

# 2016 University of Puerto Rico Combined Research and Extension Plan of Work

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## I. Plan Overview

### 1. Brief Summary about Plan Of Work

The University of Puerto Rico Agricultural Experiment Station (PRAEXS) and the Puerto Rico Agricultural Extension Service (PRAES) share the mission of improving the quality of life in Puerto Rico through research and education programs focused on the needs of our stakeholders. Our programs promote an economically viable agricultural sector, conservation of natural resources, the adoption of sustainable energy alternatives, family well-being, obesity prevention, youth life skills, leadership, and community development. In addition, they also support the safety of consumers and of industries that process food and agricultural raw materials, and provide the technological base and education required for solving the problems affecting farmers, farming operations, public and private institutions, and local communities.

The 2015 Combined Research and Extension Plan of Work (POW) was the first ever Research and Extension joint submission in Puerto Rico and provides our plans until 2019 based on our assessment of the situation and priorities of the different areas. The current update introduces little change from last year's plans. Nevertheless, particular attention was paid to updating the situation, knowledge areas, outputs and outcomes of the combined programs to reflect the contributions of new research projects and extension activities.

As in the past, this POW incorporates the input from our stakeholders, collected in the case of the PRAEXS during yearly meetings of commodity groups and during workshops and field days. It also considers recommendations received from farmers' organizations as well as from government officials who contact PRAEXS staff directly. This input helps to identify major constraints in agricultural production and to establish priorities that should be targeted by our research programs. In the case of the PRAES, stakeholder input continues to be received through the participation of key public and private leaders in meetings specifically convened to gather their views on Extension's agenda, and through the input received in meetings of the Local Advisory Committees. The integration of public and private sector officials, as well as of religious, civic, and social leaders from different organizations in the assessment process determining local needs, has been critical in obtaining their collaboration and for involving their organizations in the search for solutions to the problems identified.

Puerto Rico's almost decade long economic recession continues to affect all sectors of the island. Concerns about Puerto Rico's short to medium term liquidity loom large among investors and government officials, perhaps forecasting additional reductions to our budget. This will most likely force us to further evaluate restructuring alternatives that maximize our impact. Aware, nevertheless, of the critical role played by research and educational programs in the search for alternatives to the myriad of problems racing Puerto Rico, this POW reflects our collective proposals and agreements on the roadmap that should be followed to continue fulfilling our mission and accomplishing our long-term goals.

The combined planned programs for FY 2016-2020 presented in this POW are: (1) Global Food Security-Plant Production Systems, Genetic Resources and Breeding (PPSGRB); (2) Animal Systems; (3)

Integrated Management of New and Emerging Pests and Diseases; (4) Climate Change, Natural Resources, and Environment; (5) Food Safety, Science, and Technology; (6) Community Resources for Sustainable Development, Agricultural Economics, Marketing and Added Value, and (7) Sustainable Energy. The PRAES Global Food Security and Hunger program is solely extension-oriented because the PRAEXS addresses food security in several programs (such as Animal Systems and PPSGRB) and not as an independent initiative. Finally, the Adult and Childhood Obesity program, the Family Well-Being program, and the Strengthening Youth Life Skills, Leadership, and their Community program, also remained solely extension oriented because at present the PRAEXS has no research faculty or activity in these areas.

### **PLANNED PROGRAMS:**

Under our combined **Plant Production Systems, Genetic Resources and Breeding Program** (PSGRBP) research and extension faculty expect to address some of the most important constraints faced by our stakeholders regarding low soil fertility, erosion, production inefficiencies, lack of seeds to expand plantings, availability of disease resistant cultivars and of prospective profitable new crops. These are problems that must be actively targeted to improve food security in Puerto Rico and other tropical countries. To accomplish the goal of increasing production and productivity in an environmentally efficient way, among other research and extension approaches, our joint program relies on: the introduction of new germplasm addressing production constraints, or promising new crops; gradual re-evaluation of production recommendations for all crops; continued research and education on better management practices, for both of organic and conventional systems; evaluation of production under protected structures and dissemination of promising results; production of disease-free planting materials through micro propagation and other techniques; education on biological control of pests and organic matter incorporation to soils, where appropriate; and promotion of farmer networks to support crop production. Our research expertise and educational experiences with many tropical crops that are potentially important for increasing food production in Latin America, the Caribbean, and Africa, underscore the continued importance of this program not only locally but also as a contributor to national efforts addressing the Global Food Security and Hunger priority.

Our **Animal Systems** program is perhaps the most integrated of all, with extension and research faculty actively participating in both research projects and extension educational activities. The situation of most livestock sectors has deteriorated in the last decade as a result of the high prices of concentrated feeds and energy costs, degraded pastures, high fertilizer prices, poor reproductive performance, decreased milk sales, and the effect of other conditions including deficient animal identification and record keeping. In the dairy, beef, and small ruminant subsectors our efforts to advance solutions rely on the education and training of producers in pasture management, soil testing and utilization of inorganic and organic fertilizers, crop rotation, and biological methods of pest control. Animal breeding research will continue towards the development of dairy cattle more tolerant to heat stress, one of our long-term strategically important directions. Farmers' education in genetic selection for economic traits, such as profit index and profitable life index, will also be emphasized along with improved reproduction management practices. In combination with faculty working on the development of new products using surplus fluid milk under the Food Safety, Science and Technology program, Animal Systems extension faculty will assist entrepreneurs wishing to establish operations that manufacture diverse dairy products. Activities geared toward other animal subsectors include recommendations of more energy-efficient technologies, proper infrastructure and efficient equipment for dairy goat producers.

The increased pace of introduction of new pests and diseases--an impact associated with climate change-- coupled with emerging ones, can undermine current efforts to improve food security in Puerto Rico. Our joint research and extension program on the **Integrated Management of New and Emerging Pests and Diseases** will maintain ongoing collaborative efforts emphasizing surveillance of our current crops and farming systems, and the development of integrated management practices for the major pests

and diseases affecting our most important crops. The development of citrus greening (CG) control practices adapted to our conditions has a high priority in this plan due to the severity of the disease in areas impacted. An educational program to disseminate research results and management options for CG and its vector is planned. In the case of other crops, vegetables in particular, growers' presumable lack of awareness of alternative management practices results in a great dependency on pesticides for pest management and vector control. Accordingly, besides continuing to test mitigation methods and integrated management practices for established pests and diseases, to improve the sustainability of crop production on the island this POW emphasizes the development of baseline information on new pests and diseases, as well as the rapid dissemination of this information to educators and growers through meetings, workshops, field guides, demonstration plots and Web resources.

Extension and research faculty collaborating with our **Climate Change, Natural Resources and Environment** program are fully aware of the challenges posed by climate change in terms of an accelerated pace of biodiversity loss, land degradation, water availability and through the spread of invasive species. Expected higher temperatures, altered rainfall patterns, and more frequent or intense extreme-weather events can greatly hinder agricultural production and community well-being. PRAES educational efforts will stay focused on capacity development of climate change, water quality, watershed protection, soil erosion, the prevention of brush fires, and on the emergency management of natural disasters to prevent losses. We will continue approaching these topics through workshops, seminars, and conferences, among other methods. On the research side, efforts will continue to prioritize on pollution prevention and mitigation, and development of methodological advancements and management programs to protect watersheds and soil resources. Improving soil quality and crop yield through organic amendments is also a priority as well as continued research on the pathways of entry, biology, and ecological impact of non-native species. This information is vital for the development of management approaches for conserving and restoring biodiversity. Finally, since land availability is critical for farming, we have maintained the stakeholder-driven priority of developing a digitalized inventory of agricultural land use, with the expectation that a joint proposal is developed in the future to address this need.

It has been estimated that Puerto Rico imports about 85% of its food. The role of the agro-industry is to ensure a safe and sufficient supply of nutritious food at an affordable price, while minimizing the impact on the environment. The **Food Safety, Science and Technology** program has integrated the extension goal of targeting individuals and the food industry sector to adopt food safety handling practices, with research in the food science technologies that develop new, added value, and safe food products. The Extension educational component consists of four food safety curriculums dedicated to different types of participants: consumers, food managers, university personnel and other professionals, and industry. Extension priorities remain focused on offering the Food Safety Certification Course to persons in charge of retail food establishments, on offering the newly expanded food safety curriculums for consumers, and on offering formal education to professionals who enforce compliance regulations. As Extension transfers knowledge of better food handling practices at the consumer and food establishments level, researchers will work on developing better safety and quality parameters, ensuring safety processes in the development of new added-value products and on postharvest and packaging technologies. By maintaining the safety, quality, and nutritional value of our agricultural goods in the supply chain, this planned program contributes to our nation's food security and healthy lifestyles.

The combined **Community Resources for Sustainable Development, Agricultural Economics, Marketing, and Added Value** program offers a joint socioeconomic perspective on the major problems affecting farming and communities in Puerto Rico, and the research/extension-oriented alternatives advanced to partially address them. From the perspective of agriculture, the vulnerability of local production to competition from abroad and the loss of farming profitability, among other problems, threatens the sustainability of agriculture and of rural livelihoods. Researchers suggest that to tackle these problems the PRAEXS needs to dedicate substantial efforts to help stakeholders innovate, control costs, find new market niches, and make better use of precious natural resources. On the other hand, urban and

rural communities continue to experience sustained poverty levels, unmanageable criminality, domestic violence, high levels of school dropouts and drug addiction, and other complex social problems. In view of these, the PRAES will continue to focus on holistic educational strategies and community oriented initiatives that promote self-employment, sustainability, self-reliance, and empowerment. In addition to training activities, special emphasis will be devoted to mentoring and coaching strategies that promote family or community-based low-scale agriculture, and other economic initiatives such as local markets and business incubators.

The last and smallest of our integrated research and extension programs is the one dedicated to **Sustainable Energy**. In Puerto Rico the high cost of energy affects the economic well-being of both citizens and of local industries. Energy expenses, in the case of farming operations, significantly increase production costs and affect competitiveness in the market. Accordingly, the long-term goal of this program is to achieve greater energy efficiency and reduce the operating costs of farming and agro industrial operations on the island by diversifying and improving the design of energy alternatives available locally, assessing the cost-effectiveness of these alternatives, and disseminating this information to stakeholders. At present photovoltaic technology remains the renewable energy resource most readily available for use by the island's agro industries, but research efforts are also geared towards optimizing energy generation alternatives from agricultural wastes. Extension's experience with more technically oriented clients shows that they wish to learn about new technologies, but are concerned about making capital investments without big government incentives. Nevertheless, PRAES will continue offering orientation in all aspects of energy sustainability--from basic concepts of energy audits and conservation, to the use and demonstration of technologies. On the research side, while all of the projects formerly active in this program have officially terminated, collaborating faculty remains interested in submitting new proposals if new local funding opportunities are opened.

The **Adult and Childhood Obesity** program has integrated the adult component in our title to more adequately reflect the content of our work. With a science-based focus, this planned program intends to work in accordance with the goals set by Healthy People 2020, which include reducing the percentage of people who are overweight or obese. The ultimate goal of this program is to reduce the prevalence of adult and childhood obesity through improved nutrition, physical activity and healthy lifestyles. To accomplish this goal, this planned program will work on strategies presented by the Department of Health and Human Services 2010 Dietary Guidelines for Americans, which focus on the promotion of healthy lifestyles, nutrition adequacy and physical activity. Educational strategies will continue to focus on the areas of: healthy food choices; portion control with the adaptation of My Plate to the Puerto Rican diet; skipping meals; large portion sizes; low intake of fruits, vegetables, whole grains and water; and high consumption of sugared drinks, saturated and trans fats, among other practices. The message of food security is also integrated into this program through the promotion of gardening as an effective and low-cost means to increase the consumption of fresh fruits and vegetables, as well as of increasing physical activity. The specific aims are to implement educational curricula that include culturally and age-appropriate healthy eating patterns, physical activity, and gardening; all of which are essential in reducing the risk of obesity and of chronic disease, and of improving the health of adults and children. Since the PRAEXS does not have any faculty active in this area, during FY 2015 this program will remain based in Extension.

In addition to the National Initiatives, Puerto Rico faces a number of critical social and economic issues that have become a priority for our families and children. The **Family Well-being** planned program combines the major areas of the Family and Consumer Sciences' base program, in order to address these issues. As experts and responsible academics we need to address those global issues that affect our agriculture and our natural environment. There is also the urgency to decrease the decomposition of our society affected by the lack of social values that the long-term economic crisis has amplified. As families learn to deal with human relations, finances, parenting skills, and domestic violence against women, the elderly, and children, the individuals will be in a better position to acquire new knowledge in other important areas of their family development, such as nutrition and food safety. We, therefore, believe our

**Family Well-being** planned program is a major state initiative that will continue for years to come so as to accomplish its main goals. These goals will also be accomplished through the establishment of coalitions and collaborative agreements with other public and government agencies.

A major component of our Plan of Work is Youth Development. Through our entitled **Strengthening Youth Life Skills, Leadership and their Community** planned program, from its Youth and 4H Club base program, Extension focuses on our children and youth 5 to 18 years old, particularly those in low-income communities and schools. The main goal of this program is to increase the number of youth who have improved their life skills for a positive youth development. This is achieved by integrating three 4H National Council mission mandates: leadership, citizenship, and community; science and technology; and healthy lifestyle. Since our Agents are trained in these technical matters, our 4hers received an integrated curriculum toward their positive development. The diversity of educational strategies based on experiential learning activities such as workshops, camps, and contests, provides them with the needed opportunities to expand their knowledge and develop the necessary life skills to achieve a positive development and become productive and responsible citizens. New curricular guides are being developed to address and update the critical issues facing our youth today, such as prevention of alcohol and drugs consumption, and sex education. During these coming years the development of new educational material for younger ages (ages 5 to 8) is also planned. Expanding social media is also in agenda, to spread our educational messages, promote activities, and reach a larger audience.

**Global Food Security and Hunger** has emerged as a major risks of the 21st century (Global Risk Forum, 2008). For Puerto Rico, working towards attaining food security is imperative due to its being an island. Imports (85%) are the main source of food because of an extremely low domestic production. In 2009, only 18.9% of the food and beverages consumed in Puerto Rico were produced on the Island (External Trade Statistics, 2009). Extended supply chains that generate competitive advantage for agribusiness and people, increase, however, the vulnerability of Puerto Rico's food system to disruptive risk.

Low local agricultural production; continued loss of agricultural land; a high dependence on imported foods; and oligopolistic food import and transport logistics are among the vulnerabilities of Puerto Rico's food supply chain. In addition, food reserves are not clearly identified, a mature food security policy does not exist, and the sea routes of the island's food imports match the path of Caribbean hurricanes. Ensuring Puerto Rico's food security presupposes the elimination or reduction of these vulnerabilities. As previously noted, this program is solely extension oriented since research contributions to food security are mostly included within our integrated Plant Production Systems, Genetic Resources and Breeding; Animal Systems; and Community Resources for Sustainable Development, Agricultural Economics, Marketing and Added Value programs.

One final note is perhaps pertinent with respect to the FTEs planned for the fulfillment of this POW. In the case of the PRAES we have estimated that 159.6 FTEs will be devoted to these programs over the next five years. Although we are currently in the process of recruiting new personnel, the retirement of a significant number of faculty members over the past two years will probably offset any positive change in our FTE's numbers. In the case of the PRAEXS, the FTEs reported under each planned program are only those financed by Hatch funds. These FTEs amount to approximately 45% of the total FTEs budgeted for these programs, which on average we currently estimate to be around 54.7 FTEs.

**Estimated Number of Professional FTEs/SYs total in the State.**

Year	Extension		Research	
	1862	1890	1862	1890
2016	159.6	null	54.7	null
2017	159.6	null	55.1	null
2018	159.6	null	56.2	null
2019	159.6	null	56.5	null
2020	159.6	0.0	56.5	0.0

**II. Merit Review Process**

**1. The Merit Review Process that will be Employed during the 5-Year POW Cycle**

- Internal University Panel
- External University Panel
- Expert Peer Review

**2. Brief Explanation**

The Merit Review process for Extension continues to be conducted through four committees representing each of the four major programs: Agriculture, Marketing and Natural Resources; Family and Consumer Sciences; Four-H and Youth Development; and Community Resource Development. Each committee is composed of at least five members: Internal University members (the program leader, two specialists--one from the Planning and Evaluation Office and one from the major subject area), a researcher from the Agricultural Experiment Station and other faculty members, and external non-University members (representatives of the major government agencies or organizations that work with similar audiences). External Members to the different committees include representatives from government agencies at the regional or state level, such as: Department of the Family, Department of Education, Department of Agriculture, the Mayor's Office, the Governor's Office for Youth Issues, Rural Development Corporation, the Farmers' Association, Farm Service Agency, Consumer Department, Head Start, Police Department, as well as representatives from non-governmental organizations, the religious sector and the private sector, among others. Each committee meets at least twice during the fiscal year to evaluate the proposed plan of work. External committee members evaluate the quality and relevance of the activities and programs to the State goals and offer recommendations in order to continue emphasizing critical areas in our programs. A written report is prepared at the end of each fiscal year by the program leader, in accordance with the committee members. The report is presented to the committee and describes how the committee's recommendations will be addressed and incorporated in the Plan of Work.

In the case of the PRAEXS there has been no significant change in our program review

process since last year's POW update. We continue to allocate part of our Hatch-funded research to competitive project grants selected on the basis of an annual call for proposals with the year's revised priorities. More specifically, the scientific peer review process of Hatch proposals is the following:

An annual call for proposals which includes the year's revised research priorities is prepared and distributed by the PRAEXS Research Office. Proposals are submitted to the Assistant Dean for Research with the preliminary endorsement of the respective Department Head. The Assistant Dean for Research sends the proposal to a local peer reviewer and to an external reviewer for their written comments on the scientific merit of the proposed research and compliance with the PRAEXS strategic plan. Proposals and their reviewers' input are discussed and evaluated by the CAS Associate and Assistant Deans for Research, and a final decision is taken by the administration. Project directors of the selected proposals are given the opportunity to incorporate reviewers' suggestions and make adjustments as appropriate. These proposals are then sent to the USDA-NIFA Office of the Administrator, where the respective national program leaders review them. Once the proposals are approved in Washington, the new or revised projects are included in the PRAEXS research program.

### **III. Evaluation of Multis & Joint Activities**

#### **1. How will the planned programs address the critical issues of strategic importance, including those identified by the stakeholders?**

This POW incorporates the input of PRAEXS researchers and stakeholders attending workshops, seminars and commodity group meetings during the past years. During these activities, participants identify the most pressing needs that should be addressed by our research program. Not all issues can be dealt simultaneously; therefore, annual meetings of commodity groups continue to be held to evaluate research progress and to reassess research priorities. The list of priorities assembled is used in the year's call for proposals for new Hatch and Special Projects. Researchers also review this list when applying for grants financed by external funds. Meetings are also periodically held with extension faculty to work on incorporating research results, updating technological alternatives to problems, into the recommended management practices for different commodities and agroindustrial processes. Project results are also disseminated in publications, web pages, podcasts and other alternative means appropriate for reaching different audiences.

In addition, state funds targeted toward solving pressing needs of the agricultural sector are accessed by our researchers through proposals addressing issues of concern identified by the local Department of Agriculture. We envision this process as an opportunity to develop projects focused on more immediate critical situations, while liberating other institutional funds for more complex research problems requiring a longer-term commitment and an integrated interdisciplinary approach toward solutions.

PRAES continue working with critical issues of strategic importance that are addressed through the five national initiatives and have been integrated across the four base programs. In addition, the Local Advisory Committees are a main mechanism to identify local needs of our stakeholders in the municipalities. These needs are addressed locally in the plan of work of every municipality. Most of these issues are already incorporated as part of our planned programs.

The Merit Review process, conducted for each base program, also provides an additional perspective to the needs of our stakeholders, as numerous agencies and groups working with

similar audiences contribute to the need. In the area of agriculture, commodity meetings provide a more specific identification of critical issues.

