leverage support at the state and federal levels.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
4169468	0	4257525	0

**Institution Name:** Washington State University

<b>2. Totaled Actual dollars from Planned Programs Inputs</b>				
<b>Extension</b>			<b>Research</b>	
	<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
<b>Actual Formula</b>	5183277	0	4309388	0
<b>Actual Matching</b>	5183277	0	4309388	0
<b>Actual All Other</b>	48641005	0	48656629	0
<b>Total Actual Expended</b>	59007559	0	57275405	0

<b>3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous</b>				
<b>Carryover</b>				
	2350792	0	356666	0

## V. Planned Program Table of Content

S. No.	PROGRAM NAME
1	Natural Resources Stewardship
2	Global Food Security and Hunger
3	Sustainable Energy
4	Climate Change
5	Childhood Obesity
6	Food Safety
7	Youth, Family and Community Development

**V(A). Planned Program (Summary)**

**Program # 1**

**1. Name of the Planned Program**

Natural Resources Stewardship

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
111	Conservation and Efficient Use of Water	10%		5%	
112	Watershed Protection and Management	10%		5%	
121	Management of Range Resources	10%		5%	
122	Management and Control of Forest and Range Fires	9%		10%	
123	Management and Sustainability of Forest Resources	10%		10%	
124	Urban Forestry	5%		4%	
125	Agroforestry	2%		3%	
133	Pollution Prevention and Mitigation	5%		5%	
135	Aquatic and Terrestrial Wildlife	5%		15%	
136	Conservation of Biological Diversity	10%		6%	
213	Weeds Affecting Plants	5%		5%	
214	Vertebrates, Mollusks, and Other Pests Affecting Plants	2%		2%	
215	Biological Control of Pests Affecting Plants	5%		12%	
302	Nutrient Utilization in Animals	0%		3%	
403	Waste Disposal, Recycling, and Reuse	5%		5%	
605	Natural Resource and Environmental Economics	2%		5%	
610	Domestic Policy Analysis	5%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

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

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	21.0	0.0	50.0	0.0

Actual Paid Professional	75.6	0.0	25.1	0.0
Actual Volunteer	139.5	0.0	0.0	0.0

## 2. Institution Name: Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1059165	0	161496	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1059165	0	161496	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
4215291	0	3177884	0

## V(D). Planned Program (Activity)

### 1. Brief description of the Activity

WSU scientists conducted research leading to better understanding of the interaction between human development and terrestrial, aquatic and atmospheric conditions; genetically improve poplar and black cottonwood species to more effectively sequester carbon, restore riparian areas, and provide wood and fuel; developed innovative mechanisms for revegetating mining sites, watersheds, and native prairies; and better understanding of habitat requirements of key species, especially endangered and keystone animals. Projects of note include research in low impact development techniques for reducing the level of pollutants in storm runoff, projects to understand the habitat needs of various animals and to understand the relationship between hunting practices and wildlife community structure, and interactions between native and agricultural predator and prey populations as they relate to biological stabilization mechanisms in insect populations.

Extension educators worked with researchers and local communities to develop customized, science-based solutions to local problems and to educate target audiences about new tools to more effectively manage natural resources. This education will lead to behavior change and ultimately to improved condition of the natural resource base in Washington State. More description of some of these activities can be found in various web sites such as: <http://snohomish.wsu.edu/forestry/> , <http://raingarden.wsu.edu/> , <http://county.wsu.edu/jefferson/nrs/water/courses/Pages/default.aspx> , <http://www.shorestewards.wsu.edu/resources.html> and <http://www.beachwatchers.wsu.edu/regional/index.php> that describe university-public partnerships in areas like forestry, low impact development and water and wildlife conservation.

### 2. Brief description of the target audience

The target audiences include landowners and managers; state, federal and local natural resource agency personnel; K-12 educators, local and state governments; and the general public, including citizens

interested in natural resource issues and the scientific disciplines that relate to them.

**3. How was eXtension used?**

Four faculty members participated in Communities of Practice.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	400100	838839	35455	106360

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

**Patent Applications Submitted**

Year: 2011

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
<b>Actual</b>	0	0	47

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of extension workshops, demonstrations, and conferences conducted with a natural resources focus.

Year	Actual
2011	928



**Output #2**

**Output Measure**

- Number of peer-reviewed (official) WSU Extension publications produced on natural resource stewardship topics.

<b>Year</b>	<b>Actual</b>
2011	25

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Natural Resources stewardship.

<b>Year</b>	<b>Actual</b>
2011	77

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants evaluated who applied knowledge acquired from WSU scientists or extension educators.
3	Number of streams and waterways exhibiting reduced levels of sedimentation or contamination by non-point source pollutants.
4	Number of acres of rangelands and forests exhibiting improved condition as a result of WSU programs or program partnerships.

## **Outcome #1**

### **1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	81

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Washington State has a very rich natural resource base which supports the state's economy and contributes greatly to the quality of life in the region. These resources largely define our economy and the lifestyles, and are under increasing pressure from several sources. Priorities for the program include water quality and non-point water pollution, reduced soil erosion, improvements in range and forestlands, reduced risk of wildfire, and habitat preservation.

#### **What has been done**

Program implementation utilized local, regional, statewide, and multi-state efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

#### **Results**

81% of program participants increased their knowledge relative to one or more of the knowledge areas selected for this program effort. This impact represents an average across 921 educational events that were assessed for this program area. The overall assessment validates that program participants gained new knowledge and skills important to enhance natural resources and potentially improve water quality, forests and rangeland across the state.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
111	Conservation and Efficient Use of Water

- 112 Watershed Protection and Management
- 121 Management of Range Resources
- 122 Management and Control of Forest and Range Fires
- 123 Management and Sustainability of Forest Resources
- 124 Urban Forestry
- 125 Agroforestry
- 133 Pollution Prevention and Mitigation
- 135 Aquatic and Terrestrial Wildlife
- 136 Conservation of Biological Diversity
- 213 Weeds Affecting Plants
- 214 Vertebrates, Mollusks, and Other Pests Affecting Plants
- 215 Biological Control of Pests Affecting Plants
- 302 Nutrient Utilization in Animals
- 403 Waste Disposal, Recycling, and Reuse
- 605 Natural Resource and Environmental Economics
- 610 Domestic Policy Analysis

**Outcome #2**

**1. Outcome Measures**

Percentage of participants evaluated who applied knowledge acquired from WSU scientists or extension educators.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	69

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Washington State has a very rich natural resource base which supports the state's economy and contributes greatly to the quality of life in the region. These resources largely define our economy and the lifestyles, and are under increasing pressure from several sources. Priorities for the program include water quality and non-point water pollution, reduced soil erosion, improvements

in range and forestlands, reduced risk of wildfire, and habitat preservation.

**What has been done**

Program implementation utilized local, regional, statewide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

**Results**

69% of program participants applied one more of the principles gained through participation in this program effort. This impact represents an average across 921 educational events that were assessed for this program area. The overall assessment validates that program participants gained new knowledge and skills important to enhance natural resources and potentially improve water quality, forests and rangeland across the state.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
302	Nutrient Utilization in Animals
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

**Outcome #3**

**1. Outcome Measures**

Number of streams and waterways exhibiting reduced levels of sedimentation or contamination by non-point source pollutants.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	11

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Stream quality, especially for streams entering coastal shellfish areas or that can be used for salmon spawning, are closely tied to water quality. In other areas, addressing the need for improvement in water quality through reduced soil erosion, septic tank contamination and movement of pesticides and other non-point source pollutants into streams, waterways was a priority for this program.

**What has been done**

Program implementation utilized a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences. Our WSU Low Impact Sustainable Development program has emerged as a major source of research as well as extension to address pollutant runoff into surface waters.

**Results**

Nine separate Extension programs addressed this outcome specifically and impacted eleven waterways during 2011 to positively affect sedimentation and the movement of pollutants to these streams and rivers. These projects often involved local partnerships with other groups and non-profit organizations to provide training and informal educational events for a variety of individuals. The WSU Low Impact Sustainable Development program was our major source of research and outreach to individuals and municipalities in addressing these problems via public policy and design. Waterways positively impacted were the Chehalis River, Puyallup River, Wenas Creek, Yakima River, Wide Hollow Creek, Palouse River, Purdin Creek, Columbia River, Skagit River, Toppenish Creek, and Cowlitz River.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources

122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
403	Waste Disposal, Recycling, and Reuse
610	Domestic Policy Analysis

#### **Outcome #4**

##### **1. Outcome Measures**

Number of acres of rangelands and forests exhibiting improved condition as a result of WSU programs or program partnerships.

##### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

##### **3a. Outcome Type:**

Change in Condition Outcome Measure

##### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	75000

##### **3c. Qualitative Outcome or Impact Statement**

###### **Issue (Who cares and Why)**

Washington State has a very rich natural resource base which supports the state's economy and contributes greatly to the quality of life in the region. Washington is home to vast mountain ranges, major river systems, forests, agricultural and rangelands, coastal regions and the Puget Sound. Priorities for this outcome were to implement practices for improving range and forestlands, leading to greater biodiversity, reduced wildfire risk, and improved habitat.

###### **What has been done**

Program implementation utilized local, regional, statewide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, webinars, online learning modules, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

###### **Results**

A comprehensive survey was conducted in 2011 for the program years 2007 through 2011. 652 educational events were delivered to 21,897 participants representing 796,499 acres of forest and

range land. In addition to face-to-face assistance, at least 112,000 direct contacts were made to assist clients via email, phone calls, and office visits. Of the 21,897 who attended events, 20,802 families and individuals we surveyed indicated that they had gained new knowledge of management concepts that will help them to improve forest and rangeland health, reduce risks, and protect their financial investments. Nearly 90 percent, or 19,707 of survey respondents have executed at least two new management practices over 80,000 acres.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
124	Urban Forestry
125	Agroforestry
133	Pollution Prevention and Mitigation
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
213	Weeds Affecting Plants
214	Vertebrates, Mollusks, and Other Pests Affecting Plants
215	Biological Control of Pests Affecting Plants
403	Waste Disposal, Recycling, and Reuse
605	Natural Resource and Environmental Economics
610	Domestic Policy Analysis

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

##### Brief Explanation

Ongoing concerns and limitations of the state budget and university budget responses continue to impact our hiring and deployment of human and financial resources, resulting in the loss of faculty and administrative leadership. The uncertainty of future state policy and funding for higher education clearly impacts our ability to take bold initiatives,



given contingencies required for additional budget cuts from state and local governments. Our work in research and extension increasingly is dependent on securing competitive grants to support our system and drive our programs forward. Competing priorities for limited funds and financial resources were clearly the most limiting factor encountered in 2011.

## **V(I). Planned Program (Evaluation Studies)**

### **Evaluation Results**

The Natural Resources Program sought to evaluate program impact in terms of knowledge gained by participants, application of this knowledge, number of waterways exhibiting reduced sedimentation and contamination, and the number of range and forest acres exhibiting improvement in condition. Results were assessed using a variety of methods including pre and post event evaluations, surveys, feedback from advisory groups and stakeholder groups, and other individual assessments of program participants. The analysis provided the following aggregate results for each desired outcome:

Percentage of participants increasing knowledge from the program = 81%

Percentage of participants applying at least one practice or application of knowledge gained = 69%

Number of waterways exhibiting reduced sedimentation and contamination by non-point source pollutants = 11

Number of range and forestland acres exhibiting improved condition = 75,000 acres

### **Key Items of Evaluation**

Selected projects and events are listed below with a corresponding percentage of program participants increasing knowledge, application of the knowledge, and related impacts associated with the overall program.

Collaboration with county noxious weed control programs expanded from 35 counties in 2010 to 36 of 38 possible county programs. Through our education and implementation assistance, several counties are increasingly incorporating biocontrol into their integrated weed management (IWP) strategies. Based on outreach programs, many have requested further consultations and requests for insects and additional education. Expansion across the state will strongly benefit the land managers of these communities and will help the IWP become an all-inclusive program.

Rain Garden programs have reduced the potential for flooding. Approximately 123,000 gallons of stormwater per year is now being diverted into rain gardens reducing the amount of water flowing into undersized sewer systems. A house-to-house needs assessment was conducted with 45 households in the target neighborhood followed by year one of the education and technical assistance program. The year one follow-up survey was conducted with the same households. Interest and understanding of rain gardens improved from 20% to 73%. Eighty percent of the respondents thought the rain garden program had benefited the whole neighborhood, even though only seven households (10%) installed a rain garden.

A post training survey of Master Gardener trainees and veterans indicated that 100% had increased their gardening knowledge as a result of the training they received; 95% had increased their knowledge of environmental stewardship; 100% had increase their knowledge of Integrated Pest Management; and 90% felt very confident that they could answer gardening questions or make gardening practices recommendations to other gardeners. End-of-class evaluation indicated that residents attending the Spring Garden Day, that 95% had learned something new as a result of attending the workshop and could name specific examples of what they had learned, including home garden food production, weed identification and management, tree pruning, and pond care. End-of-class evaluations indicated that 86% attending the Spring Garden Day in past years had learned and put into practice at least one concept that they had learned and could name specific examples. These included irrigation, use of native plants, lawn care and fertilization, plant selection, and composting. End-of-class evaluations at the Spring and Fall Composting Workshops indicated that 97% and 98% of those attending these workshops had learned about composting and intended to start composting at home.