Within the Agriculture program one of the most critical issues is the impact of the introduction of new devastating pests and diseases, such as the coffee berry borer (*Hypothenemus hampei*), the black sigatoka (*Mycosphaerella fijiensis*) in plantains and bananas, and the citrus greening (Huanglongbing) in citrus fruit orchards. These problems are dealt through the implementation of Integrated Crop Management Practices (ICMP) that includes adoption of integrated pest management practices to protect the environment by means of natural resources conservation that contributes to the competitiveness and sustainability of Puerto Rico's agriculture.

The critical issue of childhood obesity, a National Initiative, continues to be addressed through collaborative efforts between all our four base programs. Mainly with the Family Consumer Sciences (CFS) and with the Agricultural base program which emphasize the establishment of family, urban, and community gardens as a means to promote the consumption of fresh fruit and vegetables. At the same time, this effort address food security too. Extension continues collaboration with the PR Department of Agriculture and the Department of Education in the establishment of school vegetable gardens. Another critical issue identified in CFS base programs, continued to be child maltreatment and economic issues. Both are addressed in the Family Well-being Planned Program.

Effective and constant communication with youth participants in 4-H program activities / events provided input from their perspectives. For instance, in the 4-H State Conference, the participants had the opportunity to present and discuss issues that they understand the program must contemplate as priorities. One critical issue identified is the need to create youth and adults networks. Issues such as, work with elderly and with peers, as well as with youth with disabilities were areas identified by 4-H youth as critical issues to work in 4-H program. Besides, 4-H continue working with the key critical issue of alcohol prevention and drug consumption among youngsters through a collaborative project between PRAES and ASSMCA.

Local Advisory Committee meetings were held to identify new needs to be addressed by the Community Resources Development Program (CRD). The lack of employment opportunities continues to be identified as the most pressing need. CRD program efforts are focused in the creation of self-employment and community based economic opportunities. These were identified as the most important critical issues.

## **2. How will the planned programs address the needs of under-served and under-represented populations of the State(s)?**

The Family and Consumer Sciences planned programs continue targeting under-served and under-represented groups including low income families, adolescent mothers, elderly people, at risk population, and women heads of households, as well as individuals with physical, social and economic disadvantages. It also targets the under-served audiences of single fathers, grandparents raising grandchildren, battered women and children living below poverty level.

4-H program plans to keep creating opportunities were under-represented audiences could participate. Some examples are the 4-H Youth Tennis Program, which integrates a Healthy Living program and physical activities using tennis sports with disabilities participants and low income kids. Tennis sport traditionally was associated with high social class level. But the 4-H program and the municipality of Juncos, volunteers and a tennis instructor, all together changed participant's way of thinking and families about practicing tennis.



A definition for under-represented in Puerto Rico is the population living in poverty, which is the main focus of our program. Focusing in this group, PRAES have created initiatives that centers in training and developing business for women, disadvantaged farmers and community services providers. Other private enterprise-community initiatives worked in the establishment of community vegetable gardens to promote recreation and the production of locally grown food.

Within the personnel and budget limitations of the PRAEXS, this POW incorporates measures to ensure that research will benefit organic farmers, small-scale farmers with low educational levels, women in farming, and rural communities in need of better tools to deal with pressing public policy issues. Most planned programs include work groups between researchers and extension specialists, both to conduct the work planned and to translate research results into educational materials for a broad audience. This includes tailoring best management practices to different scales of production, varying cropping systems, and the range of soil and climatic conditions found in Puerto Rico. Research on tropical organic systems has been included into the priorities of several commodities, and several projects are now underway to promote environmentally friendly organic management practices, and to develop an organic seed production program in the island. Collaborations by researchers in extension initiatives related to public policy issues and in a multi-state SERA project on this topic are also underway. In the past few years investments were made in upgrading research facilities in substations around the island, also improving their internet access and computer resources. Some of these resources are available to visiting stakeholders residing in neighboring rural communities. Altogether, this POW implementation involves the continued education of researchers on the diversity of stakeholders in Puerto Rico and on the need to incorporate their concerns into our programs.

### **3. How will the planned programs describe the expected outcomes and impacts?**

Each program has designed several outcomes to monitor progress. These indicators will be evaluated periodically in order to make the adjustments needed to achieve the desired impacts. In the PRAEXS, most outcome indicators are focused on changes in action. Most programs plan to record information about participants in program activities to follow-up on adoption of recommendations, or to assess factors affecting the achievement of the planned goals. It is expected that as people increasingly adopt the recommended practices, this will eventually result in improved social, economic, environmental, and civic conditions, therefore we will be able to measure changes in conditions. Impacts of the planned programs will be described in the impact statements. Some programs will use official records (of commodity production, water quality in a watershed, etc.) to monitor the impact that program interventions may have had upon the targeted population, while other programs will need to design a study to assess if the expected impacts are being achieved.

Every planned program at PRAES describes the expected outcome and impacts through outcome indicators reported in the Electronic Reporting System that collects data throughout the state. Impacts are collected through local and state success stories and reported in the section Impact Statements of the Annual Report.

Overall, the PRAES Agricultural planned programs outcomes will focus on: percentage of farmers adopting recommended practices, improvement in the quality of the products, increases in market share of local produce and increases in local agriculture production.

The Family and Consumer Sciences planned programs focuses on changes in knowledge and skills and on the adoption of recommended practices.

The Youth Development Planned Program, in addition to the data collected through our state reporting system, describes in the Impact Statements the outcomes achieved through special projects. Some of these special projects are the 4-H state project Route for Healthy Living, Food Systems and Food Security, Alcohol and Drugs Abuse Program, Youth Agro-events.

Success stories are the main descriptive methodology used to support quantitative data being informed in both, output and outcomes indicators. In addition, focus groups were held with community leaders to assess the level of knowledge and understanding in the areas of emergency and natural disaster management.

#### **4. How will the planned programs result in improved program effectiveness and/or**

PRAES planned programs continue to improve their efficiency through collaborative multi-institutional efforts with major agencies and institutions that work with similar audiences such as the PR Department of Agriculture, Farm Service, Rural Development, NRCS, Commodity Farmers' Association, The Family Department, the Head Start Program and the Departments of Education. Specifically, PRAES unite efforts with the Agricultural Experiment Station where Extension agents and researchers work together in the organization of commodity meetings in which critical issues are discussed with farmers and other audiences related to agriculture. Periodic progress evaluations are conducted to evaluate how programs are accomplishing their objectives and impacts.

The Community Resources Development by Fostering Sustainable Communities Plan Program plans to continue working with its community based economic initiatives activity and organizing new community groups.

The combined PRAEXS and PRAES planned programs are designed to address the needs of our populations. Educational techniques will be constantly evaluated to adapt to the skill levels of the participants and their educational needs, therefore, resulting in increased program effectiveness. Process evaluations, including methodologies such as focus groups, interviews, and on-site observations will be conducted periodically to evaluate strengths and weaknesses of the planned programs. Major emphasis will be placed in the development of on-line educational videos and modules in order to reach a larger population. Multi-institutional and integrated activities will contribute to achieve the efficiency of the planned programs.

We believe the adoption of the current POW will reinforce and expand ongoing research and extension collaborations, particularly in the adaptation of research results to local production systems but also in the implementation of other aspects of our programs. Integrated research and extension projects have had important successes in the past that should help model the present combined programs. Nevertheless, as is the case with other aspects of this POW, only periodical monitoring of the programs' progress will help determine if the program is being effective and help identify ways to improve efficiency.

### **IV. Stakeholder Input**

#### **1. Actions taken to seek stakeholder input that encourages 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

**Brief explanation.**

Extension's Stakeholder input process conveys mainly traditional participants or program's clientele who are members of the Local Advisory Committees. This clientele have vast experience in the four major Extension programs and include farmers, homemakers, youth and key community leaders. State agencies' representatives with similar clientele, who are also members of the local advisory committees are invited to participate in the stakeholder input process.

In the case of PRAEXS, two types of meetings are held to identify critical issues that should be addressed by our programs. First, annual meetings with researchers, extension faculty, farmers and other members of the public interested in the work performed in the different programs or commodity groups continue to be held. Both the commodity leader and other Extension personnel identify and invite member of producers associations, individual farmers, faculty and students, government officials and community organizations with an interest in the commodity's work and related research programs. These meetings are also announced in the PRAEXS web page, podcasts, and radio programs. Second, commodity group leaders, program coordinators and directors of College of Agriculture Sciences integrated academic department continue to organize thematic workshops, seminars and field days where research results are shared and the research and extension needs or public policy determinations are discussed. Participation in these thematic activities is encouraged through internal university communications, emails sent to already identified stakeholders, press releases, and personal invitations by the activity organizers.

**2(A). A brief statement of the process that will be 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
- Open Listening Sessions
- Other ((consultations with local extension agents and commodity leaders))

**Brief explanation.**

Extension's stakeholders are mostly the local (municipal) advisory committee members.

Research stakeholders are identified through commodity leaders, extension personnel and through local advisory committees established by CAS administrators. Since many meetings are also announced on the PRAEXS web page, interested public not targeted by these invitations also attend the meetings.

**2(B). A brief statement of the process that will be 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 individuals
- Meeting with the general public (open meeting advertised to all)
- Other (Focus group, electronic communications)

**Brief explanation.**

Input from Extension's stakeholders is collected at the local advisory committees meetings. Stakeholders are asked about the most critical issues affecting the different areas comprised in our educational programs, including: agriculture, families, youth and communities. They are also asked to help prioritize these issues. Focus groups are periodically conducted at the state level with a representative sample of the committee members and other participants of our educational programs. A written report is prepared by the county agents in collaboration with the committee members and sent to the PRAES Planning and Evaluation Office at the State level, which collects and analyzes the data.

Input from research stakeholders is collected at the meetings conducted by commodity and program leaders. Stakeholders are asked about the most critical issues affecting their commodities and local areas, as well as our research priorities. This information is summarized in a report made by the commodity and program leaders. Increasingly, stakeholders contact researchers and program leaders through the internet media. Stakeholders initially identified by electronic contact, are included in subsequent commodity or research activity invitations. Preferences and concerns voiced through digital means are also included in the reports presented to the administration.

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

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

**Brief explanation.**

Input collected from the Extension's stakeholders are received at the state level and discussed at staff meetings with program leaders and Planning and Evaluation Office, and Associate Dean, in order to set priorities for our educational programs. Data collected from the stakeholders at local level, will also share with the specialists, according to the area of need. Needs related to the area of agriculture will be collected in a report to be sent to PRAES specialist's what participated in the commodity joint meetings with PRAEXS. When there are issues which required to be highlighted, the programs are redirected to address these issues. Also new emerging issues are identified through these processes and analyzed according to the staff and resources available to address them. When needed, recommendations will be set for hiring staff. At the local level, input offered by the stakeholders is used to set priorities for their local plan of work.

The input received in PRAEXS meetings from all stakeholders is summarized, evaluated and presented in a concluding meeting of commodity leaders, program coordinators and research administrators, where final decisions are taken. The list of priorities assembled through this process guides the year's call for proposals for new Hatch and Special projects and is also considered by researchers when applying to externally funded grants. When there are issues which need to be emphasized,

programs are redirected to address these issues. This process may also inform decisions about recruiting new faculty members.

**V. Planned Program Table of Content**

S. No.	PROGRAM NAME
1	Global Food Security - Plant Production Systems, Genetic Resources and Breeding Program
2	Animal Systems
3	Integrated Management of New and Emerging Pests and Diseases
4	Climate Change, Natural Resources and Environment
5	Food Safety, Science and Technology
6	Community Resources for Sustainable Development, Agricultural Economics, Marketing and
7	Sustainable Energy
8	Adult and Childhood Obesity
9	Family Well-being
10	Strengthening Youth Life Skills, Leadership and their Community
11	Global Food Security and Hunger

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

### **Program # 1**

#### **1. Name of the Planned Program**

Global Food Security - Plant Production Systems, Genetic Resources and Breeding Program

#### **2. Brief summary about Planned Program**

The Plant Production Systems, Genetic Resources and Breeding (PPSGRB) program plays a key role in addressing the principal priorities of Global Food Security and Hunger locally: to develop crop production systems adapted to our variable tropical conditions and advance new and improved systems that meet the needs of producers and consumers. Research scientists, extension program leaders and specialists work to develop and help implement a variety of initiatives designed to improve management techniques, provide new and more resilient crops, and generally improve the ability of the agriculture industry, specially small farms, to increase production and productivity in an effective and environmentally efficient way.

The program focuses on delivering timely and relevant information and sound agronomic production principles in order to accelerate the adoption of production practices by farmers, increase profitability, and reduce economic and environmental risks through the use of good agricultural practices (GAP) and Integrated Pest Management systems (IPM) that contribute to the competitiveness and sustainability of Puerto Rico's agriculture.

To enhance food production and ensure food security the program will develop innovations in genetic and breeding approaches, new crops to enhance nutrition, value-added products, evaluation of tropical plant germplasm, improved cultivars, and recommended production practices for the tropics that would also be valuable to farmers in Central America, the Caribbean, and Africa.

Extension and research staff disseminate and develop production practices and marketing strategies that expand the uses and markets for existing commodities, including organics, and encourage the consumption of products that promote healthy diets. The program receives feedback from stakeholders during commodity meetings, workshops, field days, and farm visits. The input received is considered in the establishment of priorities to be addressed by our research and extension program.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

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

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		10%	
202	Plant Genetic Resources	5%		30%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		15%	
204	Plant Product Quality and Utility (Preharvest)	20%		5%	
205	Plant Management Systems	20%		30%	
403	Waste Disposal, Recycling, and Reuse	10%		0%	
405	Drainage and Irrigation Systems and Facilities	10%		5%	
601	Economics of Agricultural Production and Farm Management	15%		5%	
602	Business Management, Finance, and Taxation	10%		0%	
604	Marketing and Distribution Practices	10%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

The PPSGRB program is at the core of Extension and Research efforts to improve food security in Puerto Rico and other tropical regions of the world. During the last decade it has been an important contributor towards solving the shortage of seed limiting the production of many traditional crops. Around 85% of the food consumed in Puerto Rico is imported. Recent increases in transportation, distribution, and food costs at the point of production outside Puerto Rico have made us more vulnerable to disruptions in the food supply chain, making our initiatives under this program even more important.

Most of the Island's farms are small and owner operated. The main crop production problems confronted by farmers are product quality and deficient crop cultivation practices. Also, due to Puerto Rico's high population density, other land uses unrelated to farming increasingly compete with agriculture for the available land resources. Many important crops are located in mountainous areas where cultivation and management are difficult, and are confronted with low soil fertility and erosion.

Through the development of better management practices and more efficient production systems the program helps growers achieve higher yields and improve quality in their crops. The research staff maintains germplasm collections of several crops of economic importance. The introduction of adapted germplasm can address specific production constraints, or in the case of promising new crops, become a highly profitable alternative for Puerto Rico's agricultural sector. As economic conditions worsen, many people in Puerto Rico are turning to vegetable gardening to supplement their family's diet. Extension's staff addresses this need through a Vegetable Gardening Curricular Guide.



Priorities:

- Increase the sustainability and profitability of agriculture and forestry.
- Increase and diversify the number of profitable alternative agricultural enterprises, value added, and niche markets, and organic production systems.
  - Introduction, evaluation and preservation of germplasm and cultivars for conventional, organic, and hydroponic systems --for commercial production and for home gardening-- in order to increase yields, improve produce marketability, decrease production costs, or enhance crop value.
  - Development of BMPs for traditional and non-traditional crop production systems in Puerto Rico.
  - Multiply foundation seed of traditional crops currently being planted by farmers.
  - Select, re-evaluate and increase seed of cultivars of traditional crops.
  - Production of crops under protected structures and a micropropagation program to produce disease free plants.
  - Target Extension educators, to encourage continued interest and sensitivity to grower needs.
  - Development of educational materials.
  - Building farmer networks to support crop production.
  - Farm tours on conventional and organic production.
  - Conduct research and extension activities related to new trends in organic farming and hydroponic crop production.
  - Drainage practices in high rainfall areas of poor soil percolation

## 2. Scope of the Program

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

## V(D). Planned Program (Assumptions and Goals)

### 1. Assumptions made for the Program

- Puerto Rico grows a great diversity of valuable crops that constitute a major source of healthy, locally grown produce, which in turn contributes to local and regional economies.
  - Extension specialists and researchers have the necessary expertise and are available to develop the program.
  - It is important to motivate the farmers to become competitive, with better and more effective crop production practices, in order to increase the production, quality, and use of their products.
  - Farmers can expect to increase their income with better management practices, access to agricultural production economics, marketing and farm management.
  - Farmers who are early adopters of new information can devise different product uses (value added) and obtain high quality products to sell to niche markets like hotels, restaurants, and cruise lines, which pay higher prices for better quality.
  - The maintenance of adequate long-term financial support for research that will allow plant breeding programs to develop improved cultivars will allow researchers to develop and update recommended production practices.
  - Scientists with the expertise needed to develop crop cultivars, to maintain genetic germplasm, and to

conduct crop production research are available at the College of Agricultural Sciences.

- The seed program will continue to increase the availability of seed of improved cultivars of traditional crops.
- Extreme weather conditions will not destroy field trials, germplasm collections, or infrastructure needed to conduct research.

**2. Ultimate goal(s) of this Program**

The ultimate goal is to achieve wide-scale adoption of improved cultivars and BMPs that result in greater, more efficient, and more diverse crop production in Puerto Rico, while also addressing the challenges associated with climate change.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	25.9	0.0	10.5	0.0
2017	25.9	0.0	10.5	0.0
2018	25.9	0.0	10.5	0.0
2019	25.9	0.0	10.5	0.0
2020	25.9	0.0	10.5	0.0

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

**1. Activity for the Program**

- Develop and release improved cultivars of crops of economic importance.
- Introduce and evaluate the performance of starchy crops and fruit crops.
- Create electronic publication describing germplasm collections.
- Distribute germplasm to scientists and the public.
- Conduct research and publish technological packages describing best management practices for crops of economic importance
  - Increase on-farm research to validate new technology
  - Publish research results in bulletins and local newspapers for farmers, and in refereed journals for scientists.
  - Present research results at scientific meetings.
  - Collect information from stakeholders on critical issues of importance to this program. This information will help to establish future research priorities.
  - Upgrade research facilities for the establishment of a micropropagation program.
  - Conduct technical production training meetings.
  - Organize capacity building workshops
  - Demonstrate methods
  - Conduct meetings, visits and guidance to farmers.

- Collaborate with state, local and federal government agencies.
- Use mass media to disseminate information.
- Prepare technical plans (IPM, irrigation systems, cultivation practices)
- Prepare curricula and other educational materials

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> <li>• Other 1 (Seminars)</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (Radio Programs)</li> <li>• Other 2 (Exhibits)</li> </ul>

**3. Description of targeted audience**

Farmers, government professionals, legislators, scientists, county agents, agricultural entrepreneurs, pesticide applicators, homeowners, landscapers, USDA professionals, professionals from the private sector and nonprofit organizations.