Shore Stewards survey showed 85% of survey respondents reporting making at least one major change since joining the program. The more than doubling of the number of Shore Stewards from the mailing validates the need for and interest in this program from shoreline property owners.

In evaluations of the Water Course, 40% of participants stated that they understood the basic concepts of water in their environment.

After-event forest stewardship evaluations showed that 1,620 landowners and managers indicated increased knowledge of forest stewardship practices

The Master Gardener program in San Juan County showed an average of 81% of all participants increased their knowledge and will be implementing changes by composting garden and food wastes, soil testing, reducing pesticide use, using correct pruning techniques, and choosing correct plant varieties. The program provided 4,500 plants throughout San Juan County during the Native Plant Sale. Seventy households planted native plants and learned specifically how native plants benefit local habitats, as well as strategies for the correct use and placement of native plants. Over 300 people attended workshops on low water use, native plants, growing vegetables and composting, and 100% learned at least one new practice they intended to implement.

In Mason County, 91% of workshop attendees reported that as a result of the workshop, they can comfortably identify a failing on-site septic system. 65% reported that they plan to share this information with their friends, families and neighbors. As a result:

- 33% reported they will switch to using non-toxic cleaning products
- 20% will start composting yard waste and kitchen scraps
- 51% will have their on-site septic system regularly inspected
- 52% will reduce water use by fixing leaks
- 22% will redirect their roof and driveway runoff away from their drain field
- 36% will switch to phosphate-free detergent and use this in the recommended amount
- 24% will no longer flush expired medications, like antibiotics, down the toilet
- 13% will no longer flush other non-biodegradable products down the toilet, such as kitty litter, diapers, etc.

7% will no longer park, drive, burn brush or graze animals on their drain field.

Pre- and post-test surveys were used to evaluate "Water Courses - Connecting West Sound" and showed 100% of respondents would share what they learned; 84% learned at least one new thing about Puget Sound that they would implement; 84% indicated they'd attend the workshop two-day symposium again.

Beach Naturalist trainees taking a pre-test of their knowledge of marine habitat and creatures on average scored between 67 and 78% but their post-test scores ranged from 85 to 100%.

100% of the students mastered at least one critical concept from the water quality natural resources program; 100% had an increased interest in natural resource careers; and 40% have adjusted future educational or career plans in natural resources.

WSU Extension MG Volunteers taught 39,778 residents to conserve water in 27 counties. Washington's rivers, lakes and groundwater sources (aquifers) provide water for agriculture, residential, and recreational use and provide wildlife habitat. Safe and reliable sources of water must be maintained to meet needs of growing populations in Washington communities. Use of water conserving gardening practices such as mulching, efficient irrigation methods, planting drought tolerant plants and xeriscaping are the most cost - effective and environmentally sound ways to reduce the demand on our limited water supplies.

WSU Extension MG Volunteers taught 35,938 residents to protect water quality in 26 counties. Contamination from stormwater runoff has been linked to pollution of drinking water supplies and the health of wildlife and fish species throughout the state. Stormwater runoff has been identified as the #1 cause of pollution in the Puget Sound region. Urban gardening best management practices to protect water quality include reducing the use of pesticides and fertilizers in yards and gardens, using soil amendments and other soil applied products appropriately, composting, mulching and using groundcovers to reduce erosion, grass cycling and planting rain gardens.

WSU Extension MG Volunteers taught 37,195 residents to use Integrated Pest Management methods in 26 counties. Integrated Pest Management is a proven system of managing pests (insects, diseases and weeds) in ways that keep pest damage to a tolerable level for plant health and minimize threats to non-target species. Master Gardeners teach cultural, mechanical, biological and chemical methods of pest management, stressing plant health measures to prevent plant problems to begin with and using least toxic methods of pest control when necessary.

WSU Extension MG Volunteers taught proper tree planting and maintenance practices to 10,098 residents in 27 counties. Research points to many benefits of a healthy urban and community forest including the moderation of extreme air and soil temperatures, conservation of energy, improved air quality, reduction of stormwater runoff, lower noise levels, and increased wildlife habitat. For instance, a 25 foot tree can reduce heating and cooling of typical residence by 8-10%. Trees modify the heat island effect in urban areas by pumping hundreds of gallons of water through foliage, which evaporates and cools immediate surroundings. Roots and fallen leaves help hold soil together and protect soil from erosion and runoff. These benefits result in cost savings to residents and communities through energy savings, increased survival and health of other landscape plants. In

addition, trees and plantings enhance property values and community assets, resulting in an increased tax base for municipalities.

Landowners attending 2011 Extension wildfire preparedness workshops and events reported increased understanding of Firewise practices (45% knowledge increase on post-class evaluations) and said they would implement what they learned.

When rain gardens are built they are registered online through WSU Extension. The average rain garden in the Puget Sound infiltrates 17,500 gallons of stormwater. Seven hundred rain gardens are currently registered meaning that 12,250,000 gallons of stormwater a year are being kept on stormwater conveyance systems and thereby reducing pollutants reaching Puget Sound.

Funds were obtained to conduct eight years of research on mechanical, biological and chemical control of burrowing shrimp, and the non-target impacts of these efforts. One chemistry, imidacloprid, was effective and has registration potential. Impacts of these chemistries to nontarget species of importance, like crab, fish and in fauna, were assessed and shown to have considerably less impact than current control chemistries. Two formulations of imidacloprid were selected to advance towards federal and state registration. Funding and collaboration among stakeholders, industry, NGO, three universities, and state and federal agencies, were obtained in order to proceed with the registration process. A Federal Experimental Use Permit with EPA allowed for large-scale area-wide treatment and assessment of the proposed new control. Documentations were developed to amend the federal registration package. Studies were also conducted for the "Sampling and Analysis Plan" (SAP) to define the sediment impact zone (SIZ), required for the NDPES with the Washington State Department of Ecology for the use of imidacloprid for burrowing shrimp control. These data are being used by state agencies to help secure the use of imidacloprid by the industry. Pending registration in 2013, this project will have profound effects on shellfish production in Washington State.

The Marine Resource Committee partners with WSU to provide most of the outreach and education for their grant projects. Due to our educational efforts and the placement of boat mooring buoys, the percentage of boaters anchoring in the eelgrass beds has been reduced from 20% of anchored boats being within the eelgrass to NO boaters anchoring within the marked beds. This results in less or no eelgrass being pulled up and disturbed by boat anchors and conserves essential habitat eelgrass in Port Townsend Bay. WSU Beach Watchers perform all the boat monitoring to satisfy the requirements of the new multi-agency Mystery Bay Management Plan.

85% of respondents increased their knowledge one to four levels by attending Water Quality programs in Clark County. Over half increased their knowledge by two or more levels. Cistern Workshops: 23 out of 31 respondents (41 participants) indicated they were highly likely to use the information on cisterns. A follow-up impact survey of workshops in 2010 (94 participants, 39 respondents). Green Cleaning: 17 of 33 participants responded and all used their green cleaning products at home and they shared their new knowledge with at least 128 family, friends, and neighbors. Rain Barrels: 17 respondents (61% of 22 responses from 61 participants) installed class constructed rain barrels at home. They also installed 16 additional rain barrels. 22 respondents shared their knowledge with at least 403 family, friends, and neighbors. Three school events taught 350 students about healthy watersheds, their role in stream health, and general watershed health indicators. 23 youth and adult public volunteers stenciled 113 storm drains with the message, "Dump No Waste,

Drains to Stream." Water Steward volunteers and staff provided educational information to 6,258 people at 19 community events. Six web publications were downloaded 4,367 times; two web video clips viewed 1,479 times.

By their nature, the impacts of funded projects can take years to show cumulative impact and monitoring is rarely funded. However, in acquisition projects alone, 420 acres of riparian/estuary habitat were funded in 2011, with 2,453 acres preserved since 2001. Informal monitoring shows anadromous species using in-stream structures and rearing channels. Increased habitat had positive impacts in Southwest Washington quality of life while increased salmon production can increase economics around recreational fishers. Based on Technical Advisory Committee recommendations, the Lower Columbia Fish Recovery Board awarded \$2.57 million in ten grants for projects in Southwest Washington which will result in additional estuary and riparian habitat, 10 miles of improved stream/river habitat, improved/restored shoreline habitat, and six rearing side channels. Since inclusion of a WSU representative on the Technical Advisory Committee in 2001, participation contributed to funding (~\$17.97 million) over 76 projects through the Lower Columbia Fish Recovery Board, resulting in additional estuary and riparian habitat.

Shore Stewards surveyed showed 85% of survey respondents reporting making at least one major change to their shoreline property since joining the program. The more than doubling of the number of Shore Stewards validates the need for, and interest in, this program from shoreline property owners.

After the first four Water Courses, participants self organized into two committees (water issues, and movies). Fifty percent of participants of the first four courses attended a participant-organized movie night and viewed the movie "Blue Gold". The Puget Sound Partnership was so impressed with our initial PNW Water Course that they funded us to create a Puget Sound version of the water course and provide training.

Forest owners were provided after-event and a follow-up evaluation. As a result of our outreach: 32 Forest Stewardship Plans were developed. 1,620 landowners and managers indicated increased knowledge of forest stewardship practices, and 1,518 landowners and managers indicated they have implemented at least one new practice on their land. 63,122 acres were directly impacted by these programs. Program participants estimate execution of practices on 10% of their ownership, with a cost earnings or savings estimate of 9,468,300. As a result of implementing forest stewardship and health practices, air and water quality has been protected by reducing wildfire risk and run-off of sediments into streams and lakes, and public health threats due to smoke inhalation has been curtailed from these private and public forests. Wildlife and fish habitat has been protected by reducing damage to food and cover by reducing insect, disease, and fire risks. Local economies were not jeopardized by the repelling wildfire smoke known to impact summer season tourism. Acres impacted were self reported; UW research indicates that treated acres for reducing wildfire hazard risk is a minimum of \$1500/ acre. This value was used to estimate the dollars saved by individuals/communities/agencies by applying the learned concepts - primarily thinning, pruning, and slash abatement.

A survey focusing on the impact of Master Gardener education on water quality issues was conducted. A sample, 254 of 620 clients, was contacted to determine if they had changed their behavior based on information provided by Master Gardeners. Seventy percent stated they had reduced their use of pesticides and 20% said they had completely eliminated pesticide use. Fifty-three percent said they had reduced their use of fertilizers.

Thirty percent stated they had reduced their use of water in the landscape.

WSU Extension MG Volunteers taught 39,778 residents to conserve water in 27 counties. Washington's rivers, lakes and groundwater sources (aquifers) provide water for agriculture, residential, and recreational use and provide wildlife habitat. Safe and reliable sources of water must be maintained to meet needs of growing populations in Washington communities. Use of water conserving gardening practices such as mulching, efficient irrigation methods, planting drought tolerant plants and xeriscaping is the most cost - effective and environmentally sound way to reduce the demand on our limited water supplies.

WSU Extension MG Volunteers taught 35,938 residents to protect water quality in 26 counties. Contamination from stormwater runoff has been linked to pollution of drinking water supplies and the health of wildlife and fish species throughout the state and has been identified as the #1 cause of pollution in the Puget Sound region. Urban gardening best management practices to protect water quality include reducing the use of pesticides and fertilizers in yards and gardens, using soil amendments and other soil applied products appropriately, composting, mulching and using groundcovers to reduce erosion, grass cycling and planting rain gardens.

WSU Extension MG Volunteers taught 37,195 residents to use Integrated Pest Management methods in 26 counties. Integrated Pest Management is a proven system of managing pests (insects, diseases and weeds) in ways that keep pest damage to a tolerable level for plant health and minimize threats to non-target species and environmental health. Master Gardeners teach cultural, mechanical, biological and chemical methods of pest management, stressing plant health measures to prevent plant problems to begin with and using least toxic methods of pest control when necessary.

WSU Extension Master Gardener volunteers taught proper tree planting practices to 10,098 residents in 27 counties. Research points to many benefits of a healthy urban and community forest including the moderation of extreme air and soil temperatures, conservation of energy, improved air quality, reduction of stormwater runoff, lower noise levels, and increased wildlife habitat. For instance, a 25 foot tree can reduce heating and cooling of typical residence by eight to ten percent. Trees modify heat island effect in urban areas by pumping hundreds of gallons of water through foliage which evaporates and cools immediate surroundings. Roots and fallen leaves help hold soil together and protect from erosion and runoff. These benefits result in cost savings to residents and communities through energy savings, increased survival and health of other landscape plants. In addition, trees and plant enhance property values and community assets which result in increased tax base for municipalities.

A partnership was established in 2010 to plan and develop a demonstration site guiding future water trail access development. Parking and a pit toilet were installed. In 2011, two workshops were held at this site, and volunteers and workshop attendees placed coir fabric and planted native riparian trees and shrubs to restore and stabilize 100 feet of shoreline. Because of the workshop, at least 1000 additional feet of shoreline will be more successfully planted and managed by attendees, and agency participants will be better equipped to assist shoreline landowners with similar projects. Interpretive materials and signage at the site will continue outreach to boaters and shoreline property owners about water quality and fish-friendly ways of stabilizing shorelines and managing vegetation.

100% of volunteer participants report learning more than one key concept related to water quality and restoration renovation. Over 50% report applying concepts to their own property to improve habitat potential and water quality. Over five acres of habitat was restored in 2011, seven miles of trails maintained, cleared of invasive species, and re-vegetated resulting in improved water quality of streams.

According to site surveys, 200 producers have made Best Management Practices operation changes in their livestock operations. These include off-stream watering, fencing, removal of confined winter feeding and implementing methods to continue grazing during the winter feeding time period of the year affecting five streams. According to the NRCS, 22 livestock producers within the County have applied for and received \$1.4 million in funding to implement BMP's in riparian areas due to my educational programming in 2010-11.

Extension educational programming has led to a 20% decrease in siltation and a 60% decrease in livestock fecal bacteria in the Yakima River.

Twelve producers have changed from flood irrigation in livestock pastures to sprinklers due to Extension's educational programming.

70 hay farmers learned how to soil test, interpret soil tests, about herbicide families and used fertilizer and herbicides in an environmentally sound manner to reduce runoff to fresh water.

Vegetation analysis on the effects of managed grazing at multiple sites have shown an 18% decrease in invasive weeds in the managed intensive grazing paddock (rotationally grazed six months per year) and a four percent increase in weeds in the control and single period grazing paddocks (five grazing days per year) resulting in less runoff. The County Conservation District has also posted a sign on the farmland designating the area as a livestock water quality management area because of the steps it has taken to monitor water quality and vegetation.

32 Forest Stewardship Plans were developed. 1,620 landowners and managers indicated increased knowledge of forest stewardship practices, and 1,518 landowners and managers indicated they have implemented at least one new practice on their land. 63,122 acres were directly impacted by my program. Program participants estimate execution of practices on 10% of their ownership, with a cost earnings or savings estimate of \$9,468,300.

Post-program follow-up analysis indicates that nearly 90 percent of survey respondents have executed at least two new management practices over 80,000 acres. In terms of fire risk reduction cost savings alone, this translates to a minimum of 120 million.

A five-year evaluation conducted in 2011 documented that four-hundred seventy families completed the eight-week Coached Forest Stewardship Planning Shortcourse, and 282 Forest Stewardship Plans were prepared as a result of this training.

**V(A). Planned Program (Summary)**

**Program # 2**

**1. Name of the Planned Program**

Global Food Security and Hunger

**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%		3%	
102	Soil, Plant, Water, Nutrient Relationships	5%		5%	
104	Protect Soil from Harmful Effects of Natural Elements	5%		3%	
111	Conservation and Efficient Use of Water	8%		7%	
112	Watershed Protection and Management	5%		3%	
121	Management of Range Resources	2%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		9%	
202	Plant Genetic Resources	6%		8%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		9%	
205	Plant Management Systems	5%		6%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	12%		8%	
212	Pathogens and Nematodes Affecting Plants	12%		9%	
213	Weeds Affecting Plants	10%		3%	
215	Biological Control of Pests Affecting Plants	8%		5%	
216	Integrated Pest Management Systems	10%		4%	
301	Reproductive Performance of Animals	2%		3%	
302	Nutrient Utilization in Animals	2%		3%	
303	Genetic Improvement of Animals	3%		2%	
304	Animal Genome	0%		2%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

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

Extension	Research
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<b>Year: 2011</b>	<b>1862</b>	<b>1890</b>	<b>1862</b>	<b>1890</b>
	Plan	76.0	0.0	260.0
Actual Paid Professional	144.6	0.0	289.5	0.0
Actual Volunteer	3.0	0.0	0.0	0.0

**2. Institution Name:** Washington State University

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

<b>Extension</b>		<b>Research</b>	
<b>Smith-Lever 3b &amp; 3c</b>	<b>1890 Extension</b>	<b>Hatch</b>	<b>Evans-Allen</b>
1907240	0	3196677	0
<b>1862 Matching</b>	<b>1890 Matching</b>	<b>1862 Matching</b>	<b>1890 Matching</b>
1907240	0	3196677	0
<b>1862 All Other</b>	<b>1890 All Other</b>	<b>1862 All Other</b>	<b>1890 All Other</b>
5580867	0	29633535	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

This is the largest and most diverse of our Planned Programs since we consider that almost all of the research we do under the heading of production agriculture is included unless it fits better into another Planned Program. This rationale is based on the idea that knowledge gained about plant and animal production systems contributes to the world food supply and often can be adapted to increase food availability and stability in areas far from Washington state. Thus material previously included in Programs like Crop Science, Horticulture and Animal Science are included as are research and extension programs that are in areas like Entomology and Plant Pathology. Since having production systems that are economically viable is essential, we also include in this Planned Program Agricultural Economics and research and extension that is related to food processing and distribution. We also include work that directly relates to issues such as the availability of labor and the dynamics of communities that are not covered by other Planned Programs.

To accomplish the work included in this Planned Program, fundamental, translational and applied research has been conducted in laboratories, at research and extension centers, and in collaboration with farmers, ranchers, food processors and others. Extension programs serve many roles in this Program. Through the outreach and survey activities of extension, many of the issues are defined and articulated in a form that allows us to take action, to identify the scope of the problem, define what solutions might look like, determine the resources available and decide on a course of action, whether it would be to investigate the literature or to carry out primary research to try to come up with solutions. Extension is often involved in testing the application of partial solutions and ultimately is charged with developing mechanisms for implementing potential solutions if it appears that something suitable has been found to deal with the identified problems.

As is implied by the above, the dynamics of problem solving in this area is complex. There are many different targets for specific solution but they can generally be characterized by the boundary conditions of trying to improve the efficiency or cost effectiveness of production, processing or distribution, trying to increase consumer and stakeholder satisfaction, and trying to anticipate issues that might arise in the future that would keep the new ideas from being sustainable, in the sense that they can be applied indefinitely without adverse consequences. This latter issue may often lead to some specific work being assigned to another Program if, for example, the use of external unpriced ecosystem services like air, soil or water has become a major part of how the problem is considered.

**2. Brief description of the target audience**

Target audiences include farmers and ranchers, agricultural consultants, scientists, commodity commissions, educators, state and federal agency professionals, elected officials, food processors, transporters, agricultural chemical producers and applicators, and the general public.

**3. How was eXtension used?**

12 faculty members were engaged in Communities of Practice to advance collaborative efforts and facilitate research-based information sharing through the eXtension system.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	223309	1073999	19664	0

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

**Patent Applications Submitted**

Year: 2011

Actual: 9

**Patents listed**

Zhihua Jiang and Jennifer Michal POLYMORPHISMS IN FATTY ACID BINDING PROTEIN 4 ("FABP4") GENE AND THEIR ASSOCIATIONS WITH MEASURES OF MARBLING AND SUBCUTANEOUS FAT DEPTH IN BEEF CATTLE

Zhihua Jiang and Jennifer Michal UROTENSIN 2 AND ITS RECEPTOR AS CANDIDATE GENES FOR BEEF MARBLING SCORE, RIBEYE AREA AND FATTY ACID COMPOSITION

Zhihua Jiang and Jennifer Michal ASSOCIATION OF UQCRC1 SNPS WITH FAT DEPOSITION AND FATTY ACID COMPOSITION

Bruce Barritt APPLE TREE NAMED 'WA 2'

Kimberlee Kidwell 'Diva' Soft White Spring Wheat

Kimberlee Kidwell 'Babe' Soft White Spring Wheat

Kimberlee Kidwell 'JD' Soft White Spring Club Wheat

Patrick Moore Cascade Bounty raspberry

Patrick Moore Cascade Dawn raspberry

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
Actual	0	0	297

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, demonstrations, and field days conducted annually

Year	Actual
2011	989

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications published

Year	Actual
2011	51

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Global Food Security.

Year	Actual
2011	209

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants evaluated who applied acquired knowledge
3	Percentage increase in yield realized among program participants as a result of application of WSU-recommended practices.
4	Increase in profitability resulting from practices developed by or recommended by WSU Extension personnel and/or ARC scientists.
5	Increased number of acres managed with "Best Management Practices" designed to yield improved environmental quality.

## **Outcome #1**

### **1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

### **2. Associated Institution Types**

- 1862 Extension

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	81

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Washington producers must be competitive in global markets and have a keen understanding of the demand components from other societies. The state's productivity is also highly dependent upon the application of appropriate technologies for irrigation, farming of lands with high erosion potential, effective control of existing and invasive pests and diseases, and effective transport of agricultural products to distant markets.

#### **What has been done**

Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences

#### **Results**

81% of program participants increased their knowledge relative to one or more of the knowledge areas selected for this program effort. This impact represents an average across over 900 educational events that were assessed for this program area. The overall assessment validates that program participants gained new knowledge and skills important to enhance agricultural efficiency and productivity to add to the world food supply, while protecting the environment and resource base.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships

104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals

**Outcome #2**

**1. Outcome Measures**

Percentage of participants evaluated who applied acquired knowledge

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	70

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Washington producers must be competitive in global markets and have a keen understanding of the demand components from other societies. The state's productivity is also highly dependent upon the application of appropriate technologies for irrigation, farming of lands with high erosion potential, effective control of existing and invasive pests and diseases, and effective transport of agricultural products to distant markets.

**What has been done**

Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

### **Results**

70% of program participants increased their knowledge relative to one or more of the knowledge areas selected for this program effort. This impact represents an average across over 900 educational events that were assessed for this program area. The overall assessment validates program participants gained new knowledge and skills important to enhance agricultural efficiency and productivity to add to the world's food supply, while protecting the environment and resource base.

## **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
202	Plant Genetic Resources
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
303	Genetic Improvement of Animals

### **Outcome #3**

#### **1. Outcome Measures**

Percentage increase in yield realized among program participants as a result of application of WSU-recommended practices.

#### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	6

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Washington State is extremely variable in climate and topography leading to production of over 300 different agricultural commodities. Much of the agricultural produce of the state is also exported primarily to Pacific Rim countries. As a result, Washington producers must be competitive in global markets and have a keen understanding of the demand components from other societies.

The state's productivity is also highly dependent upon the application of appropriate technologies for irrigation, farming of lands with high erosion potential, effective control of existing and invasive pests and diseases, and effective transport of agricultural products to distant markets. This outcome measure seeks to quantify and qualify the application of new knowledge gained in outcome number 1 to further address the broad issue of global food security and hunger.

**What has been done**

Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences

**Results**

Assessment of program participants revealed an average increase of 6% in productivity through the application of research-based information and knowledge to address many of the most significant issues in food production, storage, processing, transportation, and marketing. As with the previous impacts in Planned Program #2, this impact comes from over 900 educational events and research activities to enhance agricultural efficiency and productivity to add to the world's food supply, while protecting the environment and resource base.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
121	Management of Range Resources
201	Plant Genome, Genetics, and Genetic Mechanisms



- 205 Plant Management Systems
- 211 Insects, Mites, and Other Arthropods Affecting Plants
- 212 Pathogens and Nematodes Affecting Plants
- 213 Weeds Affecting Plants
- 215 Biological Control of Pests Affecting Plants
- 216 Integrated Pest Management Systems
- 301 Reproductive Performance of Animals
- 302 Nutrient Utilization in Animals
- 303 Genetic Improvement of Animals

**Outcome #4**

**1. Outcome Measures**

Increase in profitability resulting from practices developed by or recommended by WSU Extension personnel and/or ARC scientists.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	34066000

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Washington State is extremely variable in climate and topography leading to production of over 300 different agricultural commodities. Much of the agricultural produce of the state is also exported primarily to Pacific Rim countries. The state's productivity is also highly dependent upon the application of appropriate technologies for irrigation, farming of lands with high erosion potential, effective control of existing and invasive pests and diseases, and effective transport of agricultural products to distant markets.

**What has been done**

Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

**Results**

Assessment of program participants revealed an aggregate increase in profitability of \$34,066,000 across all program participants. This outcome metric computed from an assessment of application of new knowledge and research, and linked to the assessment of enhanced productivity. This impact represents an effort for in enhancing the world food supply using a monetary metric.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
201	Plant Genome, Genetics, and Genetic Mechanisms
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems
206	Basic Plant Biology
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
304	Animal Genome

**Outcome #5**

**1. Outcome Measures**

Increased number of acres managed with "Best Management Practices" designed to yield improved environmental quality.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	134453

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The state's productivity is highly dependent upon the application of appropriate technologies for irrigation, farming of lands with high erosion potential, effective control of existing and invasive pests and diseases, and effective transport of agricultural products to distant markets. This outcome measure seeks to quantify and qualify the application of new knowledge gained to further address the broad issue of global food security and hunger.