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

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of producers trained in integrated coffee management.
- Number of producers trained in integrated banana and plantain management
- Number of producers trained in integrated starchy crops management.
- Number of producers trained in integrated vegetable management.
- Number of producers trained in integrated tropical fruits management.
- Number of producers trained in integrated citrus management.
- Number of persons trained in vegetable gardening.
- Number of collaborations established to improve outreach.
- Number of educational activities offered (e.g. meetings, demonstrations, field days, press releases, workshops).
- Number of participants in field days.
- Number of participants in on-farm demonstrations.
- Number of students attending field days to seed production fields, germplasm collections and other experimental fields.
- Number of non-refereed publications.
- Number of presentations in scientific meetings.
- Number of research and/or extension proposals submitted addressing Global Food security and hunger.
- Number of MS Thesis related to Global Food Security and Hunger.
- Number of new/improved varieties developed and released.
- Number of activities to inform stakeholders about established projects and their benefits
- Number of producers trained in integrated basic grain management.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of farmers that adopted two or more recommended practices for integrated coffee management.
2	Number of producers that increased production and quality of coffee.
3	Number of producers that adopted two or more recommended practices for integrated plantain and banana management.
4	Number of producers that increased production in plantain.
5	Number of producers that adopted two or more recommended practices for vegetable management.
6	Number of producers that increased production of vegetable crops.
7	Number of producers that adopted two or more recommended practices for citrus management.
8	Number of producers that increased production of citrus.
9	Number of producers that increased knowledge after completing a non-formal education course in vegetable gardening.
10	Number of persons that established a vegetable garden after completing a non-formal education course in vegetable gardening.
11	Number of stakeholders that adopted the proposed Best Management Practices.
12	Sales (in dollars) of improved cultivars seeds at the substations.
13	Number of locally produced starchy crops with increased output according to the Department of Agriculture Statistics and/or Extension Specialist/Commodity leader reports.
14	Number of vegetable crops with increased output according to Dept. of Agriculture statistics and/or Extension Specialist/Commodity leader reports.
15	Amount of certified organic seeds acquired at substations with organic plots (taken as a proxy of growers knowledge of organic agricultural practices).
16	Number of producers that increased production of basic grains.

**Outcome # 1**

**1. Outcome Target**

Number of farmers that adopted two or more recommended practices for integrated coffee management.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 403 - Waste Disposal, Recycling, and Reuse

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of producers that increased production and quality of coffee.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 601 - Economics of Agricultural Production and Farm Management

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of producers that adopted two or more recommended practices for integrated plantain and banana management.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

Number of producers that increased production in plantain.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 601 - Economics of Agricultural Production and Farm Management
- 604 - Marketing and Distribution Practices

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 5**

##### **1. Outcome Target**

Number of producers that adopted two or more recommended practices for vegetable management.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 6**

##### **1. Outcome Target**

Number of producers that increased production of vegetable crops.

##### **2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

Number of producers that adopted two or more recommended practices for citrus management.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 405 - Drainage and Irrigation Systems and Facilities

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

Number of producers that increased production of citrus.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices



#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 9**

##### **1. Outcome Target**

Number of producers that increased knowledge after completing a non-formal education course in vegetable gardening.

##### **2. Outcome Type** : Change in Knowledge Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 10**

##### **1. Outcome Target**

Number of persons that established a vegetable garden after completing a non-formal education course in vegetable gardening.

##### **2. Outcome Type** : Change in Knowledge Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 11**

**1. Outcome Target**

Number of stakeholders that adopted the proposed Best Management Practices.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 12**

**1. Outcome Target**

Sales (in dollars) of improved cultivars seeds at the substations.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 203 - Plant Biological Efficiency and Abiotic Stresses Affecting Plants
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 13**

**1. Outcome Target**

Number of locally produced starchy crops with increased output according to the Department of Agriculture Statistics and/or Extension Specialist/Commodity leader reports.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 14**

**1. Outcome Target**

Number of vegetable crops with increased output according to Dept. of Agriculture statistics and/or Extension Specialist/Commodity leader reports.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 15**

**1. Outcome Target**

Amount of certified organic seeds acquired at substations with organic plots (taken as a proxy of growers knowledge of organic agricultural practices).

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 204 - Plant Product Quality and Utility (Preharvest)
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 16**

**1. Outcome Target**

Number of producers that increased production of basic grains.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 202 - Plant Genetic Resources
- 205 - Plant Management Systems

**4. Associated Institute Type(s)**

- 1862 Research

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

**1. External Factors which may affect Outcomes**

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

**Description**

As a tropical island in the Caribbean, Puerto Rico can be affected by natural disasters that in turn can have devastating effects on its agriculture. Germplasm collections and field trials related to plant breeding or production research are vulnerable to adverse weather. High winds and rain from tropical storms affect production, product quality, irrigation systems, structures and educational programs. These events also increase the dependence on imported products. In addition, the government's economic and budget constraints and changes in public policies affect program priorities and outcomes. The introduction of exotic diseases affecting crops of importance on the island also could threaten some crops. The proposed activities in the work plan are dependent on the continued programmatic and fiscal support of the USDA, the Puerto Rico Agricultural Experiment Station (AES) and the Department of Agriculture of Puerto Rico.

**V(K). Planned Program - Planned Evaluation Studies**

**Description of Planned Evaluation Studies**

- Records of the planting material, or seed distributed for free, and of seed sales of cultivars

developed by the AES will be maintained at the Substations. These records will provide a measure of the impact of the variety development program.

- Dual moderator focus groups that include farmers, extensionists and researchers will be used to obtain opinions concerning the new technologies being validated and other aspects of the program's implementation. The focus group will be convened during the spring or fall semester of the 2015/16 academic year. Questions will be focused on the banana and plantain commodity design, perceived attributes of the technologies devised, and on the perceived overall success of the program on banana and plantain. The information obtained will be used to improve the design of the program and the dissemination strategies used with different types of audiences.
- Short evaluation forms in the coffee and vegetable commodity meetings will be administered to follow up on the program's progress.

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

### **Program # 2**

#### **1. Name of the Planned Program**

Animal Systems

#### **2. Brief summary about Planned Program**

In Puerto Rico, animal production represents a significant component of the agricultural income (47.8%). The sectors that contributed the most, in order of economic relevance, were dairy cattle, poultry, beef cattle, pigs, fish and other aquacultures, rabbits, bees, goats and sheep. However, challenges such as low reproductive performance, heat stress, poor nutritional management, elevated costs of high energy foods, declined demand for dairy products as well as current changes in global trends have negatively impacted livestock production on our island. In order to accommodate to these challenges, a combination of innovative approaches and new directions are needed.

The Extension Service and the Experiment Station will implement diverse outreach and research to support adoption of new practices as a means to adapt to local and global issues. Efforts will focus on seeking improvement of biological efficiency of livestock production and economic returns to the producers. Impact at the farm level relies on education and training methods to encourage adoption of recommended management practices of either a traditional or innovative nature. If successfully adopted, these endeavors should contribute to increasing production of meat and milk and dairy products of high quality offered to the consuming public at accessible prices, thus fostering food security. This program will find solutions to address the current challenges that farmers from Puerto Rico are undergoing and ensure that the industry remains profitable and sustainable, while addressing environmental and economic concerns.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

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

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
102	Soil, Plant, Water, Nutrient Relationships	8%		0%	
132	Weather and Climate	5%		0%	
133	Pollution Prevention and Mitigation	5%		0%	
202	Plant Genetic Resources	5%		0%	
205	Plant Management Systems	8%		0%	
213	Weeds Affecting Plants	0%		10%	
301	Reproductive Performance of Animals	8%		5%	
302	Nutrient Utilization in Animals	8%		30%	
303	Genetic Improvement of Animals	8%		20%	
306	Environmental Stress in Animals	8%		5%	
307	Animal Management Systems	0%		5%	
308	Improved Animal Products (Before Harvest)	5%		5%	
311	Animal Diseases	5%		5%	
313	Internal Parasites in Animals	5%		0%	
315	Animal Welfare/Well-Being and Protection	5%		5%	
401	Structures, Facilities, and General Purpose Farm Supplies	5%		0%	
403	Waste Disposal, Recycling, and Reuse	5%		0%	
601	Economics of Agricultural Production and Farm Management	5%		5%	
602	Business Management, Finance, and Taxation	2%		0%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	0%		5%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

Recent global trends have had negative impacts on livestock production worldwide. In Puerto Rico increases in the price of imported high-energy feeds have forced local dairy producers to consider

alternative feeding strategies, including more reliance on improved forage resources. However this alternative must overcome difficulties such as degraded pastures, high fertilizer prices and seasonality of biomass production from tropical grasses. Other problems that undermine dairy herd efficiency include poor reproductive performance; expensive fuel, electrical power and other inputs; decreased milk sales; and environmental and safety regulations. Beef and swine producers face many of these same challenges plus deficient animal identification and record keeping.

Our outreach efforts will seek to educate and train dairy, beef and small ruminant producers with regard to pasture management, including incorporation of alternative forages into established pastures, soil testing and utilization of synthetic and organic fertilizers including green manures, crop rotation, and biological methods of pest control. Animal breeding research will be directed toward development of dairy cattle more tolerant to heat stress such as slick-hair Holsteins. Climate change (national outcome 1, indicator 4) will be addressed by developing genotypes of dairy cattle with adaptive climatic traits, specifically for heat stress tolerance. Extension workers will educate dairy producers in genetic selection for economic traits such as profit index, total economic index and profitable life index. Improved reproduction management practices will be emphasized in both research and extension endeavors, possibly including short courses for farmers with herds of poor reproductive efficiency.

Some goat and pig producers have a great need for training in animal identification practices and financial and husbandry record keeping. Deficiencies in those sectors make difficult assessment of genetic progress, traceability of diseases, and economic outcomes. To the extent possible we will seek to improve communication with animal rights organizations and convince producers to implement those animal welfare safeguards that are not excessively difficult to implement nor unreasonably expensive. Expansion of the recently established goat-milk cheese industry of Puerto Rico will be encouraged through recommendations at an early stage concerning proper design of infrastructure and efficient equipment and procedures.

In view of the need to diversify local dairy products, we will promote efforts of new entrepreneurs in establishing operations to utilize surplus fluid milk that has no potential market. Yogurt production would be a start, and could achieve profitability over the short and long term. These efforts will be combined with ongoing research under the program of Food Safety, Science and Technology.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Integrated Research and Extension

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

- Farmers would be more willing to adopt environmental regulations when shown that practices associated with reducing carbon emissions could result in lower production costs. Moreover, using energy-efficient technology, as a means to lower carbon emissions, is associated with extended life of equipment
- The experience with educational programs indicates that adoption of animal production practices by farmers depends on several factors such as government agency subsidies, laws or regulations that force farmers to adopt or establish certain practices, and/or the ratio of return from their investment. There is a



supposition that better-educated farmers are more apt to resolve economic challenges with better possibilities of success. In addition, according to our experience, farmers in Puerto Rico more readily adopt management practices that have been shown to work with other farmers. By recommending management practices that have been proven to work with other farmers, the number of farmers adopting these will be greater compared to those practices recommended from experimental research only.

- Animal welfare should be seen by farmers as an approach to improve animal health, product quality, and human perception toward livestock production, which should improve perception of the animal industry in Puerto Rico and therefore increase demand for its products.
- Research and extension personnel under this program, who are members of the Animal Industry and Crops and Agroenvironmental Sciences Departments, have the necessary academic expertise and professional training to achieve the scientific and practical goals set forth.
- Funding from all sources, including federal, commonwealth and private, will gradually increase in constant dollars over the next 5 years as economic conditions and public finances return to a more normal state.
- Physical facilities, including various types of laboratories and animal resources, of the institution will continue to develop and prove adequate to meet the needs of the research program.
- The extension personnel working under this program area will be reinforced by filling positions now vacant.
- The island's dairy industry will not use a high degree of animal confinement but make greater use of improved grazing and supplemental feeding of highly nutritious forages such as sorghum silage.
- The specialized beef cattle industry will be compelled to make use of male dairy calves as a source of feeder animals and must strive to produce grass-fed beef, with a composition more conducive to the good health of consumers than feedlot beef that will command a higher sales price.
- Small ruminant production, including goat milk and cheese, will gradually increase in importance and make use of novel forage resources.
- The swine industry of Puerto Rico can be expected to survive thanks to the ethnic food habits of the local people, but is unlikely to increase much in production volume.

## **2. Ultimate goal(s) of this Program**

Research and extension efforts undertaken in this program seek to promote food security in Puerto Rico by increasing the volume and improving the quality of locally produced meat and milk, and their respective derived products, at prices accessible to all local consumers. Equally important is to contribute to improved economic returns for livestock producers and increased income from the agricultural sector. Another goal of critical long-term importance is to help protect the remaining agricultural lands of the island by keeping them profitably engaged in sustainable animal production and not be sold for conversion to non-agricultural uses. This program aims to accomplish the following goals during the next 4 years:

- Improve animal production traits, such as reproduction, welfare, and health through orientations using management practices adopted from other farmers and from applied research.
- Enhance prevention and control of diseases at farm level to increase animal health, production, and quality.
- Reduce carbon emissions and decrease production costs by implementing energy conservation practices.
- Ensure proper establishment of new dairy goat herds.
- Increase demand for livestock products by promotion and education of the population of Puerto Rico.

## **V(E). Planned Program (Inputs)**

### **1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	14.1	0.0	5.0	0.0
2017	14.1	0.0	5.0	0.0
2018	14.1	0.0	5.0	0.0
2019	14.1	0.0	5.0	0.0
2020	14.1	0.0	5.0	0.0

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

**1. Activity for the Program**

- Continue to use traditional extension methods such as farm visits, trainings, workshops, consultation with producers by telephone or electronic mail, participation in radio programs of agricultural interest, and publication of materials like the educational newsletter entitled "La Res Informativa", for the benefit of the local beef cattle industry.
  - Educational material (publications, newsletters, CDs).
  - Develop proposals to find external resources as a means to conduct applied research to address the current needs in livestock production.
    - Offer counseling and orientation.
    - Work in collaboration with communication media.
    - Establish collaborations with government agencies (e.g., Environmental Quality Board; State Departments of Health, Agriculture, Environmental and Natural Resources, and Education; Puerto Rico Aqueducts and Sewage Authority; USEPA; USDA; NRCS; and others).
      - Improve collaboration with our partners at the University of Puerto Rico and other educational institutions.
        - Maintain communication with livestock producers and their organizations to receive their input regarding problems that they face that may benefit from research.
        - Submit experimental results in terms of animal responses to economic evaluation and possible inclusion in the list of practices recommended for adoption on producers' farms.
        - Organize field days and training sessions to interest livestock producers in adopting recommended management practices on their farms.
        - Establish a mutually beneficial working relationship with the new leadership of the Department of Agriculture of Puerto Rico in support of its initiatives.
          - Attend and present research results at relevant scientific societies meetings at the local and international levels.
          - Prepare manuscripts from research results for submission to peer reviewed scientific journals.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

Extension	
Direct Methods	Indirect Methods

<ul style="list-style-type: none"><li>● Education Class</li><li>● Workshop</li><li>● Group Discussion</li><li>● One-on-One Intervention</li><li>● Demonstrations</li><li>● Other 1 (Telephone Calls and Email)</li><li>● Other 2 (Seminars)</li></ul>	<ul style="list-style-type: none"><li>● Public Service Announcement</li><li>● Billboards</li><li>● Newsletters</li><li>● Web sites other than eXtension</li><li>● Other 1 (Radio Programs)</li><li>● Other 2 (Exhibition, Publication software)</li></ul>
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### 3. Description of targeted audience

Farmers, agricultural entrepreneurs, animal rights organizations, students, PRAES professionals, government personnel, community leaders, and professionals from the private sector.

### V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- 1.Number of farmers trained in recommended bio-security practices as a means to mitigate diseases and increase animal production.
- 2.Number of farmers trained in practices in animal welfare and protection.
- 3.Number of farmers trained in recommended practices in recordkeeping, disease control and prevention, and feed utilization.
- 4.Number of dairy-beef farmers trained in recommended practices that are efficient against internal parasites in Puerto Rico.
- 5.Number of farmers trained in the effects of climate change on livestock production.
- 6.Number of farmers trained in the implementation of alternative crops/forages as a means to improve nutrient utilization in livestock production.
- 7.Number of farmers trained in recommended economic practices associated with efficiency in livestock production.
- 8.Number of meetings held with stakeholders to discuss the situation of each relevant industry and corresponding research priorities.
- 9.Number of popular (non-refereed) publications to report research results and other pertinent information for the benefit of producers and other interested parties.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of farmers that adopted a bio-security program.
2	Number of farmers that adopted practices in animal welfare and protection.
3	Number of farmers that increased animal production after adopting the recommended recordkeeping, <u>disease control and prevention, and feed utilization practices.</u>
4	Number of farmers that adopted practices for the control of parasites on their farms.
5	Number of farmers that adopted one or more practices to control heat stress.
6	Number of persons that improved the nutrient utilization practices in animals.
7	Number of farmers and agricultural entrepreneurs that used economic tools to make effective <u>economic decisions to improve their business.</u>
8	Number of producers participating in field days or training sessions who adopted recommended <u>management practices on their farms</u>
9	Number of animals of genetically improved breeding stock, from the University of Puerto Rico herd, <u>sold to local beef producers to improve the genetic quality of their herds.</u>
10	Number of popular (non-refereed)articles published to report research results and other pertinent information for the benefit of producers and other interested parties.

**Outcome # 1**

**1. Outcome Target**

Number of farmers that adopted a bio-security program.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 311 - Animal Diseases
- 313 - Internal Parasites in Animals
- 315 - Animal Welfare/Well-Being and Protection

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of farmers that adopted practices in animal welfare and protection.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 133 - Pollution Prevention and Mitigation
- 302 - Nutrient Utilization in Animals
- 306 - Environmental Stress in Animals
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals
- 315 - Animal Welfare/Well-Being and Protection

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of farmers that increased animal production after adopting the recommended recordkeeping, disease control and prevention, and feed utilization practices.

**2. Outcome Type** : Change in Condition Outcome Measure

### **3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 306 - Environmental Stress in Animals
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals
- 315 - Animal Welfare/Well-Being and Protection

### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

## **Outcome # 4**

### **1. Outcome Target**

Number of farmers that adopted practices for the control of parasites on their farms.

### **2. Outcome Type : Change in Action Outcome Measure**

### **3. Associated Knowledge Area(s)**

- 303 - Genetic Improvement of Animals
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals
- 315 - Animal Welfare/Well-Being and Protection

### **4. Associated Institute Type(s)**

- 1862 Extension

## **Outcome # 5**

### **1. Outcome Target**

Number of farmers that adopted one or more practices to control heat stress.

### **2. Outcome Type : Change in Action Outcome Measure**

### **3. Associated Knowledge Area(s)**

- 303 - Genetic Improvement of Animals
- 306 - Environmental Stress in Animals
- 315 - Animal Welfare/Well-Being and Protection
- 401 - Structures, Facilities, and General Purpose Farm Supplies

#### **4. Associated Institute Type(s)**

- 1862 Extension

### **Outcome # 6**

#### **1. Outcome Target**

Number of persons that improved the nutrient utilization practices in animals.

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 306 - Environmental Stress in Animals
- 313 - Internal Parasites in Animals
- 315 - Animal Welfare/Well-Being and Protection
- 601 - Economics of Agricultural Production and Farm Management

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 7**

#### **1. Outcome Target**

Number of farmers and agricultural entrepreneurs that used economic tools to make effective economic decisions to improve their business.

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management



#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 8**

##### **1. Outcome Target**

Number of producers participating in field days or training sessions who adopted recommended management practices on their farms

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 306 - Environmental Stress in Animals
- 308 - Improved Animal Products (Before Harvest)
- 601 - Economics of Agricultural Production and Farm Management

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

#### **Outcome # 9**

##### **1. Outcome Target**

Number of animals of genetically improved breeding stock, from the University of Puerto Rico herd, sold to local beef producers to improve the genetic quality of their herds.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 303 - Genetic Improvement of Animals

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 10**

#### **1. Outcome Target**

Number of popular (non-refereed) articles published to report research results and other pertinent information for the benefit of producers and other interested parties.