**What has been done**

Program implementation utilized local, regional, state-wide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, field days, field demonstrations, print and electronic publications, mass media, social networks, and other methods to disseminate research-based knowledge and other relevant information to targeted audiences.

**Results**

State-wide work on this program was assessed in terms of increased acres managed with "Best Management Practices" designed to yield improved environmental quality and sustain productivity capacity of agricultural lands. This program effort increased agricultural acreage managed under one or more of these recommended practices was 134,453 acres in 2011, exceeding our target of 5,000 acres.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
121	Management of Range Resources
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants

213	Weeds Affecting Plants
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

#### **V(H). Planned Program (External Factors)**

##### **External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges

##### **Brief Explanation**

Ongoing concerns and limitations of the state budget and university budget responses continue to impact our hiring and deployment of human and financial resources, resulting in the loss of faculty and administrative leadership. The uncertainty of future state policy and funding for higher education clearly impacts our ability to take bold initiatives, given contingencies required for additional budget cuts from state and local governments. Our work in research and extension increasingly is dependent on securing competitive grants to support our system and drive our programs forward. Competing priorities for limited funds and financial resources were clearly the most limiting factor encountered in 2011.

#### **V(I). Planned Program (Evaluation Studies)**

##### **Evaluation Results**

This program sought to evaluate impact in terms of knowledge gained by participants, application of this knowledge, productivity increases associated with the application of research-based information. We further evaluated results in terms of increased profitability of food producers and processors, as well as increases in the acreage of agricultural land managed with the application of new practices. Results were collected through a variety of methods including pre and post event evaluations, surveys, agricultural statistics, feedback from advisory groups and stakeholder groups, and other individual assessments of program participants. The analysis provided the following aggregate results for each desired outcome:

- Percentage of participants increasing knowledge from the program = 81%
- Percentage of participants applying at least one practice or application of knowledge gained = 70%
- Percentage yield or productivity increase resulting from the application of the knowledge and information extended = 6%
- Increased profitability associated with the extension and application of agricultural research findings = \$34,066,000.
- Increased acreage managed with recommended practices designed to improve

environmental quality and productivity = 134,453

### **Key Items of Evaluation**

The WSU Vegetable Extension program worked with over 700 vegetable producers using conferences and field days to increase producer knowledge by an average of 78%. Knowledge change was noted in pest and disease management, IPM practices, soil fertility, cultivar selection, and soil health. These efforts were supported by online information and a variety of outreach publications.

The Viticulture program utilized a variety of field trials, demonstrations, and conferences to increase knowledge among 83% of the 451 participants for enhanced management vineyards.

Advanced IPM strategies were taught to 215 vineyard workers to use a Pheremone-based mealybug monitoring procedure, with 80% of participants gaining new knowledge and 50% applying recommended practices. These practices reduced the use of organophosphate insecticides on 54,000 acres with an estimated impact of \$2.5 million across the region realized through reduced pesticide applications and production improvements.

Five Extension program events on the management of Rhizoctonia Stem Canker and late blight in potatoes generated a knowledge enhancement in 100% of 135 potato producers, with 100% adoption among the participants and a \$1.1 million increase in productivity.

Coordinated livestock management education for small farms utilized a series of intensive workshops and clinics at three locations across the state with assessed knowledge improvement of 95% of 530 program participants.

Small Farm Education Series provided training with 12 14-week courses and 7 internet courses to an audience of over 900 people with 99% reported new knowledge and 89% applying that new knowledge. Past surveys of these audiences indicated that 28% started new farming operations after completion of the curriculum.

International Crop Production (hosted groups of visiting farmers from other countries to learn about crop production) - 100%

35 Wine grape vineyard management programs and events served over 200 growers and wine makers from Washington and the surrounding states. These events coupled with the WSU Viticulture and Enology Certificate Program impacted over 250 individuals, with 92% of the participants gaining significant knowledge and 78% of participants reportedly applying this new knowledge to management of vineyards.

Thirty seven days of training were offered to a total of 5,627 registrations for pesticide applicator training, with a reported 85% increase in knowledge by program participants. An email survey of applicators was conducted in follow-up with 95% stating that the training improved their personal safety and 98% stated it increased their awareness of and compliance with pesticide regulations to protect the environment.

The Women in Agriculture Conference utilized 15 sites across the state to reach 250 women to enhance farm management skills, with 100% of participants reporting acquisition of new knowledge and skills to enhance their efficiency and productivity.

Over 40 local and regional programs were delivered to 1,500 dryland cereal producers on soil health, fertility, plant disease, pest management, crop genetics, and weed management. 81% of program participants gained new knowledge and information of improved production practices and efficiency.

Financial and crop marketing training was provided to over 1800 farmers and ranchers via online technologies and 15 traditional workshops to enhance their skill in efficient application of farming practices. 85% of program participants reported new knowledge gained to enhance farm productivity and profitability.

43 Tree Fruit Extension Programs and events trained over 800 orchardist and orchard workers in new strategies for management of important pests including Spotted Winged Drosophila. 85% of participants reported gaining new knowledge from the training.

The state-wide pesticide application training program achieved an 85% adoption rate among 5627 program participants for application practices to increase safety and reduce pesticide use, while maintaining desired control of target pests and plants.

Integrated programs on pest and weed management in agricultural lands delivered research-based information to 8500 program participants, achieving an 8% average improvement in overall productivity among the farms reached.

A coordinate program in health and reproduction of dairy and beef cattle utilized 13 projects and events to address a variety of contemporary issues such as lameness in dairy animals, increasing reproductive performance, reducing morbidity and mortality in young calves, enhanced biosecurity practices, animal welfare, infectious disease management, and related production concerns. Aggregate impacts included knowledge enhancement among over 85% of participants, and an estimated rate of knowledge application of over 65%.

WSU Faculty managed a series of tours for 10 Ukrainian agricultural professionals to visit the state and learn about crop production practices, transportation, and marketing. These international guests also received training on the structure and organization of Extension in the United States. Participant evaluations revealed significant learning by 90% of the participants and intentions to apply the knowledge gained in their home country.

The Immigrant Farmer Education program initiative reached over 250 individuals from Latin America and Asia with a broad offering of practical education linked to successful management of small farm enterprises, and facilitated local options for these beginning farmers to rent farmland to initiate their enterprises through local non-profit organizations. Program evaluation revealed well over a 90% of the participants gained new knowledge and applied that knowledge to their enterprises.

The Cultivating Success Small Farm Project delivered formal and informal training to 447 participants through 12 14-week training programs. The program graduated 348 of these participants, with over 90% reporting application of the training. This program impacted 8,698 acres of farmland.

Cherry fruit fly control practices implemented across the major cherry growing areas of Washington offered alternatives to organophosphate pesticides and were implemented on 77,000 acres, netting \$2.8 million in increased production.

Field research have identified six practices to address the disease problems associated with replanting apple orchards and this work is under currently being validated, with strong support from the apple industry.

The effect of the Tri-State Potato Variety Development Program on the Northwest potato industry has been substantial. The fresh market industry, French-fry processors and chippers have incorporated many varieties developed through the Tri-State variety development program into their businesses. Ranger Russet, Umatilla Russet, Alturas, Premier Russet, Bannock Russet, Western Russet, and Alpine Russet are examples of russet cultivars released from the Tri-State program that have greatly benefited the United States and Northwest potato industry, being the 3rd, 4th, 7th, 11th, 14th, 21st, and 24th most widely grown cultivars in the United States in 2011, respectively. Tri-State varieties represent over 20%, or 194,000 acres, of the national fall crop acreage. (NASS, Crop Production, November, 2011).

The use of mustard as a green-manure crop as a biofumigant practice to precede potato crops expanded further in 2011 with 30,733 acres managed with this practice to reduce or eliminate the need for soil fumigation.

WSU Extension led the training program for the Trade Adjustment Assistance Program in the Western Region, working with 9,830 applicants. 7,519 applicants have completed their Intensive Training requirement (12 hours are required), 1,543 applicants have taken 13 or more hours of intensive training, 720 applicants have taken 15 or more hours of intensive training. Impacts of the work include: approval of 7,208 initial business plans, 175 Business Planning Consultants trained, 6,756 applicants have been assigned a business planning consultant, and 3,310 applicants have completed a Long-term Business Plan. Survey evaluations have been designed and implemented for each stage of the TAA program. WSU Western Center for Risk Management Education and the WSU Social Economic Sciences Research Center are the lead in for program evaluation. Additionally Program Evaluation will follow up with producers one-year after their business plans are approved to evaluate effectiveness of the TAA program in helping producers implement change and improve their profitability.

Extension's extension irrigation education website (<http://irrigation.wsu.edu>) was created to provide pertinent information, FAQs, tutorials, links, over 45 irrigation-related calculators, databases of crop rooting depths, and soil information from the Columbia Basin. It has a smart phone version for the most popular calculators. The website receives an average of about 35,000 - 40,000 page views per year with about 14,000 of these per year from unique visitors. This is a combined total of over 150,000 page views and approximately 50,000 unique visitors since the site's launch.

WSU Extension's work with local Farmers Markets and vendors provided training and information that contributed to expanded farmer participation and increased sales by 6%. Total sales in excess of \$53 million.

Extension programs on reduced tillage practices contributed to improvements in soil quality and improved efficiency without loss of production on over 350 farms, with a rate of

adoption of 51% among participants surveyed.

155 participants in the WSU Beef 200 course increased their level of knowledge on live animal and carcass evaluation, record keeping and measuring profitability, feeding beef to meet their nutritional needs, and how to better market beef and beef products. 92% rated the Beef 200 program as highly valuable. 57% of the individuals currently owning cattle indicated that the Beef 200 program would positively impact the economic status of their beef operation by at least \$250 during the next 12 months.

WSU Beef 300 participants indicated that 100% increased their level of knowledge on the following indicators: marketing of beef and beef products; live animal and carcass evaluation; fabrication and processing of beef carcasses; food safety measures; and adding value to beef carcasses. Respondents owned/managed over 2600 cow/calf pairs; and 2 cattle feedlots with a one-time capacity of over 10,000 head of cattle each. 96% rated the program as highly valuable and 65% indicated that the program improved their perception of WSU Extension. 71% indicated that the Beef 300 program would positively impact the economic status of their beef operations during the next 12 months. Planned Practices to Implement: "By following the recommended management practices, I plan to capture value added premiums and thereby improve the financial sustainability of my operation." And "Anyone involved in the beef industry (production or retail) should participate in this program. One of the best trainings I have every attended."

Stone fruit, apple, and cherry producers have gained information on the potential environmental, economic and social impacts of having a new tool available for fruit thinning. Mechanical removal of bloom has resulted in increased final fruit size and reduced green fruit thinning time in stone fruits, cherries and apple. The net income gain ranged from \$236 to \$986 per acre across all U.S. peach trials. In Washington, the labor for follow up green fruit thinning in bloom thinned apricot, nectarine and peach trials was reduced by an average of 37% or \$150 per acre. The potential average savings for the stone fruit industry is \$600,000 annually. The net income gains in apricot and nectarine trials ranged from \$175 to \$450 per acre, which translates to an average annual potential net gain of \$1.3 million dollars to the Washington organic peach, nectarine and apricot industry. Producers are using our economic data to determine if they should design future orchards to be architecturally suitable for machine thinning and if they should purchase a mechanical thinner. Directly because of our collective efforts, the German manufacturer Fruit Tec established a North American distributor network and a local Washington company became the Western U.S. dealer. Thirty-two Darwin string thinners have been purchased by U.S. producers since 2009 generating an estimated \$380,000 in sales. The handheld thinning device went through 3 prototype phases and was applied in 4 trials in WA, 2 in PA and 2 in Chile. A commercial handheld model was applied in two additional trials in Chile. The handheld thinning device is more selective and superior in spot thinning and reaching the interior of the canopy than the two tractor mounted string thinners.



**V(A). Planned Program (Summary)**

**Program # 3**

**1. Name of the Planned Program**

Sustainable Energy

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%		5%	
123	Management and Sustainability of Forest Resources	10%		5%	
131	Alternative Uses of Land	5%		5%	
133	Pollution Prevention and Mitigation	10%		2%	
141	Air Resource Protection and Management	5%		3%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	0%		15%	
205	Plant Management Systems	0%		5%	
206	Basic Plant Biology	0%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		5%	
402	Engineering Systems and Equipment	30%		5%	
403	Waste Disposal, Recycling, and Reuse	15%		10%	
511	New and Improved Non-Food Products and Processes	0%		5%	
601	Economics of Agricultural Production and Farm Management	10%		5%	
603	Market Economics	10%		2%	
605	Natural Resource and Environmental Economics	5%		3%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	15.0	0.0	50.0	0.0

Actual Paid Professional	78.5	0.0	45.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

**2. Institution Name:** Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
104570	0	281094	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
104570	0	281094	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
18162277	0	6964320	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Research is being conducted on the use of agricultural and woody biomass, and on algal and oil seed lipid production and processing. A major focus of the basic research is in developing feedstocks and processes suitable for higher molecular weight transportation fuels. Camelina shows some promise as a crop that might fit a production niche in Eastern Washington and switchgrass and Arundo donax have some potential in irrigated regions of the state because of the high production levels we have been able to obtain. Aided by a major USDA CAP grant, an effort is underway to develop improved methods for softwood conversion into transportation fuels. Economic analyses are being conducted on various energy systems to assess thresholds for application of these technologies. Extension programs have been very active in teaching and demonstrating energy efficiency practices in homes and businesses, as well as alternative energy systems such as anaerobic digestion, biomass production, oil seed production, and the utilization of wind and solar energy systems.

**2. Brief description of the target audience**

The target audiences will include farmers, business owners, homeowners, industry technology providers, project developers, and public agencies and utilities. Two significant targets for some of these applications are the US Department of Defense, through its Green Navy Initiative, and Boeing and other aerospace related companies.

**3. How was eXtension used?**

eXtension was not used in this program.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	309046	23581	220	380214

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

**Patent Applications Submitted**

Year: 2011

Actual: 2

**Patents listed**

Craig Frear and Shulin Chen COMBINED NUTRIENT RECOVERY AND BIOGAS SCRUBBING SYSTEM INTEGRATED IN SERIES WITH ANIMAL MANURE ANAEROBIC DIGESTER

Craig Frear and Shulin Chen HETEROTROPHIC ALGAL HIGH CELL DENSITY PRODUCTION METHOD AND SYSTEM

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
<b>Actual</b>	0	0	21

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, demonstrations, and symposia conducted related to alternative energy and energy efficiency.

Year	Actual
2011	3778

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications published annually.

Year	Actual
2011	2

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Sustainable Energy.

<b>Year</b>	<b>Actual</b>
2011	77

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants who demonstrate application of new knowledge resulting from WSU energy workshops, demonstrations, or symposia.
3	Number of households and enterprises reporting reduced energy consumption as a result of WSU programs.
4	Amount of new sustainable energy (MW/YR) produced as a result of WSU programs.

## **Outcome #1**

### **1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	80

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Continued competitiveness, economic growth and quality of life is dependent in large measure on our ability to find clean, cost effective, and renewable sources of energy. Washington's economy has long relied upon relatively cheap energy from hydropower, but this source is virtually impossible to expand given societal resistance to the creation of new dams. Other sources of energy appear to be viable in the region including solar, wind, and biomass conversion.

#### **What has been done**

Research and Extension efforts have focused on energy efficiency measures, agricultural and woody biomass conversion, and algal and oil seed as biofuel sources. The projects in biomass, microbial, and oilseeds for biofuels are in early stages of work, but energy efficiency work with private individuals, corporate, and public entities was very robust during the year.

#### **Results**

Knowledge was increased among 80% of program participants related to improved energy efficiency in homes and buildings, as well as alternative energy generation such as solar and wind systems. This knowledge enhancement also lead to enhanced collaboration among groups and organizations is realizing a sustainable energy future.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation

141	Air Resource Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
603	Market Economics
605	Natural Resource and Environmental Economics

## **Outcome #2**

### **1. Outcome Measures**

Percentage of participants who demonstrate application of new knowledge resulting from WSU energy workshops, demonstrations, or symposia.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	70

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Continued competitiveness, economic growth and quality of life is dependent in large measure on our ability to find clean, cost effective, and renewable sources of energy. Washington's economy has long relied upon relatively cheap energy from hydropower, but this source is virtually impossible to expand given societal resistance to the creation of new dams. Other sources of energy appear to be viable in the region including solar, wind, and biomass conversion.

#### **What has been done**

The WSU Extension Energy Program logged over 48,000 inquiries in 2011 addressing energy efficiency questions and issues. The program has also provided information assisting in the installation of 568 new solar systems, and 16 small wind systems in 2011. This program also implemented an urban energy efficiency weatherization program with support for the state legislature. Biofuels research and development continued investigation in biomass conversion and biofuel crops and cropping systems.

#### **Results**

Program participants demonstrated 70% application of knowledge gained in the sustainable energy program, with application to improved energy efficiency practices for homes and buildings,

better decision making to address future energy needs, and plans for current and future development of solar and wind systems both large and small.

#### 4. Associated Knowledge Areas

<b>KA Code</b>	<b>Knowledge Area</b>
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse
603	Market Economics
605	Natural Resource and Environmental Economics

#### Outcome #3

##### 1. Outcome Measures

Number of households and enterprises reporting reduced energy consumption as a result of WSU programs.

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

<b>Year</b>	<b>Actual</b>
2011	9500

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Energy prices and consumption levels are rising in the U.S. and worldwide. More than ever before, the solution is the enhancement of energy efficiency and development/deployment of renewable energy solutions. The WSU Energy Program has about \$10 million per year from a variety of state, regional, national and international funding sources.

###### **What has been done**

In 2009, the Washington State Legislature charged the WSU Energy Program with developing and piloting a community approach to urban energy efficiency weatherization using \$14.5 million of ARRA funding. The resulting Community Energy Efficiency Pilot Program included nearly 200



small businesses that employ over 600 people. The program also addressed building efficiency and indoor air quality in schools, along with 18 on-site resource conservation management visits and trainings.

**Results**

This program outcome significantly exceeded our goal of 2,000 with over 9,500 homes reducing energy consumption. 2,200 of these were certified by the Energy Star Program.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
402	Engineering Systems and Equipment

**Outcome #4**

**1. Outcome Measures**

Amount of new sustainable energy (MW/YR) produced as a result of WSU programs.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	4

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Continued competitiveness, economic growth and quality of life is dependent in large measure on our ability to find clean, cost effective, and renewable sources of energy. Washington's economy has long relied upon relatively cheap energy from hydropower, but this source is virtually impossible to expand given societal resistance to the creation of new dams. Other sources of energy appear to be viable in the region including solar, wind, and biomass conversion.

**What has been done**

The WSU Sustainable Energy Program provided support to the state's renewable energy program, resulting in the installation in the State of Washington of 568 new solar systems, 16 small wind systems, and one anaerobic digester.

**Results**

Although we did not meet our goal of stimulating new sustainable energy generation of 11 MW/year in 2011, we did stimulate an increase of 4 MW in 2011 and this is growing.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
123	Management and Sustainability of Forest Resources
131	Alternative Uses of Land
133	Pollution Prevention and Mitigation
141	Air Resource Protection and Management
402	Engineering Systems and Equipment
403	Waste Disposal, Recycling, and Reuse

**V(H). Planned Program (External Factors)**

**External factors which affected outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

**Brief Explanation**

Ongoing concerns and limitations of the state budget and university budget responses continue to impact our hiring and deployment of human and financial resources,; however, our energy program has continued to flourish in this environment as a direct result of large grants and contracts awarded for energy related work. These grants and contracts are essentially the foundation of all work reported on for this planned program. Many were funded by economic stimulus funds. The level of support subsidy offered in Fall, 2011 to encourage cultivation Camelina was insufficient to stimulate growers to take on new contracts for this potentail new crop. Either the support price needs to go up or more background experience will be needed to be successful with this.

**V(I). Planned Program (Evaluation Studies)**

**Evaluation Results**

Sought to evaluated program impact in terms of the percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning

objectives (80 percent), the percentage of participants who demonstrated application of new knowledge resulting from WSU energy workshops demonstrations, or symposia (70 percent), the number of households and enterprises reporting reduced energy consumption as a result of WSU programs (9,500 households in 2011) and the amount of new sustainable energy (MW/YR) produced as a result of WSU programs (4 MW as a result of the state renewable energy cost recovery program). The number of energy-related inquiries fielded by the national information centers managed and operated by the WSU Energy Program and the number of energy trainings conducted. Results were collected through a variety of methods including training evaluations, feedback from stakeholders, calculations for funders, and program participants.

### **Key Items of Evaluation**

The key items of the evaluation focused on learning and knowledge change of program participants (80%) and application of that knowledge (70%). The success of the program was largely based on the number of households and businesses that reduced energy consumption; with 9,500 far exceeding our goal of 2,000. Our efforts also contributed directly to increasing the amount of new sustainable energy generation (wind and solar) by 4 MW in 2011.

Basic energy research related to plant biomass generation and conversion is quite active, with research programs investigating wood and energy crop growth under various local conditions, oilseed growth in the region and basic plant productivity related to oil composition, algal sources of biomass, pyrolytic and anaerobic digestion and conversion processes and lignocellulosic conversion. Most of these programs are funded through external grants, which involves significant external review.

**V(A). Planned Program (Summary)**

**Program # 4**

**1. Name of the Planned Program**

Climate Change

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
102	Soil, Plant, Water, Nutrient Relationships	0%		5%	
111	Conservation and Efficient Use of Water	10%		5%	
112	Watershed Protection and Management	10%		5%	
122	Management and Control of Forest and Range Fires	10%		5%	
123	Management and Sustainability of Forest Resources	5%		5%	
132	Weather and Climate	5%		5%	
133	Pollution Prevention and Mitigation	5%		5%	
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
202	Plant Genetic Resources	0%		5%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		10%	
205	Plant Management Systems	20%		5%	
211	Insects, Mites, and Other Arthropods Affecting Plants	10%		10%	
212	Pathogens and Nematodes Affecting Plants	10%		10%	
213	Weeds Affecting Plants	0%		3%	
216	Integrated Pest Management Systems	10%		5%	
404	Instrumentation and Control Systems	0%		2%	
605	Natural Resource and Environmental Economics	0%		5%	
610	Domestic Policy Analysis	5%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

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

Year: 2011	Extension		Research	
	1862	1890	1862	1890

Plan	2.0	0.0	55.0	0.0
Actual Paid Professional	19.1	0.0	64.5	0.0
Actual Volunteer	0.4	0.0	0.0	0.0

**2. Institution Name:** Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
99625	0	479236	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
99625	0	479236	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
3639571	0	6565960	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Research and outreach were conducted to facilitate conversion of agricultural, forestry, and industrial waste streams into clean energy and stable construction grade materials. This includes development of new products and transfer of associated technology to the private sector. Our work also targeted the general public regarding education changes in day-to-day activities that collectively are positive for society's effort to address climate change.

Our plant breeding and molecular biology programs continue to develop new crop varieties that are able to withstand emerging disease and pest threats associated with climate change. We are also in the process of assessing climate change related policies and develop research and outreach programs to position Washington's agriculture and forestry industries effectively to increase sequestration of carbon and to benefit from future carbon trading protocols or other greenhouse gas mitigation policy mechanisms.

**2. Brief description of the target audience**

The target audiences for this program included: Owners and managers of crop and range lands, forest resources, and wood products industries; community leaders; the general public; and public agencies and organizations.

**3. How was eXtension used?**

Faculty participation in communities of practice.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	24382	293204	1420	4330

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

**Patent Applications Submitted**

Year: 2011

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
<b>Actual</b>	0	0	20

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops and other educational venues delivered.

Year	Actual
2011	31

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications published per year.

Year	Actual
2011	1

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Climate Change.

<b>Year</b>	<b>Actual</b>
2011	45

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of evaluated program participants who applied knowledge attained from WSU.
3	Acres planted with WSU-developed crop varieties that are more adapted to environmental conditions or more resistant to emerging plant pests and diseases.
4	Number of farms employing anaerobic digestion or other methods to reduce GHG emissions or to sequester carbon.



## **Outcome #1**

### **1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	85

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The impacts of climate change on Washington State could be significant, with mountain snow melting earlier in the season resulting in spring flooding and low stream flows during the summer and fall months. This will impact communities, agriculture and natural resource management, navigation, and electrical generation in the state. Additionally, new plant and animal pests and diseases are likely to emerge. Conversely, some areas may have a longer effective growing season and new opportunities for land managers.

#### **What has been done**

Program implementation utilized local, regional, statewide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, print and electronic publications, mass media, social networks, volunteer-based 'train the trainer' programs, and other methods to disseminate research-based knowledge and other relevant information to target audiences.

#### **Results**

85% of program participants demonstrated increased knowledge and awareness of climate change and the associated issues impacting our state and communities. This knowledge included basic climate change models and their associated predictions, along with steps to adapt to future changes and mitigate trends that are predicted.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management

122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
132	Weather and Climate
133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
610	Domestic Policy Analysis

**Outcome #2**

**1. Outcome Measures**

Percentage of evaluated program participants who applied knowledge attained from WSU.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	54

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The impacts of climate change on Washington State could be significant, with mountain snow melting earlier in the season resulting in spring flooding and low stream flows during the summer and fall months. This will impact communities, agriculture and natural resource management, navigation, and electrical generation in the state. Additionally, new plant and animal pests and diseases are likely to emerge. Conversely, some areas may have a longer effective growing season and new opportunities for land managers.