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 132 - Weather and Climate
- 133 - Pollution Prevention and Mitigation
- 202 - Plant Genetic Resources
- 205 - Plant Management Systems
- 213 - Weeds Affecting Plants
- 301 - Reproductive Performance of Animals
- 302 - Nutrient Utilization in Animals
- 303 - Genetic Improvement of Animals
- 306 - Environmental Stress in Animals
- 307 - Animal Management Systems
- 308 - Improved Animal Products (Before Harvest)
- 311 - Animal Diseases
- 313 - Internal Parasites in Animals
- 315 - Animal Welfare/Well-Being and Protection
- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 403 - Waste Disposal, Recycling, and Reuse
- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

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

#### **1. External Factors which may affect Outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy

- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities

### **Description**

Alteration in government priorities can cause an unpredictable environment in government agencies, resulting in a challenge in reaching planned program outcomes. The general feeling that the economy is weak is another factor that makes people put off investing in the improvement of the infrastructure in their farms. When the general feeling is that the economy is strong, people tend to be more aggressive and willing to adopt new technology. Also, changes in public policies and regulations cause farmers to change their priorities and to postpone projects. The availability of economic incentives is decisive in making final decisions that require capital investments. Many projects depend on economic incentives to be cost effective.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Evaluation studies will use existing monthly records (e.g., Dairy Herd Improvement), farm records and/or observations collected by PRAES personnel to evaluate changes in production levels and health parameters pre and post implementation of the recommended practices.

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

### **Program # 3**

#### **1. Name of the Planned Program**

Integrated Management of New and Emerging Pests and Diseases

#### **2. Brief summary about Planned Program**

Traditional and commercial agricultural production in Puerto Rico is threatened by pest and disease outbreaks that limit yields and agricultural productivity. The Integrated Management of New and Emerging Pests and Diseases Program (IMNEPDP) will continue to identify new plant pathogens using molecular techniques and surveillance of quarantine pests and diseases. Information on the biology and management of new pests and diseases in vegetables is part of a strategic plan by the Agricultural Experiment Station (PRAEXS) and the Extension Service (PRAES). Scientists and extension specialists will collaborate to develop educational materials on new and emerging diseases affecting food security.

An educational program to disseminate research results and management options for citrus greening (CG) and its vector is planned. To reduce the impact of vegetative transmitted diseases on citrus, the production of healthy citrus plants is planned. Certification of citrus foundation blocks at experiment stations will be implemented. Molecular and immune-diagnostic tools for detection and surveillance of vegetative transmitted pathogens in citrus will be used. The IPM team will work closely with growers. Extension publications and workshops will be used to disseminate research results on CG development and management. The Citrus Technological Package (on citrus production and pest management) will be updated focusing on CG, tree nutrition and psyllid management. The target audience is extension specialists, agricultural technicians and citrus growers. A series of webinars and poster presentations will illustrate CG symptoms and other diseases to identify and better diagnose citrus diseases.

The primary effort of the IMNEPDP is more effective management of pathogens/pests. Its aim is to improve detection methods and to investigate practices that reduce and rationalize pesticide use. The PRAEXS Center for Excellence in Quarantine and Invasive Species at Río Piedras maintains and observes potential pests. Its quarantine and greenhouse facilities will continue developing biological control technologies to optimize using biological controls against invasive species.

The IMNEPDP continues searching for alternative practices to control diseases and pests of agricultural crops. Black Sigatoka and plant-parasitic nematodes are the main diseases affecting plantains and bananas, limiting yields of these important crops. The IR4 project will evaluate the efficacy of penthiopyrad for black Sigatoka in order to register the fungicide for plantain and banana. The use of alternative practices that include planting *Mucuna deeringiana*, applying poultry litter (alone or combined with nematicides) will continue to be investigated to reduce soil and root populations of phytonematodes and stimulate free-living nematodes. An on-farm pilot program for managing the coffee bean borer *Hypothenemus hampei* will continue. In the mountainous region, efforts regarding traditional crops (*Manihot esculenta*, *Xanthosoma*, *Dioscorea*, *Ipomoea batatas* and *Arracacha xanthorriza*) will focus on developing basic information for disease control with alternative and conventional pesticides.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
211	Insects, Mites, and Other Arthropods Affecting Plants	50%		14%	
212	Diseases and Nematodes Affecting Plants	10%		12%	
215	Biological Control of Pests Affecting Plants	0%		14%	
216	Integrated Pest Management Systems	40%		60%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Improved methods of detection, reduction, and rational use of pesticides will continue to be the goals of the IPM program. Advances in the identification of new diseases and pests in Puerto Rico will avoid losses due to new pathogens/pests. The anticipated registration of fungicides for laurel wilt in avocados will ensure a rapid response to a new disease. Also, the search for the virulent race 4 of *Fusarium oxysporum* f. sp. cubense will help prevent the establishment of the fungus and avoid future losses in bananas and plantains in the island.

Citrus Greening together with Citrus Tristeza Virus (CTV) has caused a 40% decrease in production, threatening future investment in citrus orchards. Identified stakeholders needs are the establishment of pathogen-free citrus nursery systems to regenerate citrus orchards. The priority of a certification program to test incoming citrus planting stocks for graft transmitted diseases resulted in a new collaboration with the Citrus Clean Plant Network (CCPN) to detect severe strains of Citrus Tristeza Virus and conduct regular testing for virus and viroids affecting citrus. The introduction of *Tamarixia radiata* (Pakistan strain) will be studied simultaneously and areas for future release and monitoring of parasitoids will be determined. Efforts to comply with requirements to introduce the Pakistan strain of *T. radiata* to Puerto Rico will be made.

The Coffee Berry Borer (CBB) continues to be the main coffee pest and problem for Puerto Rico's coffee producers. While efforts have been made to address the problem using *Beauveria bassiana* and cultural control, also planned are studies to determine the capacity of establishing *C. stephanoderis* under Puerto Rican conditions. To test the effectiveness of the parasitoid to control CBB, research will be conducted in three ecological areas where coffee is cultivated. The project will build a GIS database that relates incidence of CBB and biocontrol organisms to climate, soil, elevation and other variables in order to understand patterns of CBB phenology, reproduction and damage to coffee, establishing the basis of predictive models of the CBB severity in different areas of Puerto Rico so as to improve management

practices. The study will also find alternate hosts that can provide a reservoir for the CBB when coffee fruits are not available and to test CBB reproduction in sun vs. shade coffee. Increasing awareness about CBB control matters is important, particularly regarding agro-ecological pest control techniques and IPM options.

Plantain and banana are among the crops most affected by nematodes on the island; the priority is to evaluate selected synthetic and biological nematicides to suppress populations of plant-parasitic nematodes.

**2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

- Available funds for research and extension will remain stable.
- The scientists and extension specialists are available to develop the program.
- Support personnel with adequate skills and knowledge will be assigned to collaborate with the program.
- Support from the Agricultural Experiment Stations will be available to conduct research and outreach activities.
- IPM practices suggested will be adopted by the growers
- The input from the Department of Agriculture, USDA/APHIS and growers, will be available.

**2. Ultimate goal(s) of this Program**

Improve food security by decreasing crop losses due to new and emerging pests and diseases, through detection, research and evaluation of alternative practices and approaches, and by educating the growers and the public about management practices developed by the program.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	2.5	0.0	3.1	0.0
2017	2.5	0.0	3.1	0.0
2018	2.5	0.0	3.1	0.0

2019	2.5	0.0	3.1	0.0
2020	2.5	0.0	3.1	0.0

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

**1. Activity for the Program**

- Develop PCR-based detection with varying levels of specificity for viruses, fungi, and bacteria.
- Develop biological control technologies for invasive pests.
- Develop improved methods to control vectors of pathogens.
- Foster the use of cutting-edge technology to implement IPM.
- Enhance our capacity to conduct fast pest and disease diagnoses.
- Conduct research on 'reduced risk' pesticides.
- Promote greater integration of Research and Extension.
- Increase joint collaborative efforts between Research and Extension to develop management plans for emerging pest problems.
  - Promote best practices to producers through Extension personnel to reduce risk of invasion of new pests through various pathways.
    - Improve Extension outreach programs to address new and emerging pests and diseases through educational materials and awareness activities for producers, agronomists and Extension personnel.
    - Improve understanding of the needs and expectations of stakeholders and establish collaborative partnerships with stakeholders.
    - Develop effective disease and pest management strategies compatible with a sustainable food production system in Puerto Rico.
    - Disseminate research results through publications, seminars, field days, conferences, on-farm demonstrations and any other method deemed appropriate to reach our target audiences: extension specialists and agents, government partners, students, producers, consumers and environmental organizations.

The planned integration of research and outreach will benefit the development and dissemination of integrated pest management packages to the target audience. Efforts towards multidisciplinary and inter-institutional collaboration for specific pests and diseases, such as citrus greening, will be emphasized. Combination of efficient management practices will become a priority in the control of insects. Increased use of web resources with the IR-4 project and distance education technology is expected to improve the delivery of information to growers and the general public about alternative practices for pest and disease control and the proper use of pesticides on the Island. For diseases such as black Sigatoka, the adoption and implementation of effective integrated management strategies will be promoted by means of educational materials and field demonstrations. Priority will be to show producers the advantages of using IPM techniques to protect the environment from unnecessary pesticide applications. Surveys on new pests and diseases will help in the design of educational programs addressing gaps found in growers' knowledge to more effectively prepare information in workshops concerning key pests, pesticide use and IPM practices. We expect that the outcomes of the surveys and workshops will lead to an increased awareness about pests and diseases of importance, actual use of IPM practices, and reduced risks of pesticide use among growers, increasing the levels of adoption of IPM practices in targeted crops.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> <li>● One-on-One Intervention</li> <li>● Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>● Newsletters</li> <li>● TV Media Programs</li> <li>● eXtension web sites</li> <li>● Web sites other than eXtension</li> </ul>

**3. Description of targeted audience**

The target audience will include:

- Growers, agricultural businesses, commodity groups, industry leaders, and groups and individuals concerned with the effect of pests and diseases in food security, and its relationship with climate change.
- Faculty, graduate and undergraduate students, extension specialists, consultants and researchers.
- State and Federal Departments of Agriculture, USDA/ARS, USDA/NRCS, the USDA Forest Service and USDA/APHIS PPQ.
- American Phytopathological Society (APS), Agronomy Society of America, Horticultural Society, Puerto Rican Agricultural Sciences Society, Entomological Society of America.

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

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.



## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of abstracts and oral presentations in professional scientific meetings resulting from program activities.
- Number of joint Research-Extension activities that include pest diagnostics and identification.
- Number of field days, farm visits, symposia, workshops, topic conferences, and open houses that emphasized in IPM practices that impact food security.
- Number of people who participated in IPM non-formal education courses.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of farmers that adopted one or more recommended practices for Black Sigatoka Management.
2	Number of farmers that adopted one or more recommended practices for integrated management of Citrus Greening.
3	Number of persons that increased knowledge about IPM in the vegetable garden after completing a non-formal education course.
4	Number of persons that implemented integrated management recommendations after receiving a pest or disease diagnose for their crops.
5	Number of articles published in newspapers.
6	Number of emerging pests identified as a result of research activity.
7	Number of persons who adopted reduced risk pesticides and practices.
8	Number of farmers reporting decreased losses due to key and emerging pests.
9	Number of producers that increased knowledge after participating in a joint Research-Extension activity (field day, on-farm demonstration or oral presentations) on new and emerging pests and diseases.

**Outcome # 1**

**1. Outcome Target**

Number of farmers that adopted one or more recommended practices for Black Sigatoka Management.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 2**

**1. Outcome Target**

Number of farmers that adopted one or more recommended practices for integrated management of Citrus Greening.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 3**

**1. Outcome Target**

Number of persons that increased knowledge about IPM in the vegetable garden after completing a non-formal education course.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 4**

**1. Outcome Target**

Number of persons that implemented integrated management recommendations after receiving a pest or disease diagnose for their crops.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

Number of articles published in newspapers.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants

- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 6**

**1. Outcome Target**

Number of emerging pests identified as a result of research activity.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 7**

**1. Outcome Target**

Number of persons who adopted reduced risk pesticides and practices.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

#### **Outcome # 8**

##### **1. Outcome Target**

Number of farmers reporting decreased losses due to key and emerging pests.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

##### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

#### **Outcome # 9**

##### **1. Outcome Target**

Number of producers that increased knowledge after participating in a joint Research-Extension activity (field day, on-farm demonstration or oral presentations) on new and emerging pests and diseases.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants
- 215 - Biological Control of Pests Affecting Plants
- 216 - Integrated Pest Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

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

#### **1. External Factors which may affect Outcomes**

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

#### **Description**

- The island is prone to hurricanes and tropical storms that may affect the normal progress of the research and extension activities planned.
- Presence of extreme weather conditions that affect agricultural activities.
- The introduction of exotic diseases could also threaten crops of importance.
- The proposed activities in the plan of work are dependent on continued programmatic and fiscal support of the USDA, the College of Agricultural Sciences, and the Department of Agriculture of Puerto Rico.

### **V(K). Planned Program - Planned Evaluation Studies**

#### **Description of Planned Evaluation Studies**

To assess the use of sustainable IPM practices in the vegetable production areas in Puerto Rico, a survey will be administered to growers during the commodity group meetings.

A brief questionnaire will be administered to vegetable farmers of the southern region of the Island, where most vegetables are grown, to assess farmer's knowledge about new and emerging pests and diseases. Extension agents will administer the questionnaire and the information obtained will be evaluated by the Extension IPM Coordinator and the Plant pathologist of the Juana Diaz Experimental Station.

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

### **Program # 4**

#### **1. Name of the Planned Program**

Climate Change, Natural Resources and Environment

#### **2. Brief summary about Planned Program**

The Puerto Rico Agriculture Extension Service (PRAES) have been working in climate change for several years by developing educational materials and conducting educational activities on the subject. The educational material was used for agricultural agent capacity building, mostly train-the-trainer. The educational effort was extended to reach a broader clientele, such as the Puerto Rico Department of Agriculture and other agricultural agencies personnel. Other educational materials have been developed with recommended adaptation practices, most recently, targeting community impact and how to prepare for a natural disaster.

The educational component for the 2016-2020 Plan of Work will be supported by the research effort conducted by the Puerto Rico Agricultural Experiment Station on natural resources and environment through the development of a joint Plan of Work. A series of Agro-Environmental Colloquiums offered during the academic year 2013-14 were conducted as an initial collaboration in this work plan.

Collaboration was initiated with the USDA Caribbean Climate Sub Hub as well as with the PR Climate Change Council, an association of more than 150 scientists, researchers, agency representatives, planners and NGO's that evaluate how the changes in temperature, precipitation, sea level and other climate parameters could affect infrastructure and natural resources in Puerto Rico. This information can be useful in generating local adaptation recommendations on how to cope with these climate changes at the local level and for reducing vulnerability. Special attention will be given to waste management.

The main goal of the Climate Change Natural Resources and Environment research program continues to be to develop, perform and support scientific research regarding the impact of agricultural practices on the environment and natural resources of Puerto Rico. The program addresses key Agricultural Experiment Station mission goals by supporting both the Department of Agriculture and the Natural Resources Department.

Research priorities identified by program stakeholders, and partially addressed in our projects, are: a digitalized inventory of agricultural land use in crop production and other land uses; appraisal of this resource availability and suitability for specific uses; pollution prevention and mitigation practices for soil; watershed protection and management based on conservation practices; development of sustainable agricultural production practices to protect and enhance natural ecosystems; and prevention and control of invasive species through management approaches for biodiversity conservation and restoration.

Soil management research promotes a long-term sustainable system of crop production by identifying and developing management practices that reduce the amount of nutrients released to soil and water. Continued research on these topics will provide reliable scientific data to quantify the contribution of agriculture in relation to other pollution sources, and to measure the short and long-term impact of agricultural management systems on the environment.



**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

**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	0%		8%	
102	Soil, Plant, Water, Nutrient Relationships	0%		12%	
103	Management of Saline and Sodic Soils and Salinity	0%		3%	
104	Protect Soil from Harmful Effects of Natural Elements	25%		7%	
111	Conservation and Efficient Use of Water	25%		11%	
112	Watershed Protection and Management	25%		13%	
121	Management of Range Resources	0%		3%	
123	Management and Sustainability of Forest Resources	0%		3%	
125	Agroforestry	5%		0%	
132	Weather and Climate	5%		3%	
133	Pollution Prevention and Mitigation	0%		7%	
136	Conservation of Biological Diversity	0%		17%	
141	Air Resource Protection and Management	0%		2%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		7%	
212	Diseases and Nematodes Affecting Plants	0%		2%	
403	Waste Disposal, Recycling, and Reuse	15%		1%	
405	Drainage and Irrigation Systems and Facilities	0%		1%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

1. Situation and priorities

The Caribbean is one of the regions hardest hit by global warming. Smaller islands and low-lying

areas are being affected by rising sea levels and other consequences. Sudden climate changes have had an adverse effect on farming in Puerto Rico. In 2014, 28 municipalities in southern Puerto Rico suffered a drought of more than six months. Agriculture commodities most affected were beef, dairy, small animals and coffee. Coffee is grown mostly in the central mountain area and irrigation is not used. Lack of water adversely affects coffee quality.

Brush fires are common in the southern coastal plains. As of July 2014, there were 3,059 fires reported in this area, negatively affecting beef production. In 2014, the situation worsened due to the drought, which caused over \$20 million in damages affecting 2,541 out of 9,180 farms that raise beef or dairy cattle, goat or sheep. As for coffee, a total of 2,767 out of 4,171 farms were affected. For 2015 collaboration has been set up with the PR Fire Department to conduct an island wide educational campaign called "Puerto Rico frente al fuego".

Another concern is solid waste. Recent estimates show that each person in the island generates 5.6 pounds daily. The life span of existing landfills is overdue, and considering the island's dimensions and critical ecosystems, there is little space to build new ones. Since 27% of the solid waste destined for landfills is organic, there is a need to continue work encouraging more composting, alternative uses, and markets.

Agricultural land use planning in PR is challenging due to land scarcity and high value. Since land is a major component of agriculture, this POW incorporates the stakeholder-driven priority of developing a digitalized inventory of agricultural land use, to appraise resource availability and suitability for specific uses.

The role of agricultural practices in the potential degradation of water and soil resources emphasizes the need for appropriate crop management systems. Therefore, It is necessary to quantify the contribution of agriculture as a pollution source and to measure the impact of agricultural operations on the environment. Through the development of research methodological advancements and management programs, the protection of watershed and soil resources is expected to increase.

Sustainable agricultural practices are key to fostering agricultural-led economic growth in the Island. Continued research on the improvement in soil quality and crop yield in tropical acid soils by using organic amendments, will advance understanding of the use of compost in the tropics and its effect on organic matter buildup, mineralization, and crop yield.

Research to address the impact of non-native species is also a priority. Still, much work needs to be done to address the pathways of entry and management of non-native species to avoid biodiversity losses and ecological degradation of island ecosystems. Such knowledge is important in developing management approaches for biodiversity conservation and restoration.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research
- Integrated Research and Extension

## **V(D). Planned Program (Assumptions and Goals)**

## 1. Assumptions made for the Program

The main emphasis of the Extension Educational Program on Climate Change is on implementing recommended adaptation practices for agriculture production. There are several ways that the Extension system can help farmers and communities deal with climate change. These include: adaption and contingency measures for events that cannot be prevented (i.e., providing information on how to deal with droughts, floods, storms and other extreme weather events). Adaptation to current climate variability can also increase resilience to long-term climate change. In a number of cases, however, anthropogenic climate change is likely to also require forward-looking investment and planning responses that go beyond short-term responses to current climate variability.

Farmers are more inclined to listen to recommendations by PRAES, if they aim to stay in business, to stimulate the implementation of environmentally sound and sustainable agriculture practices, so as to remain viable and hopefully, profitable. Therefore, PRAES needs to continue to provide assistance to the farmers and the community with information, technologies, and education on how to cope with climate change, stay in business and remain profitable.

The assumptions of the planned research program are:

- Reasonable funds, both internal and external , will be available throughout the program duration.
- Personnel with adequate skills and understanding of the subject will be working in the program by virtue of availability and recruitment.
- Support and input of related agencies such as the PR Department of Agriculture, USDA, NRCS, EPA, local Environmental Quality Board, PR Department of Natural Resources, and US Forest Service will be available.
- Producers and the general public will adopt watershed, soil erosion and biodiversity management conservation practices developed in the program.
- Quantitative thresholds of impairment of nutrients will be developed to comply with the USEPA mandate.
- The appraisal of soil resources on the island will lead to a better understanding of soil diversity, management and conservation practices.