**What has been done**

Program implementation utilized local, regional, statewide, and multistate efforts in a coordinated effort that involved workshops, clinics, seminars, print and electronic publications, mass media, social networks, volunteer-based programs, and other methods to disseminate research-based knowledge and other relevant information to target audiences.

**Results**

54% of program participants applied knowledge gained from the 31 educational events that were assessed for this program area. The overall assessment was that program participants gained new knowledge and skills important to change their daily habits and teach others to do the same.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
122	Management and Control of Forest and Range Fires
123	Management and Sustainability of Forest Resources
132	Weather and Climate
133	Pollution Prevention and Mitigation
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems
610	Domestic Policy Analysis

**Outcome #3**

**1. Outcome Measures**

Acres planted with WSU-developed crop varieties that are more adapted to environmental conditions or more resistant to emerging plant pests and diseases.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	350000

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The impacts of climate change on Washington State could be significant, with new plant and animal pests and diseases likely to emerge. Conversely, some areas may have a longer effective

growing season and new opportunities for land managers. Crop varieties adapted to these changes will be essential for future production.

**What has been done**

WSU scientist and plant breeders continue to select and develop crop cultivars with characteristics important to pest and disease resistance, as well as water-use efficiencies for sustained production under evolving plant growth conditions. Extension personnel disseminated this ongoing work via 56 training events and numerous reports, media releases, and communications to farmers during the year.

**Results**

During 2011 150 varieties of wheat were evaluated in replicated trials. Similarly other crops such as carrots, onions, potatoes, barley, grapes, hops, alfalfa, forage grasses, berries, and tree fruit crops were under similar testing and evaluation. At least 15 varieties of crops recently developed by WSU with important characteristics were utilized on an estimated 350,000 acres.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
205	Plant Management Systems
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

**Outcome #4**

**1. Outcome Measures**

Number of farms employing anaerobic digestion or other methods to reduce GHG emissions or to sequester carbon.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	15

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Farm and processor waste lead to major unproductive release of fixed carbon from the agroecosystems. By using anaerobic digestion to recover some of the energy content of this waste, less fossil fuels is needed and energy associated with disposal is reduced. The economics of AD operations in animal production in Washington is best if can also generate tipping fees for disposal of other waste products.

#### **What has been done**

WSU scientists have conducted extensive research on Anaerobic Digestion (AD) as a technology for recovery of methane (energy), stable carbon, and nutrients from organic wastes such as manure, food processing wastes and the organic fraction of municipal solid wastes. We have evaluated the technical and economic performance of commercially available systems, developed improved AD reactors, and commercialized WSU patented nutrient recovery technology.

#### **Results**

15 commercial, farm-based anaerobic digestion projects are now operating and three are under construction. They process 4,750 tons per day of organic wastes (60,000 Wet Cow Equivalents, 161 tons per day of food waste), mitigating nearly 850,000 tons of carbon dioxide annually and representing an estimated \$91 million in capital invested

#### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
133	Pollution Prevention and Mitigation
205	Plant Management Systems

#### **V(H). Planned Program (External Factors)**

##### **External factors which affected outcomes**

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges
- Other (Political opposition to the significance of anthropogenic climate change.)

##### **Brief Explanation**

The external factors marked above have created some limitations, but the most impactful was reduced baseline appropriations from the state to support our work. Conversely, grants and outside investments have allowed this program to move forward, in spite of political opposition to climate change as an issue.

#### **V(I). Planned Program (Evaluation Studies)**

##### **Evaluation Results**

Adoption of improved and productive and sustainable agricultural systems will help assure that producers will continue and individuals, families and communities have a safe and abundant food supply, save resources, and reduce their carbon footprint. At the level

of operations, our producers are receptive to procedures and materials that will allow them to adapt to climate change, even as they reject the concept that some of the changes in practice are motivated by an evolving climate.

### **Key Items of Evaluation**

The work of the NIFA priority on Climate Change includes animal and plant production systems and integrates Extension education in disseminating research results in Washington. Most of our effort can be classified as mitigation of climate change and is seen by our stakeholders as the type of incremental adaptation that has become routine in breeding and in adapting farm operations to altered economics of inputs and products. While we probably should be more aggressive in pointing out that there may be an underlying motivation for some of these incremental changes, our audiences are often unwilling to acknowledge this, raising the possibility of rejection of all of our work.

**V(A). Planned Program (Summary)**

**Program # 5**

**1. Name of the Planned Program**

Childhood Obesity

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
134	Outdoor Recreation	5%		0%	
601	Economics of Agricultural Production and Farm Management	5%		0%	
604	Marketing and Distribution Practices	5%		0%	
607	Consumer Economics	0%		60%	
701	Nutrient Composition of Food	10%		40%	
703	Nutrition Education and Behavior	20%		0%	
704	Nutrition and Hunger in the Population	15%		0%	
724	Healthy Lifestyle	20%		0%	
806	Youth Development	20%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

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

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	8.0	0.0	3.0	0.0
Actual Paid Professional	42.3	0.0	0.8	0.0
Actual Volunteer	4.3	0.0	0.0	0.0

**2. Institution Name:** Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
253925	0	4041	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
253925	0	4041	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
6055171	0	126815	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Educational programming was delivered to limited resource families through our nutrition education programs funded by SNAP-Ed and EFNEP (Smith-Lever 3-D) programs. Additionally, youth development programs expanded emphasis on physical activity in a number of programs and project areas. Finally, technical assistance was provided to farmers in the rural and urban fringe to help them produce and effectively market produce to urban residents.

**2. Brief description of the target audience**

Limited resource families, youth enrolled in 4-H programs, and agricultural producers (generally small producers) operating in the urban fringe.

**3. How was eXtension used?**

Faculty and staff participated in Communities of Practice

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	1885749	462338	4795091	30118

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

**Patent Applications Submitted**

Year: 2011

Actual: 0

**Patents listed**



**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
Actual	0	0	8

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of educational programs delivered focused on increasing local food supplies, improving dietary quality, and increasing physical activity.

Year	Actual
2011	3448

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications published per year.

Year	Actual
2011	2

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Childhood Obesity

Year	Actual
2011	3

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants evaluated who applied acquired knowledge to improve their diet quality, level of physical activity, or production of locally-grown produce.
3	Percentage of participants reporting increased physical activity.
4	Number of communities cooperating with WSU program with farmers' markets and community gardens producing and/or selling locally grown fruits and vegetables.

**Outcome #1**

**1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

**2. Associated Institution Types**

- 1862 Extension

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	79

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

The obesity epidemic has been created by changes in the physical, social and economic environment. Each day, adults and especially children are consuming more calories than they burn off. Many barriers such as limited access to low-cost nutritious foods, poverty, lack of physical exercise, limited experience with preparing, selecting or eating nutritious foods all compound the obesity issue. A prevention plan that includes hands-on education and physical activity is the greatest hope to slow and reverse obesity.

**What has been done**

Our Expanded Foods and Nutrition Education Program (EFNEP) operated in five counties in Washington State in 2011, with more than 5,000 new participants completing the program. Our Washington State Supplemental Foods and Nutrition Program (Food \$ense) enrolled over 139,000 people in an educational program that teaches healthier food choices through age-appropriate lessons and activities. Programs encourage youth and adults with limited incomes to share learned skills at home to affect positive health behaviors.

**Results**

This program effort assessed a knowledge change among 79% of all program participants after receiving an average of 6.8 lessons in direct education. This included twelfth grade students and adults who improved their ability to read food labels, identify low sugar foods and identify foods with specific nutrients that are important for building healthy lives, in conjunction with exercise.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
---------	----------------

134	Outdoor Recreation
701	Nutrient Composition of Food
724	Healthy Lifestyle
806	Youth Development

## **Outcome #2**

### **1. Outcome Measures**

Percentage of participants evaluated who applied acquired knowledge to improve their diet quality, level of physical activity, or production of locally-grown produce.

### **2. Associated Institution Types**

- 1862 Extension

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	65

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

The obesity epidemic has been created by changes in the physical, social and economic environment. Each day, adults and especially children are consuming more calories than they burn off. Many barriers such as limited access to low-cost nutritious foods, poverty, lack of physical exercise, limited experience with preparing, selecting or eating nutritious foods all compound the obesity issue. A prevention plan that includes hands-on education and physical activity is the greatest hope to slow and reverse obesity.

#### **What has been done**

Our Expanded Foods and Nutrition Education Program (EFNEP) operated in five counties in Washington State in 2011, with more than 5,000 new participants completing the program. Washington State Supplemental Foods and Nutrition Program (Food \$ense) enrolled over 139,000 people in an educational program that offers children and parents simple tools and information to make healthier food choices through age-appropriate lessons and activities.

#### **Results**

The program impacts include improved food choices among youth, with 65% of program participants changing behavior by increasing their consumption of fruits and vegetables, while reducing consumption of high fat, high sugar snack foods. Anecdotally there was a reported increased consumption of white milk over chocolate milk by the youth in the programs.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
134	Outdoor Recreation
701	Nutrient Composition of Food
724	Healthy Lifestyle
806	Youth Development

### **Outcome #3**

#### **1. Outcome Measures**

Percentage of participants reporting increased physical activity.

#### **2. Associated Institution Types**

- 1862 Extension

#### **3a. Outcome Type:**

Change in Condition Outcome Measure

#### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	50

#### **3c. Qualitative Outcome or Impact Statement**

##### **Issue (Who cares and Why)**

The obesity epidemic has been created by changes in the physical, social and economic environment. Each day, adults and especially children are consuming more calories than they burn off. Many barriers such as limited access to low-cost nutritious foods, poverty, lack of physical exercise, limited experience with preparing, selecting or eating nutritious foods all compound the obesity issue. A prevention plan that includes hands-on education and physical activity is the greatest hope to slow and reverse obesity.

##### **What has been done**

Our Expanded Foods and Nutrition Education Program (EFNEP) operated in five counties in Washington State in 2011, with more than 5,000 new participants completing the program. Our Washington State Supplemental Foods and Nutrition Program (Food \$ense) enrolled over 139,000 people in an educational program that teaches healthier food choices through age-appropriate lessons and activities. Programs encourage youth and adults with limited incomes to share learned skills at home to affect positive health behaviors.

##### **Results**

50% of program participants reported increased physical activity and exercise after delivery of lessons. This was accompanied by positive reports in increased physical activity among parents of children participating in the program. Classroom teachers associated with the programs also

confirmed positive behavior changes in physical activity among program participants.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
134	Outdoor Recreation
703	Nutrition Education and Behavior
724	Healthy Lifestyle
806	Youth Development

#### Outcome #4

##### 1. Outcome Measures

Number of communities cooperating with WSU program with farmers' markets and community gardens producing and/or selling locally grown fruits and vegetables.

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2011	53

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

The obesity epidemic has been created by changes in the physical, social and economic environment. Each day, adults and especially children are consuming more calories than they burn off. Many barriers such as limited access to low-cost nutritious foods, poverty, lack of physical exercise, limited experience with preparing, selecting or eating nutritious foods all compound the obesity issue. A prevention plan that includes hands-on education and physical activity is the greatest hope to slow and reverse obesity.

###### **What has been done**

Growing Groceries with Families Project was a program to increase accessibility and consumption of fresh, locally grown produce via a mentoring program with gardening and nutrition education. This program engaged local farmers markets and community gardens with the goal of increasing low-income families to use more fresh fruit and vegetables in their daily diet. The program used cooking demonstrations with produce grown on site, and provided an opportunity to discuss childhood obesity risks and prevention work with parents.

### Results

Through the increased interest, popularity and focus on growing and buying local, nutritious foods, the numbers of community and school gardens have rapidly expanded, with 53 additional communities cooperating on the project. In addition, the interest and growth in farmer's or local markets has also greatly expanded. This whole moment has resulted in the demand and interest for future expansion of the junior master gardening training and food safety across the state for teachers, parents, community members and school staff.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management
604	Marketing and Distribution Practices
701	Nutrient Composition of Food
704	Nutrition and Hunger in the Population

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

##### Brief Explanation

This past year we were able to maintain or expand our education and outreach in Childhood obesity only due to Competitive grants and contracts. Many program participants had limited income, changes in rules related to Food Stamp eligibility and access to SNAP-ED funded programs were critical for our program success. Additionally, continued institutional support for small farms program, youth development and nutrition education were key to advancing the goals of the program.

#### V(I). Planned Program (Evaluation Studies)

##### Evaluation Results

Our evaluation methodologies were designed to assess the amount of acquired learning, degree of application of learning and the social, environmental and economic value of this application. We used post-program, retrospective and before and after assessments to document changes in knowledge. We used survey methods after an appropriate time lag to assess how much of the new knowledge was actually applied. Finally, we used research methodologies, industry assessments, and survey responses to determine the social economic and environmental values derived from the application of new techniques.

##### Key Items of Evaluation

79% of the 3,033 EFNEP youth increased their knowledge of essential human nutrition.

41% of the Food \$ense youth increased their understanding of essentials of human nutrition.

77% of the 3,033 EFNEP youth reported an increased ability to select low-cost, nutritious food and 79% have improved their food safety and preparation practices.

50% of the Food \$ense youth (13,615) report eating a variety of foods more often.

68% of the Food \$ense youth (13,486) improved practices in food preparation and safety.

41% of the Food \$ense youth (12,258) report participating in at least 60 minutes of physical activity daily.

46% Food \$ense adults increased the number of days of physically active for 30 minutes.

75% of the 3,033 EFNEP youth report now eating a variety of foods and have a more nutritious diet.

78% of the EFNEP adults have also improved their diet, consuming an extra 2/3 cup of fruits and vegetables.

43% of the Food \$ense adults reported their children ate breakfast more often.

Through the educational Food \$ense sessions, adults learned how to select and prepare low-cost meals.

As a result, 41% reported running out of food less often.

57% of the Food \$ense parents reported increasing their weekly physical activity.

Through the Growing Groceries with Families Project - 95% of participants reported they now eat vegetables/fruit at least 2x/wk; 80% report they now feel comfortable starting their own garden/container garden; 1,672+ pounds of produce harvested by families for home use with approximately 1,396 hours of volunteer time donated towards the project leveraging \$28,440 (volunteer value).

Master Gardener Program Coordinators reported that 100% of adults and youth learned gardening skills from participation in classes and demonstrations. A savings of \$147,581 occurred by stretching food dollars in the grocery stores. A total of 104 tons of produce were donated from MG community demonstration gardens to food banks, stretching the ability of food banks to by other non-perishable ems for clientele.



**V(A). Planned Program (Summary)**

**Program # 6**

**1. Name of the Planned Program**

Food Safety

**V(B). Program Knowledge Area(s)**

**1. Program Knowledge Areas and Percentage**

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
307	Animal Management Systems	0%		20%	
315	Animal Welfare/Well-Being and Protection	0%		5%	
504	Home and Commercial Food Service	25%		5%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	15%		10%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	25%		50%	
723	Hazards to Human Health and Safety	35%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

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

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	4.0	0.0	25.0	0.0
Actual Paid Professional	44.6	0.0	13.4	0.0
Actual Volunteer	3.5	0.0	0.0	0.0

**2. Institution Name:** Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
433865	0	167763	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
433865	0	167763	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
1859791	0	2122105	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

Research strength is primarily in the epidemiology of foodborne bacterial diseases, especially in animal herds, and in mechanisms whereby pathogenic organisms are transmitted and ultimately reach the consumer. A secondary area of research strength is in sterilization and pasteurization technology, especially in the use of microwaves and other physical technologies to limit the potential for significant numbers of viable pathogens to reach end users. Extension programs have concentrated on the presence of pathogens in the production and distribution system, including crops, food processing and consumer safety. Conferences, workshops, and onsite visits have been conducted. In some counties, volunteers have been and are being trained to engage with the general public to provide training on home food preservation. Publications and websites are also maintained as outreach instruments to the food industry and to consumers.

**2. Brief description of the target audience**

The target audiences for this program include food processors, food purveyors, food producers and the general public.

**3. How was eXtension used?**

Faculty Participation in Communities of Practice.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	28696	225000	14442	25000

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

**Patent Applications Submitted**

Year: 2011

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
Actual	0	0	18

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of conferences, workshops or other training sessions conducted by WSU Extension educators related to food safety.

Year	Actual
2011	558

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications published per year

Year	Actual
2011	7

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Food Safety.

Year	Actual
2011	26

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of evaluated participants who applied at least one practice learned from WSU Extension workshops, conferneces, or training sessions.
3	Percentage of participants who will institute a HACCP plan as a result of attending WSU workshops.

**Outcome #1**

**1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Knowledge Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	78

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Food can transmit disease from person to person as well as serve as a growth medium for bacteria that can cause food poisoning. An estimated 48 million cases of foodborne illness occur each year in the U.S. according to the CDC. Food safety is the use of resources and methods to keep food safe for human consumption. There are typically 40 to 60 outbreaks reported annually in Washington State, each with few to even hundreds of individual cases in each outbreak.

**What has been done**

WSU Extension faculty members delivered 558 training sessions statewide, and logged over 43,000 contacts in 2011. This work included Food Worker Education classes (ServSafe Program), General Ag Practices (GAP) Training for farmers, safe food handling for individuals, food preservation methods, worked with small to mid-size food processors on food safety issues, and responded to a large number of food safety questions from individual consumers.

**Results**

78% of program participants reported an increase in knowledge and skill on food safety practices. There was significant increase in interest among home gardeners on proper food preservation, and many asked for continuing classes in the future. The Germ City Program was a particularly effective means of reaching school-age youth to improve knowledge of hand washing techniques.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
504	Home and Commercial Food Service

- 711 Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
- 712 Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
- 723 Hazards to Human Health and Safety

## **Outcome #2**

### **1. Outcome Measures**

Percentage of evaluated participants who applied at least one practice learned from WSU Extension workshops, conferences, or training sessions.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Action Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	55

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Food can transmit disease from person to person as well as serve as a growth medium for bacteria that can cause food poisoning. An estimated 48 million cases of foodborne illness occur each year in the U.S. Food safety is the use of resources and methods to keep food safe for human consumption. There are typically 40 to 60 outbreaks reported annually in Washington State, each with a few to even hundreds of cases in each outbreak.

#### **What has been done**

WSU Extension faculty members delivered 558 training sessions statewide, and logged over 43,000 contacts in 2011. This work included Food Worker Education classes (ServSafe Program), General Ag Practices (GAP) Training for farmers, safe food handling for individuals, food preservation methods, worked with small to mid-size food processors on food safety issues, and responded to a large number of food safety questions from individual consumers.

#### **Results**

55% of the program participants adopted one or more safe food handling and processing practices learned through the variety of programs and events delivered during the year. Deploying these techniques clearly benefited food safety and shelf-life, and minimized foodborne illness.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

#### Outcome #3

##### 1. Outcome Measures

Percentage of participants who will institute a HACCP plan as a result of attending WSU workshops.

##### 2. Associated Institution Types

- 1862 Extension
- 1862 Research

##### 3a. Outcome Type:

Change in Action Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2011	95

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Food packers and processors in the Pacific Northwest represent the target audience for assessment of this outcome. HACCP is a food safety management system utilized by many food companies to manage food safety risks, meet buyer requirements, and in some cases is a regulatory requirement.

###### **What has been done**

Training was provided for HACCP plan development, implementation, management, and recordkeeping to strengthen food safety of US food products. The workshops are delivered as a 2.5-day course involving lectures and a group learning activity to develop a HACCP plan for selected packed and processed foods relevant to the participants attending the workshop.

###### **Results**

95 of the program participants developed and implemented a HACCP plan based on this training.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
504	Home and Commercial Food Service
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Other (Limited resources to train and supervise)

##### Brief Explanation

Numerous external factors can impact the success of our extension and research programs. Reduced availability of funding has recently impacted our capacity to deliver some programs related to food safety. This year, we have continued to reduce the number of trained volunteers in the state because of limited resources to train and supervise this resource. Because of volunteer training represents cost effective leveraging of food safety information, this is not a desirable outcome.

One development that has significant future potential is the development of the School for Global Animal Health, which is focusing on zoonotic diseases and their potential role as reservoirs for human illness. This effort, which was primarily developed by the WSU College of Veterinary Medicine and funded by Foundations, has involved several ARC supported faculty.

#### V(I). Planned Program (Evaluation Studies)

##### Evaluation Results

3820 Food Worker Education participants completed a post-course survey. 60% indicated their knowledge of how to keep food safe to eat improved after taking the class. Participants indicated they learned more about the following critical retail food safety practices: 59% to cook foods to the right temperature; 65% to hold hot food at 140F or higher; 69% to reheat cold food to at least 165F within two hours; 65% to mix sanitizer properly.

In evaluations from the food thermometer education program, 38% indicated they had



never used a food thermometer when cooking small cuts of meat, prior to the workshop. 75% of the participants said they would now use a food thermometer more often when cooking small cuts of meat.

75% of the EFNEP adult participants demonstrated acceptable food safety practices such as thawing and storing food properly. 92% of the EFNEP youth participants improved practices in food preparation and food safety,

As a result of the Food Worker training, 55% of the participants report they now know how to wash, rinse and sanitize dishes and food contact surfaces to remove germs that can cause illness.

Participants demonstrated increased knowledge of HACCP; average post-test scores increased 1.5 points.

69% of participants anticipated increased employee awareness of food safety and HACCP.

61% anticipated economic benefits for their company.

36% planned to improve recordkeeping practices.

36% planned to perform employee training on food safety.

36% planned to reassess their pre-requisite programs.

34% planned to change or implement pre-requisite programs.

33% planned to improve performance on third-party audits and regulatory inspections.

32% planned to reassess their HACCP program.

92% of the restaurant managers in courses passed the ServSafe test.

## Key Items of Evaluation

In evaluations from the food thermometer education program, 38% indicated they had never used a food thermometer when cooking small cuts of meat, prior to the workshop. In addition, 42% of the pressure gauges that were tested were inaccurate and the consumer was told to purchase a new one. This saved many people from getting ill from food that would have been preserved unsafely and also indicates that gauge testing should be a point of emphasis in the training to enable the procedures taught to be effective.

In a 2-county area in South-central Washington, our Food Safety Educator conducted an analysis of a random sample of 2011 data. There were 8383 food safety program contacts. Each case of food borne illness was estimated to cost \$1,851, and the CDC estimates a one in six chance of an individual experiencing food poisoning each year. Using his metric for the individuals in this sample alone, the impact of this local series of programs could provide a savings of over \$2 million from reduced incidence of food poisoning.

**V(A). Planned Program (Summary)**

**Program # 7**

**1. Name of the Planned Program**

Youth, Family and Community Development

**V(B). Program Knowledge Area(s)**

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
801	Individual and Family Resource Management	5%		0%	
802	Human Development and Family Well-Being	25%		10%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	15%		30%	
805	Community Institutions, Health, and Social Services	5%		50%	
806	Youth Development	50%		10%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Inputs)**

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890
Plan	40.0	0.0	5.0	0.0
Actual Paid Professional	128.0	0.0	0.1	0.0
Actual Volunteer	343.4	0.0	0.0	0.0

2. Institution Name: Washington State University

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

Extension		Research	
Smith-Lever 3b & 3c	1890 Extension	Hatch	Evans-Allen
1324887	0	19081	0
1862 Matching	1890 Matching	1862 Matching	1890 Matching
1324887	0	19081	0
1862 All Other	1890 All Other	1862 All Other	1890 All Other
9128037	0	66010	0

**V(D). Planned Program (Activity)**

**1. Brief description of the Activity**

WSU Extension works with diverse communities in Washington State to address positive youth development issues by providing information, experiential education, activities, technical assistance and local capacity enhancement. Our programs are available without discrimination and we are proactive in addressing the special needs of unique youth audiences and the adults who support their efforts. The proactive nature of our outreach efforts has led to 39% of 4-H statewide membership being youth of color.

WSU Extension addresses youth, family and community development directly through educational programs, demonstrations, and facilitated processes. Training programs and professional development are extended to faculty, staff, volunteers, and partner organizations as well as to specific groups such as professional child care providers. Particular outreach effort was made to and in cooperation with underserved and emerging populations.

Educational programs are targeted to the following:

- Strengthening a sense of belonging for youth so that they will feel emotionally and physically safe in these educational settings and develop positive relationships with supportive, caring adults.
- Increasing decision-making skills, relationship building, understanding of self, learning, management, navigating group processes and communication skills in youth.
- Decreasing risk behaviors of the youth who actively engage in 4-H.
- Increasing adoption rates of health and wellness indicators such as regular exercise activities and improved nutritional choices.
- Improving the safety and quality of child care.
- Mastering relevant skills and technical knowledge areas for youth success.
- Applying best practice prevention programs (e.g. the Strengthening Families Program for Parents and Youth ages 10-14) that engage both parents and their youth will be conducted and evaluated statewide with outreach in both English and Spanish languages.

Research-based programs were delivered by extension professionals and supervised volunteers. These programs include 4-H club programs, in-school and after school programs for youth, and family-based program like Strengthening Families, which focus on enhancing preventive mechanisms. Additionally, communities were engaged to collectively analyze situations, resolve conflicts, and assess and recommend mechanisms to enhance public services. These programs were customized based upon community need and delivered by programs such as Horizons, the William D. Ruckelshaus Center, or the WSU Division of Governmental Studies and Services. Finally, programs were delivered that lead to enhanced leadership and facilitation skills of youth, adults and communities.

**2. Brief description of the target audience**

Target audiences included the youth, adults, and families of Washington and the agencies, decision makers and organizations that support and mentor them. Youth (K-12) throughout the state; military families; urban and rural communities; current and future community and organization leaders; families; and volunteers, teachers and other educators.

**3. How was eXtension used?**

Several faculty members participated in Communities of Practice and two of these serve in a leadership capacity within Communities of Practice.