## 2. Ultimate goal(s) of this Program

- Enhance resilience and response capacity to extreme weather events while maintaining productivity and quality of life.
- Provide reliable scientific data to quantify the contribution of agriculture in relation to other pollution sources, and to measure the short and long term impact of agricultural management systems on the environment.
- Ensure an economically viable agricultural production by developing sustainable management practices that enhance and protect forest, soil, and water resources while also enhancing the island's biodiversity.
- Decrease biodiversity losses and ecological degradation of island ecosystems by developing research on the interactions and effects of invasive species on natural ecosystems dynamics.

## V(E). Planned Program (Inputs)

### 1. Estimated Number of professional FTE/SYs to be budgeted for this Program

Year	Extension		Research	
	1862	1890	1862	1890
2016	7.7	0.0	3.1	0.0
2017	7.7	0.0	3.1	0.0
2018	7.7	0.0	4.0	0.0
2019	7.7	0.0	4.0	0.0
2020	7.7	0.0	4.0	0.0

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

**1. Activity for the Program**

- Offer capacity building workshops.
- Hold technical training meetings.
- Use mass media to disseminate information.
- Collaborate with local, state and federal government agencies.
- Research to quantify the contribution of agriculture in relation to pollution source, and to measure the short and long- term impact of agricultural operations on the environment.
  - Develop pollution prevention and mitigation (practices, measures, thresholds) to protect watershed and soil resources.
  - Develop soil improvement and maintenance practices.
  - Develop and promote sustainable agricultural practices as a key component to foster agricultural-led economic growth on the island.
  - Determine pathways of entry, ecological impact, and management of non-native species on biodiversity.
  - Develop management approaches for conserving and restoring biodiversity.
  - Publish research advancements in journals, bulletins, newspaper articles, and popular magazines.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>• Public Service Announcement</li> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (Exhibits)</li> <li>• Other 2 (Radio Programs)</li> </ul>

**3. Description of targeted audience**

Farmers, producers, communities, government professionals, county Extension personnel, community leaders, youth, leaders, volunteers, students (undergraduate and graduates), Puerto Rico Department of Agriculture personnel, USDA personnel..

### **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## V(H). State Defined Outputs

### 1. Output Measure

- Number of people who received capacity development (workshops, seminars, conferences) on water quality, watershed protection, and conservation.
- Number of participants in non-formal educational courses on water collection, storage and re-use for agricultural purposes.
- Number of people who received capacity development in agroforestry, soil erosion, and storm water runoff control.
- Number of people who received capacity development on soil erosion and water environmental regulations.
  
- Number of people who received capacity development on prevention of brush or forest fire.
- Number of people who received capacity development on natural disasters and emergency management to reduce loses and maintain their farming operation.
- Number of stakeholders receiving research information on best management practices for agricultural and natural ecosystems.
- Number of oral or poster presentations at professional scientific meetings resulting from program activities.
- Number of research proposals submitted.
  
- Number of educational activities in collaboration with the Extension Service personnel to disseminate information to farmers and the general public about research results.
- Number of graduate and undergraduate students involved in research projects.
- Number of people who received capacity development on farm waste management and gas emission in farms.
- Number of producers/persons that participated in joint Research-Extension activities (field days, on-farm demonstrations or oral presentations).
- Number of people who participated in non-formal education courses in climate change.
  
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of people who adopted recommended practices for the adaptation or mitigation of climate change on their farms (water use efficiency, waste management, livestock feeding practices, carbon sequestration, others).
2	Number of people who established watershed protection practices.
3	Number of people who adopted practices to improve water collection, storage, and reuse efficiency.
4	Number of people who adopted agroforestry practices, soil erosion or water runoff control practices.
5	Number of people who comply with environmental soil erosion and water requirements.
6	Number of people who adopted one or more practices to prevent brush or forest fires.
7	Number of people who prepared a contingency plan for natural disasters or got farm insurance.
8	Number of people reporting willingness to adopt best management practices to improve conservation and efficient use of water.
9	Number of students (graduate and undergraduates) receiving training and work experience in this research program.
10	Number of people who increased knowledge in soil management practices, soil health and carbon sequestration.
11	Number of stakeholders gaining knowledge on what constitutes acceptable levels of periphyton biomass for recreational purposes in rivers of PR.
12	Number of people who increased knowledge on practices to improve soil quality through an integrated soil management system.
13	Number of non-native insects and weed species that pose a significant economic, ecologic and aesthetic impact in Puerto Rico, identified through an island-wide pest status assessment.
14	Number of people gaining knowledge about tropical forests landscaping models developed to enhance management decisions.

### **Outcome # 1**

#### **1. Outcome Target**

Number of people who adopted recommended practices for the adaptation or mitigation of climate change on their farms (water use efficiency, waste management, livestock feeding practices, carbon sequestration, others).

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 125 - Agroforestry
- 132 - Weather and Climate
- 403 - Waste Disposal, Recycling, and Reuse

#### **4. Associated Institute Type(s)**

- 1862 Extension

### **Outcome # 2**

#### **1. Outcome Target**

Number of people who established watershed protection practices.

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 125 - Agroforestry
- 132 - Weather and Climate

#### **4. Associated Institute Type(s)**

- 1862 Extension



**Outcome # 3**

**1. Outcome Target**

Number of people who adopted practices to improve water collection, storage, and reuse efficiency.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 403 - Waste Disposal, Recycling, and Reuse

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 4**

**1. Outcome Target**

Number of people who adopted agroforestry practices, soil erosion or water runoff control practices.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 125 - Agroforestry
- 403 - Waste Disposal, Recycling, and Reuse

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

Number of people who comply with environmental soil erosion and water requirements.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 403 - Waste Disposal, Recycling, and Reuse

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 6**

**1. Outcome Target**

Number of people who adopted one or more practices to prevent brush or forest fires.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 132 - Weather and Climate

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

Number of people who prepared a contingency plan for natural disasters or got farm insurance.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 125 - Agroforestry
- 132 - Weather and Climate

- 403 - Waste Disposal, Recycling, and Reuse

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

Number of people reporting willingness to adopt best management practices to improve conservation and efficient use of water.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 9**

**1. Outcome Target**

Number of students (graduate and undergraduates) receiving training and work experience in this research program.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 101 - Appraisal of Soil Resources
- 102 - Soil, Plant, Water, Nutrient Relationships
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 136 - Conservation of Biological Diversity
- 211 - Insects, Mites, and Other Arthropods Affecting Plants

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 10**

**1. Outcome Target**

Number of people who increased knowledge in soil management practices, soil health and carbon sequestration.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 104 - Protect Soil from Harmful Effects of Natural Elements
- 111 - Conservation and Efficient Use of Water
- 112 - Watershed Protection and Management
- 403 - Waste Disposal, Recycling, and Reuse

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 11**

**1. Outcome Target**

Number of stakeholders gaining knowledge on what constitutes acceptable levels of periphyton biomass for recreational purposes in rivers of PR.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 112 - Watershed Protection and Management

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 12**

**1. Outcome Target**

Number of people who increased knowledge on practices to improve soil quality through an integrated soil management system.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 102 - Soil, Plant, Water, Nutrient Relationships
- 103 - Management of Saline and Sodic Soils and Salinity
- 104 - Protect Soil from Harmful Effects of Natural Elements
- 403 - Waste Disposal, Recycling, and Reuse

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 13**

#### **1. Outcome Target**

Number of non-native insects and weed species that pose a significant economic, ecologic and aesthetic impact in Puerto Rico, identified through an island-wide pest status assessment.

#### **2. Outcome Type** : Change in Knowledge Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 136 - Conservation of Biological Diversity
- 211 - Insects, Mites, and Other Arthropods Affecting Plants
- 212 - Diseases and Nematodes Affecting Plants

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 14**

#### **1. Outcome Target**

Number of people gaining knowledge about tropical forests landscaping models developed to enhance management decisions.

#### **2. Outcome Type** : Change in Knowledge Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 123 - Management and Sustainability of Forest Resources
- 136 - Conservation of Biological Diversity

#### **4. Associated Institute Type(s)**

- 1862 Research

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

### **1. External Factors which may affect Outcomes**

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

#### **Description**

Puerto Rico is frequently exposed to the impact of hurricanes and heavy rains that complicate existing problems of soil erosion and nutrient transport particularly in the central mountain region. Budget reductions at the university, and increases in the cost of higher education for students, may affect the number of scientists and graduate students working under this program.

Climate changes in an island ecosystem are expected to negatively affect natural resources such as water and soil and the livelihood of its inhabitants. Natural resources are at stake because of increasing demand to satisfy the needs of the human population and because of pressures brought on by an ever increasing dependence on imported goods and products. Any changes in world markets are greatly felt on economic activity in Puerto Rico.

The government has a very important role to play in addressing climate change, mostly in the way public policy is implemented.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Based on a case study format and recommendations by agricultural agents' of observed farmers' progress in applying recommended practices/activities to adapt to changes in climate, at least one farm/farmer per region will be documented (a total of five cases or more). The methodology will convey information on farm visits and interviews, as well as agricultural agents' records on farm development progress. This study will be conducted starting during the fourth period of this plan of work, 2016-17.

#### **Purpose of the evaluation**

To identify and prioritize issues that will shape the Agricultural Experiment Station (PRAEXS) research program for years to come is a continuous endeavor of our personnel and staff work. Checking out our current priorities to learn more about the needs and critical issues of greatest concern to PRAEXS stakeholders, speaking out on change and leading research that addresses these challenges are essential to fulfilling the program goals. The research program evaluation will have a double purpose: the first is a descriptive procedure that will produce a management model describing the research activities related to intended beneficiaries and expected outcomes. The second part of the evaluation effort will examine why the outcomes were or were not achieved. The primary purpose of this evaluation is to equip the programming effort through developing a management model that describes the factors that either enhance or detract from the completion of stated goals and objectives.

#### **Data collection sources**

- CAS Mayagüez-UPR Research Program Reports, database records, peer reviewed publications, newspaper articles
- Program participants and beneficiaries
- Direct observation of program events and results
- Documentation of program events and activities

**Data Collection Methods:**

Multiple data collection methods will be used to ensure a thorough account evaluation and validation of the findings. The following methods will be used at program activities to collect input from the program participants and stakeholders: survey, focus group interview, personal interviews, workshops and seminars, end section questionnaires, document review and analysis.

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

### **Program # 5**

#### **1. Name of the Planned Program**

Food Safety, Science and Technology

#### **2. Brief summary about Planned Program**

The extension goal of the Food Safety, Science, and Technology (FSST) planned program is "To improve food safety through the control, reduction or elimination of contamination risks." This component consists of two main areas: education for consumers and education for food managers. The Puerto Rico Agricultural Extension Service (PRAES) has the following curriculums on Food Safety: (A) For consumers: The "Food Safe Family Campaign," in which home economists have developed 15 new lessons including Four Steps for food safety, Food Safety during emergencies, Food Safety in fruit and vegetable gardens, Food Safety for events, and Protecting your baby. These lessons are to be combined according to their audience; ( B) For persons in charge of food establishments: the Food Safety Certification course, and (C) For university personnel and professionals from government agencies and organizations: Train-the-trainers; and (D) For Industry: Education and Dissemination of Food Safety Production and Food Industry Regulation. On the research side, our mission is to promote the quality of life and economic viability of the agricultural sector and rural communities through continuous improvement of current, and development of new, food and non-food products and their respective manufacturing and other related processes. In so doing, the program considers aspects such as food safety, nutritional value, environmental impact, education and information dissemination needs, consumer and industry support, technology development, transfer and adaptation. Information gathered in our outcomes, particularly on technologies developed or modified with a focus on food safety or shelf life, is expected to contribute to NIFA's national indicators on Food Safety (outcome 1, indicator 1) related to viable technologies for the detection and characterization of food supply contamination.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes



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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	0%		29%	
502	New and Improved Food Products	0%		25%	
602	Business Management, Finance, and Taxation	0%		7%	
701	Nutrient Composition of Food	0%		18%	
711	Ensure Food Products Free of Harmful Chemicals, Including Residues from Agricultural and Other Sources	0%		7%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	100%		14%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

The CDC (Center for Disease and Prevention) estimates that each year roughly 1 in 6 Americans (or 48 million people) get sick, 128,000 are hospitalized, and 3,000 die of foodborne diseases. Reducing foodborne illness by just 10% would keep 5 million Americans from getting sick each year and preventing a single fatal case of E. coli O157 infection would save an estimated \$7 million. Ensuring safe food is an important public health priority.

The ideal retail food program performance indicator should be the level of foodborne illness, but the occurrence of these illnesses is grossly underreported (FDA (2004). Preliminary data of the Morbidity and Mortality Weekly Report, April 2008, reported that a long-term decline in foodborne illness appears stalled. This makes the incidence of foodborne illness an unreliable program measurement. On the other hand, research reveals that American consumers are more knowledgeable about food safety, but may have erroneous ideas about which handling practices are effective in reducing foodborne illnesses in a home environment. Among restaurants, the major difference between those with foodborne disease outbreaks and those with non-outbreaks is the presence of a certified kitchen manager. Accordingly, Extension priorities remain to offer the Food Safety Certification Course (FSCC) to persons in charge of retail food establishments, and to continue offering formal education to professionals that enforce compliance regulations.

Nourishment, however, is essential for sustaining life. It is the role of the agro-industry to ensure a safe and sufficient supply of nutritious food at affordable prices, while minimizing the impact on the environment. Fulfilling such a role requires agro-industry to balance its own objectives along with consumer demands, governmental regulations, and market push towards the implementation of quality management systems. It has been estimated that Puerto Rico imports about 85% of its food. Traditionally, efforts of the Department of Agriculture of PR and the University of Puerto Rico's College of Agricultural Sciences have focused on farm production, even though experts have suggested that PR's agricultural

goods are more expensive than those imported from competing countries. Agricultural economists concur on the need to add value to agricultural products as a means to revive PR's agricultural industry. In this context research priorities in food safety, science and technology include the following:

- To improve consumer health through the development of products and processes that add value to agricultural goods, ensuring their safety and nutritional value to the consumers.
- To strengthen the market through the development or adaptation of postharvest and packaging technology and practices to maintain the safety and quality of agricultural goods in the supply chain.
- To define or evaluate quality parameters for fresh and processed goods, including chemical properties, safety and nutritional value.
- To characterize and reutilize harvest, slaughter or food processing wastes, residues and effluents for the development of value added goods.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

- Educating our PRAES agents and community leaders will help disseminate the information to the communities and individuals.
- Working in different partnerships will help in the development of programs aimed at promoting health and the preventing disease.
- Individuals that enroll or take a course or program are more willing and motivated to learn and adopt changes.
- The ability to learn is fundamental to the human nature, but there are individual differences.
- Food safety education will increase participants' knowledge and promote positive attitudes towards food safety practices.
- Positive attitudes will enhance the adoption of safe food handling behavior.
- The high cost of manual labor on the island, compared to that of our competitors in the Caribbean and Latin America, limits the fresh market potential of our agricultural system. As a result, Puerto Rico has an underutilized agricultural production system, which could become more productive with relative ease.
- In order for agriculture to become more economically attractive, Puerto Rico needs to move farmers away from fresh market production and onto a community-oriented agricultural development strategy to deliver value added products.
- If new feasible value-added product alternatives become available, Puerto Rico's farmer cooperatives and industry will embrace the new markets and exploit them.
- The establishment and habilitation of the Center for Innovation and Agro Industrial Technology (CITAI), will position the program as the leader in developing and adapting technology to improve production processes of value-added agricultural products.
- External funding will support research and related activities of the program.
- The knowledge of chemical and nutritional properties of cultivars will help identify special market niches for growers.

### **2. Ultimate goal(s) of this Program**

- To improve food safety handling practices among individuals that prepare and serve food by controlling, reducing or eliminating contamination risks.
- To improve food safety handling practices among consumers.
- To promote the quality of life and economic viability of the agricultural sector and rural communities by continuous improvement of current preservation techniques and development of new food and non-food products and their respective manufacturing and other related processes, while considering such aspects as food safety, nutritional value, environmental impact, education and information dissemination, consumer and industry support, and technology development.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	4.4	0.0	1.8	0.0
2017	4.4	0.0	1.8	0.0
2018	4.4	0.0	1.8	0.0
2019	4.4	0.0	1.8	0.0
2020	4.4	0.0	1.8	0.0

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

**1. Activity for the Program**

- Update Food Managers curriculum in order to update and include recommendations for adult learning techniques.
- Work in collaboration with the communication media.
- Continue working in partnership with other agencies to develop educational programs.
- Offer Safe Food Handling Curriculum to consumers. This curriculum includes food safety for pregnant women, food safety around the year, and food safety during emergencies.
  - Arrange for exhibitions, information centers, radio shows, among others.
  - Offer Food Safety Courses to food establishment managers, PRAES and personnel of other agencies
  - Offer trainings with emphasis on institutions that serve At-Risk Population in the Food Code Regulations, Hazard Analysis and Critical Control Points, Food Defense, and others.
    - Develop presentations, journal articles, Extension Service publications, and other literature contributions that make research results available to users and/or that establish guidelines or recommendations for process improvement or compliance with government regulations.
    - Hold seminars, short courses and workshops on various topics with open registration for industry and individual participants.
    - Establish collaborations with industry and/or farmers to research specific issues affecting their products or processes.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> <li>● One-on-One Intervention</li> <li>● Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>● TV Media Programs</li> <li>● Other 1 (Publications, exhibitions)</li> <li>● Other 2 (Radio spots)</li> </ul>

**3. Description of targeted audience**

- Extension professionals and other professionals
- Parents and persons that plan/buy/prepare food for the family
- Consumers with an emphasis on At risk Population
- Persons in charge of retail food establishments
- Farmers
- Food Industry

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

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
    - Direct Adult Contacts
    - Indirect Adult Contacts
    - Direct Youth Contacts
    - Indirect Youth Contact
  - Number of patents submitted
  - Number of peer reviewed publications
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of consumers completing one Food Safety educational curriculum for consumers.
  - Number persons in charge of food establishments completing Food Safety Course.
  - Number of persons completing courses, workshops, and seminars offered by the program.
  - Number of active research projects in the program.
  - Number of non-refereed publications based on research results.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of consumers that adopted one or more food handling practices.
2	Number of participants that approved the certification exam.
3	Number of participants that adopted three or more of eight selected food-handling practices recommended by the Food Code.
4	Number of enterprise participants impacted by the program that acquired knowledge of technologies based on scientific research
5	Number of improvements in technologies developed focusing on safety or shelf life extension.
6	Number of enterprises impacted by the program that improved their food technologies based on scientific research

**Outcome # 1**

**1. Outcome Target**

Number of consumers that adopted one or more food handling practices.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of participants that approved the certification exam.

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of participants that adopted three or more of eight selected food-handling practices recommended by the Food Code.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 712 - Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 4**

**1. Outcome Target**

Number of enterprise participants impacted by the program that acquired knowledge of technologies based on scientific research

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 602 - Business Management, Finance, and Taxation

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 5**

**1. Outcome Target**

Number of improvements in technologies developed focusing on safety or shelf life extension.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 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

**4. Associated Institute Type(s)**

- 1862 Research



**Outcome # 6**

**1. Outcome Target**

Number of enterprises impacted by the program that improved their food technologies based on scientific research

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 502 - New and Improved Food Products
- 701 - Nutrient Composition of Food

**4. Associated Institute Type(s)**

- 1862 Research

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

**1. External Factors which may affect Outcomes**

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

**Description**

Puerto Rico's location in the Caribbean makes it the object of a variety of natural events, which include hurricanes, heavy winds, droughts, and heavy rainy seasons that can cause floods. A major natural disaster such as a hurricane could completely reorient the government's priorities and make it essential to spend the already scarce resources on recovery rather than on health related programs. On the other hand, individuals will be caught up in trying to reestablish their businesses, homes, and assisting their families' needs.

Puerto Rico, as in many other places, is going through a major financial crisis, which may or may not be solved in the near future. We expect changes in the amount of money assigned to our government's budget. This will have a domino effect on agencies and instrumentalities, as well as on public policies and regulations.

Occasionally, the support needed from municipal governments may vary if their interests are different from the ones established by our program, particularly when part of the program is based on a different paradigm. It could take time for individuals, including our personnel, to change their attitudes and adopt a new model.

Competing Programmatic challenges - Research Program resources are not exclusively engaged with this program, thus, we have a pool of researchers who are constantly entering and leaving the program when their projects end.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Different methods will be employed to measure the extent of the program. These will vary according to the curriculum presented. A pre/post instrument will be used to identify behavior changes with the persons in charge of food establishments after taking the Food Safety course. Another test will be administered after the course to measure knowledge acquired.

Annual internal meetings (only with program faculty) will be held to check progress on metrics and to validate the research priorities.

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

### **Program # 6**

#### **1. Name of the Planned Program**

Community Resources for Sustainable Development, Agricultural Economics, Marketing and Added Value

#### **2. Brief summary about Planned Program**

Although agriculture has experienced limited improvement during the last year, farmers and rural communities in Puerto Rico continue to face the challenges of a long run declining trend of the PR agricultural sector and a 9-year long ongoing economic recession. This situation has been exacerbated by the expected reduction in budgetary allocations and appropriations levels due to fiscal distress experienced by PR and federal governments. Altogether, these problems underline the need to conduct more carefully defined research and extension efforts aimed at addressing the most fundamental and pressing economic and social issues of Puerto Rico's rural communities.

Research efforts planned under this program at the Puerto Rico Agricultural Experiment Station (PRAEXS) include those that (1) introduce new promising products and explore new markets for our traditional products, (2) make effective use of marketing tools to exploit products' full potential, (3) explore new uses for conventional products through processing, (4) research the market for "specialty products" as a possible new alternative for our tropical crops, (5) examine efficiency problems at the level of farm management, (6) evaluate the performance of plans and programs implemented in the areas of agricultural economics, marketing, value added, and community development, (7) document the status of community food systems and alternative community agricultural projects, and (8) research, analyze and educate on agriculture and natural resource management and policy alternatives.

At the Puerto Rico Agricultural Extension Service (PRAES), the Community Resources Development Program (CRD) has consolidated an effective Community Economic Development and Self-management program. The Empowering Communities and Community Economic Development sections of CRD continue expanding the initiative started in 2010, with special emphasis on community based agricultural land conservation and the promotion of sustainable low-scale family or community-based agriculture and other economic initiatives. To achieve these objectives, the CRD strategies are already focusing beyond training activities. This fiscal year our program will continue to reinforce the mentoring and coaching components. In addition, our program will emphasize the creation of local markets and business incubators. CRD program will continue focusing its efforts in guiding community leaders towards self-management and empowerment. We will continue relying in the use of Participative Action Research methodology as our principal approach to empower and construct stronger communities.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** Yes

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

## 1. Program Knowledge Areas and Percentage

<b>KA Code</b>	<b>Knowledge Area</b>	<b>%1862 Extension</b>	<b>%1890 Extension</b>	<b>%1862 Research</b>	<b>%1890 Research</b>
601	Economics of Agricultural Production and Farm Management	0%		30%	
602	Business Management, Finance, and Taxation	20%		5%	
604	Marketing and Distribution Practices	0%		30%	
605	Natural Resource and Environmental Economics	0%		5%	
607	Consumer Economics	0%		5%	
608	Community Resource Planning and Development	40%		10%	
610	Domestic Policy Analysis	0%		15%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	30%		0%	
805	Community Institutions and Social Services	10%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

Although agriculture has experienced limited improvement during the last year, farmers and rural communities in PR continue to face great and increasing challenges. Globalization has made evident how vulnerable local production is to competition from abroad. Countries in latitudes close to those of PR supply not only many of the same things and in the same moment of the year as PR does, but in much greater quantities, with higher productivity levels, and at a fraction of the cost. Labor cost differences are particularly noticeable. Land availability and cost are also important issues, with suburban sprawl posing serious irreversible threats to the future availability of land for agriculture. The massive supply of low-cost goods by foreign competitors has lowered market prices, many times at levels that fall below the high costs of production experienced by PR farmers. The overall effect is a loss in profitability that threatens the sustainability of PR's agriculture and the livelihoods of its rural communities. These problems highlight the need at the PRAEXS for substantial efforts to innovate, control costs, find new market niches, and make better use of precious natural resources.

Other problem areas threaten the food security status of PR, including the high vulnerability of PR's food chain to the occurrence of catastrophic risks, the increasing prevalence of obesity, and the greater market power of intermediary business. There is also the continued fiscal crisis with its expected detrimental impacts to society. As a result, there is a need at the PRAEXS to study the vulnerabilities of PR's food supply chain, consumption choices, particularly as impacted by changes in government programs, the development alternatives available to rural communities, as well as the nature of linkages between local farms and major food retailers.

The nature of PR's problems has complex social and economic consequences. For instance, PR experiences a sustained poverty level rate close to 50%. The public debt per capita is at \$7,837, while the per capita income is \$13,675, for a debt income ratio of 57.3% (Figures for the U.S. are \$4,606, \$51,302, and 9%). PR remains the only US jurisdiction where there are more people of the "working age" group out of the labor market than working. The rate of communities, both urban and rural, that experience long-term spells of poverty and inequality far surpass those in the US. PR also continues experiencing an uncontrolled process of social decomposition with unmanageable criminality, domestic violence, school dropouts, suicide, drug addiction, and alcoholism rates.

In view of these pressing social issues, the PRAES plans to continue focusing on holistic educational strategies to promote self-employment, and community oriented initiatives that foster sustainability, self-reliance and empowerment. Through the use of the Participatory Action Research methodology already in place, the PRAES continues promoting the organization of community councils and their involvement in the definition of problems and aspirations, in the search for possible solutions, in implementing strategies, and in evaluating results.

## **2. Scope of the Program**

- In-State Extension
- In-State Research
- Multistate Research

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

- Better knowledge of production costs, consumers' preferences and local markets will translate into marketing strategies that will allow producers to identify niches to penetrate, and support expanded commodity production.
  - The institutional funding and staff needed to conduct this program will be available.
  - The technology needed to increase the physical output of the selected commodities is economically available.
  - An expansion in the agricultural sector production will improve the employment situation of rural communities.
  - A strong extension component will be developed to translate research results into effective marketing and community development strategies.
  - Holistic training of the field agents, home economists, and community leaders will help disseminate information to the communities that will foster social change.
  - In order to make an adult education program successful, we must integrate the participants to all aspects of the educational process (i.e., definition of the problems and aspirations, development of possible solutions, implementation and evaluation).
    - Meaningful long-term changes in behavior and attitude take time to accomplish.
    - Communities possess the human, cultural and material resources needed for their social and economic development.
      - Sustainable, self-employment and economic development are possible if people possess basic social and entrepreneurial tools that will let them to take advantage of their existing skills and existing opportunities in their communities.
      - The work of those who have the ministerial duty to serve the communities will be more effective and fruitful if they form strategic alliances that would maximize both institutional and human resources.

- Popular knowledge is as essential and valuable as technical knowledge; both complement each other, both should be promoted and respected to achieve a meaningful improvement in the quality of life of the communities.
- To obtain a positive outcome in the program development, it is necessary that people work together to address their common interests and goals.
- A strong program is developed when the people involved in it are motivated to learn and adopt changes in the implementation of the program.

**2. Ultimate goal(s) of this Program**

- To increase adoption of improved management and decision making systems (e.g., costs of production) by PR producers that improve competitive advantage and profitability
- To identify and increase adoption of improved marketing and logistics systems by PR producers and intermediaries that improve market access for PR producers and reduces vulnerabilities to catastrophic risks.
- To identify and develop highly profitable new market niches, crop species and crop varieties that improve the competitive position of Puerto Rico producers.
- To identify and increase adoption of improved institutional arrangements by PR rural communities that allow their members to effectively (i) benefit of all the other objectives stated here, as well as (ii) participate in public policy decisions affecting their well-being.
- To increase adoption of improved management and decision-making systems, by PR community leaders and government officials, that optimize public funds and natural resource use.
- To improve the quality of life and food security situation of households and rural communities.
- To increase the communities' quality of life and sustainability through the establishment of collaborative, community oriented, and community based economic initiatives and enterprises.
- To improve the social, economic and environmental quality for individuals and families by increasing the number of community projects focused on developing empowered and self-managed communities.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	24.3	0.0	0.6	0.0
2017	24.3	0.0	0.8	0.0
2018	24.3	0.0	1.0	0.0
2019	24.3	0.0	1.0	0.0
2020	24.3	0.0	1.0	0.0

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

**1. Activity for the Program**

- Conduct research to identify new market niches and new promising products, as well as to determine farmers' costs of production, consumer preferences, marketing margins, and farmers' and other participant's shares in the marketing channels of selected agricultural commodities.
- Carry out studies to identify the diverse strategies local food system stakeholders are currently using or might use to create and manage ongoing or potential change, and their information needs.
- Conduct research to improve natural resource and environmental use by farmers and to support policy-making process by government officials in order to achieve greater economic and material sustainability.
- Translate results, in collaboration with Extension faculty and agents, into recommendations for farmers and community organizers.
- Prepare publications and make presentations to producers' associations and agricultural professionals.
- Use of Economic Development "tool box" material that will empower community participants to take advantage of the endless amount of possibilities for community oriented economic initiatives.
- Increase in mentorship and companionship efforts vis-à-vis entrepreneurial workshops.
- Establish local farmers and artisans' markets, and business incubators.
- Organize community assemblies, gatherings, and other meetings to establish rapport and explore needs and aspirations.
- Conduct conference/training in areas of social investment, marketing, market study and analysis, self-employment opportunities identification, community based business and empowerment.
- Use Participative Action Research strategies such as "reading the streets", participant observation, ethnographies, life histories, focus groups, informal interviews, and reflexive diaries.
- Establish strategic alliances with government agencies, non-government organizations and community institutions to collaborate in the promotion of community based economic initiatives.
- Develop educational material such as curriculum and modules.
- Establish community coalitions with volunteer organizations, community services organizations, institutions, and other agencies.
- Carry out seminars with community services institutions that offer assistance in case of disaster or emergency, including volunteer organizations, non-profit groups and government agencies.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> <li>• Other 1 (Community assemblies, meetings)</li> <li>• Other 2 (Participative Action Research)</li> </ul>	<ul style="list-style-type: none"> <li>• Web sites other than eXtension</li> <li>• Other 1 (Radio Programs)</li> </ul>

**3. Description of targeted audience**

Farmers, extension professionals, community leaders and organizers, producers associations, academic community, local and state government officials, and other professionals.

Community participants (i.e., individuals and families), community leaders, extension professionals and other professionals.

### **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

### **V(H). State Defined Outputs**

#### **1. Output Measure**

- Number of presentations in scientific meetings
- Number of non-refereed publications (posters, newspaper articles, etc)
- Number of new technology generated (models, software, processes)
- Number of persons trained in community-based business.
- Number of leaders trained in community organization and empowerment (at least four workshops).
- Number of leaders trained in emergency and disaster situations (at least four workshops).

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.



**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of stakeholders gaining knowledge about new information/tools (medium term measure) aimed at improving: consumption decisions, production management, marketing decisions, institutional arrangements and organizational capacities, public policy decisions, natural resources and environmental management.
2	Number of adopters of new or improved practices/tools in consumption decisions, production management, marketing decisions, institutional arrangements and organizational capacities, public policy decisions, natural resources and the environmental management.
3	Total number of participants in new market-niches improved as a result of program research.
4	Number of persons applying the recommended practices in the process of developing a community-based business.
5	Number of community-based businesses established.
6	Number of community projects established to benefit the community.
7	Number of leaders participating actively in the design and implementation of community projects.
8	Number of communities that developed an emergency and safety plan.
9	Number of families that developed an emergency and safety plan.

### **Outcome # 1**

#### **1. Outcome Target**

Number of stakeholders gaining knowledge about new information/tools (medium term measure) aimed at improving: consumption decisions, production management, marketing decisions, institutional arrangements and organizational capacities, public policy decisions, natural resources and environmental management.

**2. Outcome Type :** Change in Knowledge Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices
- 605 - Natural Resource and Environmental Economics
- 607 - Consumer Economics
- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis

#### **4. Associated Institute Type(s)**

- 1862 Research

### **Outcome # 2**

#### **1. Outcome Target**

Number of adopters of new or improved practices/tools in consumption decisions, production management, marketing decisions, institutional arrangements and organizational capacities, public policy decisions, natural resources and the environmental management.

**2. Outcome Type :** Change in Action Outcome Measure

#### **3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices
- 605 - Natural Resource and Environmental Economics
- 607 - Consumer Economics
- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 3**

**1. Outcome Target**

Total number of participants in new market-niches improved as a result of program research.

**2. Outcome Type : Change in Condition Outcome Measure**

**3. Associated Knowledge Area(s)**

- 601 - Economics of Agricultural Production and Farm Management
- 602 - Business Management, Finance, and Taxation
- 604 - Marketing and Distribution Practices
- 607 - Consumer Economics
- 608 - Community Resource Planning and Development
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Research

**Outcome # 4**

**1. Outcome Target**

Number of persons applying the recommended practices in the process of developing a community-based business.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 602 - Business Management, Finance, and Taxation
- 608 - Community Resource Planning and Development
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities
- 805 - Community Institutions and Social Services

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 5**

**1. Outcome Target**

Number of community-based businesses established.

**2. Outcome Type : Change in Condition Outcome Measure**

**3. Associated Knowledge Area(s)**

- 602 - Business Management, Finance, and Taxation
- 608 - Community Resource Planning and Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 6**

**1. Outcome Target**

Number of community projects established to benefit the community.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 608 - Community Resource Planning and Development
- 805 - Community Institutions and Social Services

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

Number of leaders participating actively in the design and implementation of community projects.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 608 - Community Resource Planning and Development
- 803 - Sociological and Technological Change Affecting Individuals, Families, and Communities

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 8**

##### **1. Outcome Target**

Number of communities that developed an emergency and safety plan.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 608 - Community Resource Planning and Development

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 9**

##### **1. Outcome Target**

Number of families that developed an emergency and safety plan.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 608 - Community Resource Planning and Development
- 805 - Community Institutions and Social Services

#### **4. Associated Institute Type(s)**

- 1862 Extension

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

#### **1. External Factors which may affect Outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Competing Programmatic Challenges

## **Description**

**Natural Disasters:** Due to the geographic location of Puerto Rico, the island is subject to the possibility of tropical weather extremes such as hurricanes, drought or flooding, as well as telluric movements such as earthquakes and tsunamis.

**Economy:** Puerto Rico is experiencing a nine-year in a row negative growth economic spiral. Significant Federal Government cuts are foreseeable in the near future, exacerbating the already stricken economic situation.

**Appropriations Change:** The projected reduction in the federal government's budget is expected to affect both the amount of economic resources, human capital, and as a result, the capacity to develop community projects and spur economic growth, with a serious concomitant effect in state earnings and revenue collection.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Our program has some traditional areas of research such as production and marketing studies. However, it has recently begun or is planning to begin research covering the following broad topics: (1) identification and development of new export niches, (2) development of management tools and public policy analyses in the areas natural resource and the environment, and (3) development of management tools for organic agriculture. We will undertake a needs and market assessment type of evaluation for these three new topics. In particular, for topics (1) and (3) pre-post questionnaires will be administered to a sample of producers. These questionnaires will be supplemented with case studies or focus groups.

In our extension component of the program, evaluation studies will be conducted during the program development in order to understand the changes occurring in the communities. Several methodologies will be employed to measure knowledge acquisition. A retrospective pre-post questionnaire will be administered as part of the Community Entrepreneurship Tool Box workshop series. Case studies or focus groups will be carried out to illustrate norms that could serve to establish a program model, or to illustrate anomalous outcomes that could help establish idiosyncratic or particular aspects to the community development initiative. These case studies will also help document the implementation of new abilities, skills and behaviors, to gain an in depth understanding of personal and community entrepreneurial transformation, as well as of the development of emergency and disaster plans.

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

**Program # 7**

**1. Name of the Planned Program**

Sustainable Energy

**2. Brief summary about Planned Program**

Decreases in oil availability, uncertainty in the cost of fuel and its implications for the economic well-being of our citizens, have triggered an urgency for energy independence and sustainability. Puerto Rico has one of the highest fuel costs in the United States but not many projects have passed the planning phase, even though our tropical climate favors the sustainable energy industry.

The Sustainable Energy planned program seeks to increase knowledge in our clientele of sustainable energy technologies, energy conservation, opportunities for financing sustainable energy projects, their implementation and environmental benefits. Our research and extension goals are to achieve greater energy efficiency, and reduce the operating costs of farming and agroindustrial operations on the island. To achieve our goals we will diversify and improve the design of available energy alternatives, assess the cost-effectiveness of these alternatives and disseminate this information to stakeholders.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :**Yes

**6. Expending other than formula funds or state-matching funds :** Yes

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
401	Structures, Facilities, and General Purpose Farm Supplies	15%		30%	
402	Engineering Systems and Equipment	10%		30%	
403	Waste Disposal, Recycling, and Reuse	65%		40%	
405	Drainage and Irrigation Systems and Facilities	10%		0%	
	<b>Total</b>	100%		100%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

Dependence on fossil fuels negatively affects the economic wellbeing of the citizens of Puerto Rico. At a rate fluctuating between 22 and 31 cents per kW of electricity, the costs of production on the island

are extremely high, affecting the competitiveness of local industries and agribusinesses in the market. For the average household, the electric bill also takes a big piece of income.

The local government has been partially successful in stimulating investment in sustainable energy technologies by offering tax incentives. A recent economic incentive promoting the purchase of "more efficient" hybrid vehicles was accepted by some sectors of the population. However, new legislation requiring the Puerto Rico Electric Power Authority to buy surplus electric power generated by its clients' "net metering", has been criticized for requiring high capital investments and for being too complicated to be understood by the average client. Bureaucratic steps, contacts, and paperwork involved in the process of obtaining the required permits and in getting the net metering connection to work properly, hinders the pace of adoption of new technologies and the startup of new projects.

During the 1970s energy crisis, Puerto Rico began to develop a biomass research program based on our sugar cane industry operating then. Drying up of funding sources halted this research after the early 1990s. Research results from other studies conducted at the PRAEXS in the 1980s using dairy wastes, showed that this type of project can be successful under the island's prevailing climate conditions. In Aibonito, biogas produced with poultry waste hydrolyzed with slaughterhouse wastewater improved water quality and produced an organic fertilizer by-product.

Solar radiation, through photovoltaic technology, remains the renewable energy resource most readily available for use in Puerto Rico. Nevertheless, additional assessments of its suitability for different kinds of operations must be done. Our experience with some of the more technically oriented clients of the PRAES shows that they wish to learn about new technologies, but are concerned about making capital investments without big government incentives. Our clientele needs orientation in all aspects of energy sustainability--from basic concepts of energy audits and conservation, to the use and demonstration of technologies.

Current research and extension priorities are therefore:

- To increase the knowledge of our stakeholders of available sustainable energy technologies, energy conservation, and opportunities to finance sustainable energy projects;
- To improve the design and cost effectiveness of technologies, such as biodigestors fueled with different types of wastes, and photovoltaic cells; and,
- To identify and evaluate non-food crops with potential for developing a new biofuel industry on the island.

At present all of the research projects formerly active in the program have terminated but faculty remains interested in submitting new proposals.

## **2. Scope of the Program**

- In-State Extension
- In-State Research

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

- Economic incentives available for sustainable energy projects will continue to be offered and improved.
- Funding for research projects in the area of sustainable energy will be available either from local or external source.
- Relevant expertise for conducting this type of research will continue to be available in the CAS and in the College of Engineering.