**V(E). Planned Program (Outputs)**

**1. Standard output measures**

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
<b>Actual</b>	93097	92115	169835	114971

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

**Patent Applications Submitted**

Year: 2011

Actual: 0

**Patents listed**

**3. Publications (Standard General Output Measure)**

**Number of Peer Reviewed Publications**

2011	Extension	Research	Total
<b>Actual</b>	0	0	11

**V(F). State Defined Outputs**

**Output Target**

**Output #1**

**Output Measure**

- Number of workshops, demonstrations, and projects developed to foster positive youth, family and community development.

Year	Actual
2011	136601

**Output #2**

**Output Measure**

- Number of peer reviewed (official) WSU Extension publications published annually.

<b>Year</b>	<b>Actual</b>
2011	18

**Output #3**

**Output Measure**

- Number of graduate students with a significant professional orientation in the area of Youth, Family and Community Development

<b>Year</b>	<b>Actual</b>
2011	26

**V(G). State Defined Outcomes**

**V. State Defined Outcomes Table of Content**

O. No.	OUTCOME NAME
1	Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.
2	Percentage of participants evaluated who applied knowledge or skills from WSU programs.
3	Difference in grade point average between former 4-H members and peer students at WSU
4	Number of persons completing a WSU leadership development program who serve in a community, county, state, or agency leadership role.
5	Number of communities enacting processes to increase economic development or to address poverty and its impacts as a result of WSU programs.

## **Outcome #1**

### **1. Outcome Measures**

Percentage of evaluated participants who demonstrated increased knowledge and skills relative to key learning objectives.

### **2. Associated Institution Types**

- 1862 Extension
- 1862 Research

### **3a. Outcome Type:**

Change in Knowledge Outcome Measure

### **3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	90

### **3c. Qualitative Outcome or Impact Statement**

#### **Issue (Who cares and Why)**

Strong families, positive youth development, and vibrant communities are among the core values of our society. Research has identified a host of threats to these important societal foundations, including substance abuse, lack of parenting skills, divorce, lack of essential life skills, loss of civic engagement, and a deterioration of sense of community among citizens. This broad program area seeks to address many of the core issues through a variety of educational and experiential learning experiences.

#### **What has been done**

A broad variety of educational and experiential activities and events were conducted during the year, including the state-wide 4-H Youth Development Program, Strengthening Families Program, Horizons Community Development Program, and a host of other related projects and programs designed to address issues in our three categories of youth, family, and community. This broad effort reached over 90,000 Youth, 37,000 families, and 68 individual communities directly.

#### **Results**

Aggregate program analysis shows that 90% of program participants in this broad program area benefited by increased knowledge and skill on one or more of the principles taught. Life skills development was among the key components of the knowledge extended to youth, while knowledge that fostered resilient, healthy families were a key element of the work directed at families. Community empowerment was a central theme for our work with communities.

### **4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
801	Individual and Family Resource Management

- 802 Human Development and Family Well-Being
- 803 Sociological and Technological Change Affecting Individuals, Families, and Communities
- 805 Community Institutions, Health, and Social Services
- 806 Youth Development

**Outcome #2**

**1. Outcome Measures**

Percentage of participants evaluated who applied knowledge or skills from WSU programs.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Action Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	80

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Strong families, positive youth development, and vibrant communities are among the core values of our society. Research has identified a host of threats to these important societal foundations, including substance abuse, lack of parenting skills, divorce, lack of essential life skills, loss of civic engagement, and a deterioration of sense of community among citizens. This broad program area seeks to address many of the core issues through a variety of educational and experiential learning experiences.

**What has been done**

A broad variety of educational and experiential activities and events were conducted during the year, including the state-wide 4-H Youth Development Program, Strengthening Families Program, Horizons Community Development Program, and a host of other related projects and programs designed to address issues in our the three categories of youth, family, and community. This broad effort reached over 90,000 Youth, 37,000 families, and 68 individual communities directly.

**Results**

80% of program participants evaluated applied at least one concept, skill or knowledge area to their lives or community as a result of the program effort. Youth demonstrated important life skills learned through their experiences, and families applied one or more of the principles taught for sustaining healthy families. All 68 communities undertook new civic practices or undertook efforts



to improve the quality of life in their local community.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
801	Individual and Family Resource Management
802	Human Development and Family Well-Being
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services
806	Youth Development

#### Outcome #3

##### 1. Outcome Measures

Difference in grade point average between former 4-H members and peer students at WSU

##### 2. Associated Institution Types

- 1862 Extension

##### 3a. Outcome Type:

Change in Condition Outcome Measure

##### 3b. Quantitative Outcome

Year	Actual
2011	18

##### 3c. Qualitative Outcome or Impact Statement

###### **Issue (Who cares and Why)**

Educational attainment for Washington youth has reached a crisis level, with 1/3 of students entering 9th grade not graduating within five years. The statistics for subsets are worse; nearly 2/3 (64%) of Hispanic males fail to graduate from high school. Without significant increases in youth academic attainment, we are creating a permanent underclass.

###### **What has been done**

The 4-H Youth Development Program has a strong emphasis on the Essential Elements of Positive Youth Development. Essential Elements produces strong life-skill attainment. Over 136,000 different 4-H activities and events were conducted in 2011 designed to strengthen life skills including 1,404 4-H clubs, 2,000 school-based enrichment activities, 135 after-school clubs and 48 camping programs. 3,804 adult volunteers (or 66% of the total 4-H volunteer base) participated in at least one life skill building educational opportunity.

**Results**

Washington's 4-H youth continued to outmatch their non-4-H peers in academic competence grades 9-12 by 18 grade points in our sample, and demonstrated stronger attachments and connections to their schools and communities. This improved engagement with school results in increased academic success and higher academic aspirations for young people. As part of annual year-end club reports, 4-H volunteers were asked to report on the high school graduation rates and entrance into post-secondary study.

**4. Associated Knowledge Areas**

KA Code	Knowledge Area
806	Youth Development

**Outcome #4**

**1. Outcome Measures**

Number of persons completing a WSU leadership development program who serve in a community, county, state, or agency leadership role.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

Year	Actual
2011	483

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Strong leadership remains central to organizational, community, and local government success. With a weak economy and rapid turnover of local leadership, training the next generation of leaders remains essential to the survival of most community organizations. Successful training and succession planning can help ease the effects of rapid turnover as well as keep Washington competitive in both the public and private sectors.

**What has been done**

WSU Extension has a long history of local leadership training. In 2011, leadership training was conducted through a number of Extension entities, mostly notably the Division of Governmental Studies and Services (DGSS), that supports local government officials and state agency managers; the Horizon Project, aimed at poverty reduction in small rural communities; and Leadership Skagit, a leadership training program aimed at community and business leaders.

**Results**

483 community leaders completed training in our community leadership development program. All received rigorous training through a comprehensive curriculum, providing a foundation for the next generation of leaders and decision-makers in their respective communities. At the same time, Extension programs positively influenced two state agencies, three tribes, sixty-eight communities, and a multitude of non-profits and organizations through this effort.

**4. Associated Knowledge Areas**

<b>KA Code</b>	<b>Knowledge Area</b>
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

**Outcome #5**

**1. Outcome Measures**

Number of communities enacting processes to increase economic development or to address poverty and its impacts as a result of WSU programs.

**2. Associated Institution Types**

- 1862 Extension
- 1862 Research

**3a. Outcome Type:**

Change in Condition Outcome Measure

**3b. Quantitative Outcome**

<b>Year</b>	<b>Actual</b>
2011	27

**3c. Qualitative Outcome or Impact Statement**

**Issue (Who cares and Why)**

Poverty and lack of opportunities continues to plague rural communities in many areas of the state. This situation leads to ongoing societal problems ranging from unemployment to substance abuse, among a host of other problems that force communities into a downward spiral. Our approach to addressing this is based on empowerment of local leaders with training and knowledge to confront these local problems with new and innovative ideas.

**What has been done**

In 2011, WSU Extension's Community Development program continued to provide community-focused coaching to 40 Horizons Alumni communities and residents in the surrounding communities (from the Canadian border in Northeast Washington south to the Columbia River in South-central Washington and then across to the Southwest corner of the state). 9,641 people

attended 264 workshops and trainings throughout the geographic area served by the grant.

### Results

Of the communities that participated in the WSU Extension Horizons project, 27 enacted economic development and poverty reduction plans. These plans identified strategies to reduce poverty, build wealth, and align their communities for future success. In taking ownership for their future, 22 communities planned to seek new funds to continue to expand their poverty reduction plans by utilizing their leadership skills developed through the Horizons project.

#### 4. Associated Knowledge Areas

KA Code	Knowledge Area
803	Sociological and Technological Change Affecting Individuals, Families, and Communities
805	Community Institutions, Health, and Social Services

#### V(H). Planned Program (External Factors)

##### External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)

##### Brief Explanation

Numerous external factors can potentially impact the success of our programs. Reduced availability of funding has most recently challenged our ability to meet projected targets. We have increased our use of technology to maximize staff efficiency; however, this sort of increased output per professional FTE cannot be expected to continue to rise at current rates. Changes in political priorities also impacted the effectiveness of our work either by changing the availability of resources supporting our programs or by altering the available options for target audiences. Additionally, legislative action created new pressures on extension educators due to unfunded mandates and changes in organizations, which have been traditional partners. This past year, flooding and weather changes have impacted the demand for community, family and youth resources in some locations.

#### V(I). Planned Program (Evaluation Studies)

##### Evaluation Results

To judge whether the goal of leadership training is met, Extension staff include participant self-reporting in their programs. This often takes the form of session and/or program evaluations to gauge training quality and knowledge gained. In addition, the leadership programs funded through private foundations include formative and/or

summative evaluations of the program's effectiveness. The results of doing both participant and program evaluations allows WSU Extension to keep materials current and tailored to those it serves.

In follow-up activities, the percentage of clients that change their mode of operation to include collaborative approaches to public policy development and/or number of clients that incorporate applied research findings and research-based recommendations into public policy is assessed.

## Key Items of Evaluation

Strengthening Families Program facilitators administer evaluations to parents and youths separately on the first and last nights of the program (pretest-posttest). The evaluation consists of validated measures assessing risk and protective measures in the domain of family functioning. For parents mastery is considered to be a positive change on at least one of 5 parenting behavior scales from beginning to end of program. 90% of the parents master at least one concept/skill learned in the program.

Parents who participated in the Children Coping With Divorce self-report knowledge gains in six content areas (grief process, active listening, community resources, managing economic changes, co-parenting, and child development) increased 0.77 points on a 5-point Likert Scale. Satisfaction levels among participants remain high: While 55% of participants resented the requirement to attend, after the four hour course 95% reported that they were "Glad they came."

In the WA 4-H program, attitude change was assessed using two assessment approaches. Various classes that had a total of 6+ hours contact time with youth were assessed. Both of these assessments evaluated for the life skills of: decision making, communication, accepting differences, and marketable skills. The average for all life skills proficiency was from a pre-test of 2.12 to a post test of 3.06 on a 1-4 scale, a difference of .94 or 44% increase in life skills. The teacher interviews, of youth present when the survey with the class was done, reported that 98% of youth believed that they had personally experienced life skill development. (n=586)

Through the Salishan 4-H afterschool Program in Pierce County, a life skill development assessment survey was administered. Attitude change was assessed using two approaches. Various classes that had a total of 6+ hours contact time with youth were assessed. Both assessments evaluated for the following life skills: Decision Making, Communication, Accepting Differences, and Useful/marketable skills. The average for all life skills was from a pre test of 2.12 to a post test of 3.06 on a 1-4 scale, a difference of .94 or 44% increase in life skills. The teacher interviews of youth present when the survey with the class was taken, reported 98% increase of youth believing that life skills development occurred.

98% of the parents that participated in the State Strengthening Families Program indicate 89% of parents apply at least one concept/skill learned in the program. Statewide, the cost benefit assessment figure applied to the Strengthening Families Program revealed \$3,014,400 dollars saved (cost benefit assessment of potential costs of treatment avoided through prevention of problem behaviors, e.g., substance abuse, delinquency) in 2011.

In 2011, 86% of Washington 4-H youth entering post-secondary education with a 92%

graduation rate (compared to Washington State average of less than 73% graduation rate). Hence, the lifelong earning power of 4-H members will be collectively better than their peers and thereby strengthen their over-all contributions to their communities and the society in general.

The long-term outcome of the 4-H program is to develop caring, capable, and contributing adults. A three year longitudinal assessment with 4-H volunteer club leaders in Pierce County indicated a continual increase of youth pursuing post secondary education and/or a job following graduation. (From 87% in 2009 to 100% in 2011.)

166 WA Statewide Rural Conference participants reported on the post-conference evaluation that they would "use the skills/information" that they learned while attending the educational workshops.

230 community members increased their understanding of the overall political process; took action to amend state policy affecting rural schools; and organized dialogue with local commerce and county government regarding environmental and small business regulations.

Of 28 graduates in Leadership Skagit, almost all have undertaken a community project or involvement and more than 5 have taken leadership positions in their communities.