- PRAES specialists continue to work on proposals and special projects to obtain external resources to expand our capabilities. Our program could be expanded if we are successful in attracting external funding and working through our network of county agents and home economists.

**2. Ultimate goal(s) of this Program**

To achieve greater energy efficiency and help reduce the operating costs of farming and agroindustrial operations on the island by diversifying and improving the design of the energy alternatives currently available locally, by assessing the cost-effectiveness of these alternatives, and by disseminating this information to stakeholders.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	4.0	0.0	0.0	0.0
2017	4.0	0.0	0.2	0.0
2018	4.0	0.0	0.2	0.0
2019	4.0	0.0	0.5	0.0
2020	4.0	0.0	0.5	0.0

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

**1. Activity for the Program**

- Design and make plans that include and promote energy sustainability and efficiency in structures, waste management systems, and irrigation systems (new facilities or improvement to existing facilities).
  - Establish collaborations with government agencies (Puerto Rico Electric Power Authority; Environmental Quality Board; Departments of Agriculture, Environmental and Natural Resources, and Education; Puerto Rico Aqueducts and Sewage Authority; USEPA; USDA; NRCS; and others) and with our partners in the University of Puerto Rico and other educational institutions.
  - Include in our workshops and meetings aspects of sustainable energy with emphasis on structures, waste management and irrigation equipment, and energy conservation.
    - Collect data on energy consumption from different types of agricultural operations.
    - Conduct viability studies of different types of alternative energy solutions, tailored to the conditions of farming operations in Puerto Rico.
    - Conduct technological studies of energy generation from agricultural wastes and optimization of designs.
  - Disseminate results to the scientific community and to farmers, government officials, and other interested stakeholders through publications and presentations adapted to the audience.
    - Monitor photovoltaic systems in PRAEXS facilities to serve as models for future initiatives.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>● Education Class</li> <li>● Workshop</li> <li>● Group Discussion</li> <li>● One-on-One Intervention</li> <li>● Demonstrations</li> </ul>	<ul style="list-style-type: none"> <li>● Newsletters</li> <li>● TV Media Programs</li> </ul>

**3. Description of targeted audience**

- Extension professionals.
- Professional personnel of the Puerto Rican Department of Agriculture and USDA.
- Policy makers in the Commonwealth and Federal governments.
- Professionals engaged in private enterprises related to renewable energy projects.
- Faculty members and university graduate and undergraduate students.
- Farmers and managers of agroindustrial operations.

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

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
    - Direct Adult Contacts
    - Indirect Adult Contacts
    - Direct Youth Contacts
    - Indirect Youth Contact
  - Number of patents submitted
  - Number of peer reviewed publications
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of clients that participated in workshops and meetings offered which include aspects of energy sustainability and efficiency.
  - Number of government agencies and partners in the University of Puerto Rico and other educational institutions that collaborate in projects that promote energy sustainability and efficiency.
  - Number of active research projects in the program.
  - Number of new proposals submitted targeting the program's priorities.
  - Number of popular (non-refereed) publications based on research results.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of clients adopting designs and plans that include and promote energy sustainability and efficiency in structures, waste management systems and irrigation systems (new facilities or improvements to existing facilities).
2	Number of projects/initiatives/clients adopting designs, plans, or energy alternatives developed as a result of partnerships between government agencies, the University of Puerto Rico, and other educational institutions that collaborate and promote energy sustainability and efficiency.
3	Number of popular (non-refereed) articles published based on research results.

**Outcome # 1**

**1. Outcome Target**

Number of clients adopting designs and plans that include and promote energy sustainability and efficiency in structures, waste management systems and irrigation systems (new facilities or improvements to existing facilities).

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 402 - Engineering Systems and Equipment
- 403 - Waste Disposal, Recycling, and Reuse
- 405 - Drainage and Irrigation Systems and Facilities

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

**Outcome # 2**

**1. Outcome Target**

Number of projects/initiatives/clients adopting designs, plans, or energy alternatives developed as a result of partnerships between government agencies, the University of Puerto Rico, and other educational institutions that collaborate and promote energy sustainability and efficiency.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 402 - Engineering Systems and Equipment
- 403 - Waste Disposal, Recycling, and Reuse
- 405 - Drainage and Irrigation Systems and Facilities

**4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

### **Outcome # 3**

#### **1. Outcome Target**

Number of popular (non-refereed) articles published based on research results.

#### **2. Outcome Type : Change in Action Outcome Measure**

#### **3. Associated Knowledge Area(s)**

- 401 - Structures, Facilities, and General Purpose Farm Supplies
- 402 - Engineering Systems and Equipment
- 403 - Waste Disposal, Recycling, and Reuse
- 405 - Drainage and Irrigation Systems and Facilities

#### **4. Associated Institute Type(s)**

- 1862 Extension
- 1862 Research

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

#### **1. External Factors which may affect Outcomes**

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Programmatic Challenges
- Other (Availability of economic incenti)

#### **Description**

Economy- The recession and increasing cost of inputs may limit farmers' ability to adopt technologies with long-term payoffs.

Appropriation changes- Availability of continued funding for research and for incentives for public adoption of technologies is vital for achieving progress in this program.

In a tropical island setting, priorities can drastically be affected by natural disasters. Tropical hurricanes and storms are the most common. Many facilities can be affected and under these circumstances the number one priority for our clients is to get their enterprises back in business as quickly as possible; energy sustainability will be secondary.

A weak economy is another factor that precludes people from investing in improving their infrastructures. When the general feeling is that the economy is strong, people tend to be more aggressive with infrastructure investments. Changes in public policies also make people change priorities and postpone projects. The availability of economic incentives is decisive in making final decisions that require capital investments.

Our extension program depends on the amount of time that the PRAES county agents and home economists can allocate to it. Any changes in priorities set by the administration will have an effect on the program's outcome.

### **V(K). Planned Program - Planned Evaluation Studies**

#### **Description of Planned Evaluation Studies**

Surveys will be conducted with the program's clientele to find out how many people have made changes to alternative energy systems and their efficiency.

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

### **Program # 8**

#### **1. Name of the Planned Program**

Adult and Childhood Obesity

#### **2. Brief summary about Planned Program**

Childhood obesity rates are still a major public health concern, since it has triplicated in the last ten years. Moreover, it is increasing in teenagers and school-age children. A new trend in sedentary lifestyles and increased TV-viewing in preschoolers might impact unhealthy eating practices that can be maintained. Efforts to prevent and stop childhood obesity require the implementation of programs focused on healthy eating, nutrition education strategies and ongoing evaluation of results for improvement following the Logic Model.

Our planned programs are science-based practice focused. The planned program intends to work in accordance with the goals set by Healthy People 2020, which include a decrease in the percentage of people who are overweight or obese. To accomplish these goals, the planned program Adult and Childhood Obesity will work on strategies presented by the Department of Health and Human Services' 2010 and 2015 Dietary Guidelines for Americans, which focus on the promotion of healthy lifestyles, nutrition adequacy and physical activity.

The major target areas of improvement of healthy eating practices and physical activities will have an integrative focus, in which the nutrition education contains a physical activity component. The education component will be focusing the areas of: healthy food choices, portion control and using the garden to increase consumption of fresh fruits and vegetables to target the lack of physical activity, skipping meals, large portion sizes, low intake of fruits, vegetables, whole grains and water, and high consumption of sugared drinks, saturated and trans fats, among other practices. Considering that the cause of obesity is multifactorial, this planned program will focus on physical environment, parental influence, socioeconomic status, and media.

The physical environment, which includes the home, work, school or childcare facilities and in leisure activities, should promote healthy eating and physical activities. The areas to be impacted are: 1) public policies- working with government agencies promoting physical activity programs for the community; 2) strategies for healthy eating at home through easy to prepare inexpensive culturally competent recipes; 3) involvement of the community in gardening; 4) and the dissemination of educational material throughout community centers, schools and churches.

Socioeconomic changes, such as the increase of single parents with extended working hours, which leads to eating out more, prolonged exposure to childcare centers, and unsupervised children at home, can contribute to more exposure to media, sedentary lives, and the consumption of most of the meals at the childcare centers. This educational program will focus on low cost healthy food and physical activity choices for overall community, including public policy initiatives interventions.

Our long-range goal will reduce the progression of obesity in the local population through community based interventions to preschoolers, school-age and adolescents, and their families, tools to develop, adopt, and maintain behavioral changes that promote healthy eating, and physical activity. The educational philosophies supporting are cooperative learning and learning-by-doing, which involve comprehensive and coordinated efforts of all the participants.

The specific aims are the activities required to implement an educational curricula that include the following: culturally and age-appropriate healthy eating patterns, physical activity and gardening for reducing risk of obesity and of chronic disease, with the purpose of improving the health of adults and children.



**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** No

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
703	Nutrition Education and Behavior	60%		0%	
704	Nutrition and Hunger in the Population	10%		0%	
724	Healthy Lifestyle	30%		0%	
	<b>Total</b>	100%		0%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

According to the Center of Disease Control (2011), obesity rates triplicated in the past 30 years, where 65% of the adults are overweight or obese. In United States, childhood obesity doubled in children from 6-11 years and tripled in adolescents, accounting for 17% of the young population to be ranked as overweight or obese (NHANES 2009-10). The total cost for obesity in the United States is around \$117 billion.

World Health Organization (WHO) estimated that over 1 billion people globally are currently overweight, 300 million people are clinically obese, and the number of overweight children under the age of five is estimated to be over 42 million. More than 2.5 million deaths annually are weight related and this could rise to 5 million by 2020. The USA forecasts to spend 19% of GDP on health care by 2014, up from 15% in 2003.

One of seven low-income preschool children is obese (Pediatric Nutrition Surveillance System). Among preschool children aged 2-5, obesity increased from 5.0 to 10.4% between 1976-1980 and 2007-2008, and from 6.5 to 19.6% among children aged 6-11. Among adolescents aged 12-19, obesity increased from 5.0 to 18.1% during the same period. Sedentary lifestyles in children are related to TV viewing, and promotion of high fat, high sodium and sugary products.

Obesity rates in Puerto Rico are similar to the United States, 65% of the total adult population is overweight or obese. According to the 2010 report of the Trust for America's Health: "F as Fat", Puerto Rico ranked as the obese state in the Nation. According to data from the PR Department of Health, 35% of adults and 27% of children in Puerto Rico are obese.

The Youth Behavioral Risk Factor Surveillance System (2013) reported that only 18% of the teenagers in Puerto Rico engage in 60 minutes of physical activity five days a week and 82% do not meet the recommendations from 2010 DGA,. Unhealthy eating behaviors such as skipping breakfast and low fruits and vegetables consumption might relate with the 26% of Puerto Ricans teens that are overweight to obese.; 27% do not eat fruits and vegetables and 62% of teens do not eat breakfast . Moreover, a study from Rivera Soto et al., (2012) revealed that, although 38% of elementary school children (n=250) were obese, only 20% of the parents classified them as such, demonstrating the need of nutrition education for parents and caregivers in this area.

The Health and Balance report from the Institute of Medicine (IOM) encourages developing strategies to develop effective initiatives followed by a consistent evaluation method for sustainability. The Recommended Community Strategies and Measures to Prevent Obesity in the U.S. propose the community based strategies that change obesogenic environments. Changes might be having access to healthy food and promoting the free practice of physical activities, the development of public policy for healthier environments in schools, day care centers, and communities offering equal opportunity for all citizens, avoiding inequality by gender, socioeconomic status, race and ethnicity.

**2. Scope of the Program**

- In-State Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

1. Adults and children are consuming less fruits and vegetables than the federal recommendations
2. Decline in healthy snacks and breakfast consumption in children
3. Adults and children have sedentary lifestyles
4. Constraints in parent time result in a reduction in prepared home-cooked meals, or even to serve family dinner
5. Electronic technologies and media are conducive to sedentary forms of socializing and recreation
6. Increased cost of food promote the purchase of unhealthy but less expensive meals
7. Cultural beliefs of adults can affect weight perception of obese children
8. Media is promoting the consumption of high fat, high sodium, sugary foods
9. Portion sizes are increasing and promoting overeating.

**2. Ultimate goal(s) of this Program**

To reduce the prevalence of adult (families/ caregivers) and childhood obesity through the improvement of nutrition, physical activity and healthy lifestyles.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	9.5	0.0	0.0	0.0
2017	8.8	0.0	0.0	0.0
2018	8.8	0.0	0.0	0.0
2019	8.8	0.0	0.0	0.0
2020	8.8	0.0	0.0	0.0

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

**1. Activity for the Program**

- Develop a nutrition education and physical activity curriculum for children (pre-school, elementary school and adolescents) and adults to promote and implement both programs within the community served.
  - Short courses about the importance of healthy eating practices: importance of breakfast, healthy snacks, and healthy food choices (reading food labels, supermarket tours, meal planning, shopping lists to ensure healthy food choices within a budget)
  - Short courses about the control of portion size, reduction of sugary, high fat and/or salty foods.
  - Demonstrative workshops about easy, healthy food recipes to encourage the consumption of fruit, vegetables, whole grain foods, low fat milk products and lean meats.
  - Workshops on the importance of gardening to increase physical activity and the consumption of fruit, vegetables and healthy foods.
  - Develop evaluation tools on nutrition knowledge, attitudes and beliefs toward healthy eating and physical activity before and after the nutrition education program.

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> <li>• Other 1 (Courses)</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletters</li> <li>• TV Media Programs</li> </ul>

**3. Description of targeted audience**

Children/youth and their families, caregivers, and adults.

### **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
    - Direct Adult Contacts
    - Indirect Adult Contacts
    - Direct Youth Contacts
    - Indirect Youth Contact
  - Number of patents submitted
  - Number of peer reviewed publications
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

### **V(H). State Defined Outputs**

#### **1. Output Measure**

- Number of children and youth that completed non-formal nutrition and physical activity education courses.
  - Number of families/caregivers that completed non-formal nutrition and physical activity education courses.
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of children and youth that reported eating more healthy foods.
2	Number of families/caregivers that reported eating more of healthy foods.
3	Number of children and youth that reported eating less of foods/food components which are commonly eaten in excess.
4	Number of families/caregivers that reported eating less of foods/food components which are commonly eaten in excess.
5	Number of children and youth that reported increasing their physical activity.
6	Number of children and youth that reported engaging daily in 60 minutes or more of physical activity.
7	Number of families/caregivers who gained knowledge about the importance of gardening to promote physical activity and improve nutrition.
8	Number of children and youth that reported adopting healthy eating patterns

**Outcome # 1**

**1. Outcome Target**

Number of children and youth that reported eating more healthy foods.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of families/caregivers that reported eating more of healthy foods.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of children and youth that reported eating less of foods/food components which are commonly eaten in excess.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

Number of families/caregivers that reported eating less of foods/food components which are commonly eaten in excess.

**2. Outcome Type** : Change in Action Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 5**

##### **1. Outcome Target**

Number of children and youth that reported increasing their physical activity.

**2. Outcome Type** : Change in Action Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 6**

##### **1. Outcome Target**

Number of children and youth that reported engaging daily in 60 minutes or more of physical activity.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

Number of families/caregivers who gained knowledge about the importance of gardening to promote physical activity and improve nutrition.

**2. Outcome Type :** Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 704 - Nutrition and Hunger in the Population

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

Number of children and youth that reported adopting healthy eating patterns

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 703 - Nutrition Education and Behavior
- 724 - Healthy Lifestyle

**4. Associated Institute Type(s)**

- 1862 Extension

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

**1. External Factors which may affect Outcomes**



- Economy
- Public Policy changes
- Government Regulations

### **Description**

Puerto Rico's location in the Caribbean area makes it the object of natural events, which include hurricanes, heavy winds, droughts, and heavy rainy seasons that can cause floods. Puerto Rico is also in earthquake risk zone, as was demonstrated in the case of Haiti. A major natural disaster or new pest's diseases could completely reorient the government's priorities and make it essential to spend scarce resources on recovery rather than health related programs. On the other hand, individuals will be caught up in trying to reestablish their business, homes and assisting their families' needs.

Having major ongoing political changes and a crisis on the devaluation of the credit, Puerto Rico face major constraints in employments, food availability and costs. We will be working with fewer personnel to visit the communities, more unemployed clientele and more challenge for the families to buy healthy foods. Parents must have to get more than one job to supply for the family, increasing the number of children unsupervised by parents making unhealthy food choices.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

We will administer questionnaires to evaluate behavior changes in food consumption and physical activity among a selected sample of participants (youth and families/caregivers) that participated in PRAES non-formal education courses on nutrition and physical activity. The questionnaire will include questions on behavior changes according to the outcome measures. Questionnaire will be administered at the completion of the course. We anticipate annual administration of these questionnaires to develop continuous surveillance and adoption of culturally and economically appropriate education programs.

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

### **Program # 9**

#### **1. Name of the Planned Program**

Family Well-being

#### **2. Brief summary about Planned Program**

The 2010 U.S. Census counted 3,725,789 million people living in Puerto Rico, almost entirely of Hispanic origin. Forty-five (44.9%) percent of this population lives in poverty.

The increase in population, as well as social, political, and economic changes impact Puerto Rican families and affect their vital function. The family structure in Puerto Rico has changed with important implications for children and youth. Changes in economic and financial issues impact individuals and families leading to negative effects on the emotional stability of individuals, the elderly and families. This also leads to the instability of couples relationships, parental responsibilities, and poor healthy styles of living, among others.

The Family Well-being planned program targets individuals, families and population at risk, children, youth, elderly people, young parents, stepfamilies, grandparents raising grandchildren, and employees of the public and private sectors and institutions. Its goal is to develop educational programs to empower families, individuals to nurture, support, and guide members throughout their lives, and improve the quality of lifestyles and well-being for individuals, the elderly and others.

To reach this goal, the Family and Consumer Science Specialists develops courses, workshops, trainings, curricula, radio and TV programs, information centers and, informative bulletins, which cover areas such as: family development behaviors and related areas, aging aspects, healthy life styles, financial capability and consumer behavior skills.

Through the establishment of coalitions and collaborative agreements with other public and government agencies, community faith base, and other institutions, consumer behavior influences decision-making, budgeting, debt reduction, credit wise, savings, and promoting healthy life styles and health services.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** No

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
607	Consumer Economics	10%		0%	
724	Healthy Lifestyle	30%		0%	
801	Individual and Family Resource Management	20%		0%	
802	Human Development and Family Well-Being	40%		0%	
	<b>Total</b>	100%		0%	

**V(C). Planned Program (Situation and Scope)**

1. Situation and priorities

The composition of Puerto Rican families has changed due to social, political and economic changes which affect their vital function.

According to the 2010 Census for Puerto Rico, the total population 3,725,789 is people. Of this total 327,560 people live alone. This equates to nearly one fourth (23.8%) of all Puerto Rican households (1,376,531). Families whose income head of household is a woman with own children under 18 years old was 150,575 (10.9%); of these families 68% live under the poverty level.

The Consumer Price Index for November 2012 was 115,719, an increase from 113,976 in December 2011. This suggests hard economic times for individuals and families in Puerto Rico are not over yet.

Financial problems can also cause negative effects on individuals and families. According to the Puerto Rico Department of Family, during 2012, 22,000 families had active cases involving children maltreatment--9,948 reported cases of family violence in which 83% were against women. There was also an increase in the number of divorces, pregnant adolescents, single mothers, stepfamilies, grandparents raising grandchildren, and domestic violence.

Due to the present economic situation, financial education has gained interest among consumers. According to Hogarth (2002), well-educated consumers should make better decisions for their families, increasing their economic security and well-being. As a result, financially secure families are better able to contribute to vital, thriving communities, further fostering community economic development.

Health conditions and services to individuals and families also contribute to changes in the vital function of families. Over 42% of the people have one or more risk factors to develop cardiovascular diseases, 13 out of 100 people in Puerto Rico are diagnosed with diabetes, there were 7,929 cases of VIH reported, and the incidence of people with cancer increased.

Through family non-formal education courses, families can improve their family development behaviors, and related areas to decrease family violence and child maltreatment, simultaneously promoting healthy lifestyles. In addition, through financial literacy families should develop the appropriate tools for better decision-making process related to financial capability and consumer behavior.

2. Scope of the Program

- In-State Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

- Coordination and collaboration with government and private agencies and partnerships are important to increase the impact of educational/preventive programs through the intervention of Extension Specialists/Educators.
  - Education to our Extension agents/educators and community leaders will help to disseminate and promote the information to families and children.
  - Clientele is motivated to learn and adopt practices in family relations and related areas to satisfy their essential needs.
  - Submitting proposals and working on special projects to obtain external resources that expand our staff and capabilities.
  - Early exposure to financial concepts may increase comfort and familiarity with financial matters, thereby, removing psychological barriers that impede proper decision-making (Barthein, Garret and Maki (2001).
  - Programs that enable households to identify savings rules that are manageable and easy to follow, will help households build wealth (Youn, Montalto and Hanna, 2006)
  - Educating parents to deal properly with any future economic, emotional, or familiar challenge contributes to attenuate the adverse effects of economic hardship.
  - Educate clientele to adopt practices and gained knowledge in healthy life styles.

**2. Ultimate goal(s) of this Program**

- Increase the number of families that support positive relationships among their members.
- Increase skills in family members and caregivers to avoid child and elderly maltreatment, neglect and family violence.
- Increase the financial well-being of consumers through Knowledge, skills and self-confidence in competencies such as: how consumers' behavior influences decision making, budgeting, debt reduction, credit wise and savings.
- Increase the number of persons that adopt a healthy lifestyle.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	31.0	0.0	0.0	0.0
2017	20.2	0.0	0.0	0.0
2018	20.2	0.0	0.0	0.0
2019	20.2	0.0	0.0	0.0
2020	20.2	0.0	0.0	0.0

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

**1. Activity for the Program**

- Educational Campaigns
- Curriculum and educational materials development.
- Provide Training
- Conduct Workshops meetings and short courses.
- Establishment of collaborations with government agencies, private institutions, and faith base leaders
- Counseling
- Exhibitions (Billboards in malls and public places with informative brochures and other educational material).
  - Mass media communication
  - Web sites

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> <li>• Other 1 (Courses)</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletters</li> <li>• eXtension web sites</li> <li>• Other 1 (Campaigns and exhibits)</li> <li>• Other 2 (Radio programs)</li> </ul>

**3. Description of targeted audience**

Extension agents, FCS professionals, PRAES specialists, professionals from other agencies, parents, low income families, children, youth, older people, individuals, volunteers, new couples, risk population and the general public.

## **V(G). Planned Program (Outputs)**

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of persons that completed courses in parenting and related areas.
- Number of persons that completed courses in aging aspects.
- Number of persons that completed courses in consumer education and family resource management
- Number of persons that completed courses in nutrition, health, and/or physical activity

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

<b>O. No</b>	<b>Outcome Name</b>
1	Number of persons that gained knowledge in aging aspects.
2	Number of reported changes of family development behaviors.
3	Number of reported changes in financial capability and/or consumer behavior
4	Number of reported changes of nutrition, health, and/or physical activity behaviors

**Outcome # 1**

**1. Outcome Target**

Number of persons that gained knowledge in aging aspects.

**2. Outcome Type** : Change in Knowledge Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of reported changes of family development behaviors.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 802 - Human Development and Family Well-Being

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of reported changes in financial capability and/or consumer behavior

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 607 - Consumer Economics
- 801 - Individual and Family Resource Management



#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

Number of reported changes of nutrition, health, and/or physical activity behaviors

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 724 - Healthy Lifestyle

##### **4. Associated Institute Type(s)**

- 1862 Extension

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

##### **1. External Factors which may affect Outcomes**

- Economy
- Public Policy changes
- Competing Programmatic Challenges

##### **Description**

Achievement of goals could be affected by external elements, including natural disasters because of our physical location. Puerto Rico has also been affected by the economy crisis. In addition, availability of competitive federal and/or external funds, and/or changes in public policy can affect program's outcomes.

#### **V(K). Planned Program - Planned Evaluation Studies**

##### **Description of Planned Evaluation Studies**

Periodically a post program evaluation will be conducted among a sample of participants of the Family Relations and related areas using the focus group methodology. This will be used to understand how families have adopted practices and skills learned through the courses. Questionnaires will be another method used to measure changes in behaviors in the areas of consumer education and health. Questionnaires will be administered to a sample of participants at the completion of the courses.

In addition, process evaluations during program development will be conducted to observe



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

### **Program # 10**

#### **1. Name of the Planned Program**

Strengthening Youth Life Skills, Leadership and their Community

#### **2. Brief summary about Planned Program**

Children and young people need safe and comfortable place to live, access to nutritious foods and social recreational opportunities. Young people, especially the most vulnerable, require access to opportunities for employment, in order to obtain income security, a transition to the world of employment to alleviate poverty and facilitate growth and opportunities for their future.

Positive Youth Development has as direct objective in which young people learn to be productive, in connection with others and understanding its surroundings, and as an indirect goal, promote that they become adults who are financially self-sufficient, have healthy families, maintain excellent relationships and contribute to their communities. To achieve these objectives, it is important to identify the "assets" and "support for development" to achieve positive results in the long term. Contrasting with the efforts that focus on the remediation of already acquired negative behaviours or prevention for young people with "at risk" behaviours, youth development focuses on promoting positive outcomes in all young people. In other words, positive youth development seeks to ensure that all young people have access to positive experiences and positive development relationships that allow them to become healthy adults.

Youth Development is a mayor emphasis area of the Puerto Rico 4-H and Youth Development Program for its long-range educational program. It is designed to provide youth with positive opportunities to learn and interact with peers and adults, provide leadership development, and focus on the enhancement of life skills through research-based educational programs focusing on healthy lifestyles; science, engineering and technology; citizenship and leadership. Different activities and methods such as: camps, competitions, meetings, demonstrations, and workshops will be used, especially, the development of projects as a strategic learning tool. In-service learning experiences will be promoted to give youngsters the opportunity to reflect on and take action concerning issues that impact them. Through the project the youngsters will acquire and develop life skills in order to identify the most important issues, within a real world situation, through critical thinking, generate emotional consequences, which challenge values and ideas, and support social, emotional and cognitive learning and development.

**3. Program existence :** Mature (More than five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** No

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

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%		0%	
	<b>Total</b>	100%		0%	

**V(C). Planned Program (Situation and Scope)**

**1. Situation and priorities**

The basic knowledge that we have of the community conditions that affect the development of the youth will help us to establish priorities in order to create experiences and opportunities for all youth with special attention to youth with less opportunities in order to be successful in developing their maximum potential.

According with US Census Bureau, 903,295 is the population under 18 in Puerto Rico, 56 % of kids and young people in Puerto Rico live below poverty, 36% live in extreme poverty, 17% of children live in crowded housing. In addition, 15% of the students from 9th grade to 12th grade are overweight (Youth Behavioral Risk Survey). From 2008 to 2010 the percent of teens who were high school dropouts was 7.5%. (Kids Counts). During last year 13% of high schools students were bullied victims. Fourteen percent of high schools students said they do not assist to school because they do not feel confidence.

The social impacts of the excessive use of alcohol are numerous and harmful: family dysfunction, domestic violence, and mental health problems among others. In Puerto Rico, alcohol is the substance most used among young people 7th to 10th grade, (VIII Youth Consultation Survey, 2012).

Results of the study, in which 275,263 students were interviewed during 2010-2011 and 2011-2012, show that 132,319 (48.6%) said they had consumed alcoholic beverages, other than just a few sips, 120,220 had consumed liquor during the year previous to the survey and 93,643 admitted they had been drinking recently.

Results also showed that 55,845 of the underage students interviewed began drinking alcoholic beverages such as beer, rum, gin or breezers, among others, during the year previous to study and the incidence of new users was higher among females (30.2%) than among males (26.9%).

For the first time in 23 years marijuana surpassed cigarette usage in this population. According to experts, in previous studies made during the 1990's, cigarette usage had been in second place in risky behavior among teens. However, this line is now occupied by controlled substances, headed by marijuana.

Marijuana showed the highest increase, duplicating its prevalence from 6.1% during 2005-2007 to 12.4% during 2010-2012. Ironically, 81.9% of those interviewed admitted to having extensive knowledge of the dangers of using illicit drugs.

We have also seen and experienced the impact of domestic violence, drug dealing, increased incidence of violent crimes, and the shortcomings of our public education with higher dropout rates, the poor quality and lack of accessibility to mental health services, among others; which have impacted negatively on the well-being of Puerto Ricans.

To address this situation we will use the Positive Youth Development Model and the Five Action Strategies Model (Search Institute) to provide youth with positive opportunities to learn and interact with peers and adults, provide leadership development, and focus on the enhancement of life skills through research-based educational programs focusing on healthy lifestyles; science, engineering and technology; citizenship and leadership.

**2. Scope of the Program**

- In-State Extension

**V(D). Planned Program (Assumptions and Goals)**

**1. Assumptions made for the Program**

- When we work in an integral form, respecting the competency and potential of each participant, there is a great amount of motivation and disposition on behalf of the youngsters to learn and participate in 4-H, scholastic, and community activities.
- The experiences learning-to-know, learning-to-make, learning-to-be and learning-to-live, according to John Dewey's philosophy, have been extensively used by the 4-H program "Learning-by-doing".
- There are 603 adult volunteers and 203 youth volunteers offering support to the 4-H Program working with youngsters in different activities (2012).
- Life skills prepare people to be successful in life. The goal is that every person learn the necessary skills to succeed.
- Life skills are tools that help people to cope with whatever life brings. When integrated into curriculum development, life skills determine how subject matter content is delivered and practiced, when a learner is engaged in an educational activity. Life skills are useful long afterwards in other life situations.
- We depend on a dedicated staff that acknowledges the mission of the 4-H Program to address youth needs.

**2. Ultimate goal(s) of this Program**

Increase the number of youngsters that have improved their life skills for a positive youth development.

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

**1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	32.4	0.0	0.0	0.0
2017	35.7	0.0	0.0	0.0
2018	35.7	0.0	0.0	0.0
2019	35.7	0.0	0.0	0.0
2020	35.7	0.0	0.0	0.0

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

**1. Activity for the Program**

- Conferences or workshops training in life skills, leadership, and community services.
- Camping and outdoor activities.

- Curriculum developed in life skills, leadership and community service.
- Participate in mass communication to promote 4-H as a positive organization for youth.
- Communications projects in radio , press and TV
- Projects where youth and adults volunteers can develop skills that will enable them to make a positive contribution to society.
- Contests activities/events.
- Field trips / fairs / Exhibitions activities/events.
- Research projects
- Photo- voice community projects

**2. Type(s) of methods to be used to reach direct and indirect contacts**

**Extension**

Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> <li>• Demonstrations</li> <li>• Other 1 (Courses)</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletters</li> <li>• TV Media Programs</li> <li>• Web sites other than eXtension</li> </ul>

**3. Description of targeted audience**

Youth and 4-H members, Extension professionals (agricultural agents and specialists, home economists), professional government personnel, volunteers, and community residents.

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

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## **V(H). State Defined Outputs**

### **1. Output Measure**

- Number of children/ youth who participated in life skills and subject matter educational programs designed to teach basic life skills and leadership
- Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

**V(I). State Defined Outcome**

O. No	Outcome Name
1	As a result of experiences in a 4H program or project, the number of participants who take responsibilities for their actions
2	As a result of experiences in a 4-H program or project, Number of participants who are confident to speak in front of groups
3	As a result of experiences in a 4H program or project, the number of participants who can work well with others youth.
4	As a result of experiences in a 4H program or project, the number of participants who helped with a project that made a difference in through community service.
5	As a result of experiences in a 4-H program or project, Number of participants who can work successfully with adults



**Outcome # 1**

**1. Outcome Target**

As a result of experiences in a 4H program or project, the number of participants who take responsibilities for their actions

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

As a result of experiences in a 4-H program or project, Number of participants who are confident to speak in front of groups

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 806 - Youth Development

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

As a result of experiences in a 4H program or project, the number of participants who can work well with others youth.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 806 - Youth Development

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

As a result of experiences in a 4H program or project, the number of participants who helped with a project that made a difference in through community service.

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 806 - Youth Development

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 5**

##### **1. Outcome Target**

As a result of experiences in a 4-H program or project, Number of participants who can work successfully with adults

##### **2. Outcome Type : Change in Action Outcome Measure**

##### **3. Associated Knowledge Area(s)**

- 806 - Youth Development

#### **4. Associated Institute Type(s)**

- 1862 Extension

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

#### **1. External Factors which may affect Outcomes**

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

### **Description**

The Island's location in the Caribbean area puts it in the path of tropical hurricanes with heavy winds and heavy rains which cause floods. The people feel that we have an unstable economy. Changes in the budget assigned to government agencies and changes in public policy due to the situation of the economy are expected.

## **V(K). Planned Program - Planned Evaluation Studies**

### **Description of Planned Evaluation Studies**

Pre/post evaluation studies will be conducted every other year, in which Extension will measure changes in life skills after participating in 4-H educational activities. Questionnaires will be administered to a sample of 4-H members. These questionnaires will be developed based on the National Outcome Indicators included in this Planned Program.

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

### **Program # 11**

#### **1. Name of the Planned Program**

Global Food Security and Hunger

#### **2. Brief summary about Planned Program**

Food security emerged as one of the major risks of the 21st century (Global Risk Forum, 2008). For Puerto Rico working towards attaining food security is imperative due to its condition as an island. Food availability is mainly through imports (80%) due to an extremely low domestic production of less than 20%. Extended supply chains that generated competitive advantage to agribusiness and people, increased Puerto Rico's food system vulnerability to disruptive risk.

In 2009, only 18.9% of the food and beverages consumed in Puerto Rico were produced on the Island (External Trade Statistics, 2009). Practically all of the cereal, oil, fat, sugar, vegetables, fish, and soup consumed were imported, as were more than 3/4 of fruit, vegetables, and meats. Most imports came from the United States (food miles from the USA farms to PR consumers are an average of more than 2,800 miles, 1,300 are by sea), but Puerto Rico also received food from more than 50 countries around the world. The domestic agricultural production consisted mainly of milk, plantains, eggs and coffee.

Although 58% of the people in Puerto Rico have access to appropriate foods for a nutritious diet through transfer income benefits, WIC Plan or School Food Service, consumers need continuous orientation on the utilization of food through an adequate diet, water, sanitation, and health care. The system's stability is threatened by various factors such as climate change and the actual economic crisis which increases food prices.

Among the vulnerabilities of Puerto Rico's food supply chain are: a low local agricultural production; continued loss of agricultural land, a high dependence on imported foods, oligopolistic food import and transport logistics. In addition, food reserve are not clearly identify, there is not a mature food security policy, and the food imports sea routes towards the island match the path of Caribbean hurricane. Ensuring Puerto Rico's food security presupposes the elimination or reduction of these vulnerabilities. Although the Government is in charge of solving any crisis and emergency related to food, the private sector still has to develop innovative strategies to guarantee food security.

The PRAES should help farmers, agro entrepreneurs, and the general public understand the threats to our food security and to identify strategies to attend these threats. Extension can coordinate the exchange of information between the government, academy, and private sectors to define and adopt strategies. The initiative will promote a business culture among farmers as a means to encourage the development of local capital and small and medium businesses on the island. To accomplish this goal PRAES will use different strategies such as youth and child curriculum development, while collaborating with the public and private sectors in the dissemination of information.

**3. Program existence :** Intermediate (One to five years)

**4. Program duration :** Long-Term (More than five years)

**5. Expending formula funds or state-matching funds :** Yes

**6. Expending other than formula funds or state-matching funds :** No

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

## 1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
131	Alternative Uses of Land	15%		0%	
205	Plant Management Systems	20%		0%	
307	Animal Management Systems	20%		0%	
501	New and Improved Food Processing Technologies	5%		0%	
603	Market Economics	15%		0%	
610	Domestic Policy Analysis	5%		0%	
704	Nutrition and Hunger in the Population	20%		0%	
	<b>Total</b>	100%		0%	

**V(C). Planned Program (Situation and Scope)**

## 1. Situation and priorities

Food security emerged as one of the major risks of the 21st century (Global Risk Forum, 2008). Extended supply chains that generated competitive advantage to agribusiness and people increased vulnerability of the food global system to disruptive risk. According to FAO, food security exists when all people, at all times, have physical and economic access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life (FAO, Food Security Policy Report, 2006). Global water crisis, land degradation, dependence on fossil fuel, price setting, and climate change are some of the risks that can affect food security. During 2010 and 2011, Puerto Rico local news highlighted a global food shortage and an islandwide lack of food security.

In 2008, the total value of agricultural production in the Island was less than 1% of the Gross Domestic Products. In 2007, there were 15,745 farms on the Island, a decline of an 11% compared to 2002, and the average farms size was 39.1 acres. The farmers' average age was 58.2 years old and more than one third were over 65 years old (Census of Agriculture, 2007).

During 2009, only 18.9% of the food and beverages consumed in Puerto Rico were produced on the Island (External Trade Statistics, 2009, preliminary data). Practically all the cereal, oil and fat, sugar, vegetables, fish and soup consumed were imported as were more than 3/4 of fruit, vegetables, and meat. Most imports were from the United States, but Puerto Rico received food from more than 50 countries around the world. Local production consisted mainly of milk, plantain, eggs and coffee.

Some of the vulnerabilities of Puerto Rico's food supply chain are: lack of an adequate food security policy, low local agricultural production, continued loss of agricultural land and a high dependence on imported food (more than 80% of our food consumption), monopolistic or oligopolistic food import and transport logistics, and sea routes towards the island match the path of hurricanes routes in the Caribbean.

It should be noted, nonetheless, that within the Caribbean region Puerto Rico does not have a high vulnerability index because of its fairly advanced economic development and receives federal funds in case of emergency from FEMA or Homeland Security. However, the food supply chains' stability can be impacted by extreme weather events such as hurricanes (the season runs from June 1 to November 30), which could devastate crops and cause severe damage to animal production and transportation logistics, as the island is located in one of the climate change hot zones identified by Intergovernmental

Panel on Climate Change (2007), where severe changes--like an increase in the intensity and frequency of hurricanes--are expected. According to some estimates, if operations at port are halted for any reason, provisions to feed the population of almost four million people will be used up in 15 days, Puerto Rico being one of the most densely populated countries in the world with a high dependence on transfer incomes.

Ensuring Puerto Rico's food security presupposes the elimination or reduction of its vulnerabilities. Although the Government is in charge of solving any crisis and emergency related to food, the private sector still has to develop innovative strategies to adapt to and handle food supply chain risks.

The National Food Security initiative contact person Dr. Myrna Comas Ph.D. degree was based on Food Supply Chain Vulnerability and she developed a protocol to attend the disruption on the food supply chain. She suggested that the public and private sector need to work together on this matter. On January 2011, she presented the College of Agricultural Sciences, UPR-Mayagüez Campus, position on Food Security Proposal Policy. Now as Secretary of Agriculture she is implementing this Food Security Policy.

## **2. Scope of the Program**

- In-State Extension

## **V(D). Planned Program (Assumptions and Goals)**

### **1. Assumptions made for the Program**

Due to a continuous food supply, many people in Puerto Rico assume that there are no problems with our food security. Indeed, they are unaware that the food supply consists mostly imported (more than 80%) and that a lot of people use transfer income and other government programs to acquire their food. The food reserve, the food miles, and the threats to the food supply chain are also unknown.

In the management of food security the Agricultural Extension Service should help farmers, agro entrepreneurs and public in general to understand the threats to our food security and to identify strategies to attend these threats. The exchange of information between the government, the academy, and the private sectors is required for the definition and adoption of strategies. The initiative will promote a business culture among farmers as a way to encourage the development of local capital and small and medium businesses in the island. Because food security is a multi-sector issue we are working with both the government and the private sector, as they need to coordinate work together. Some of the strategies promoted are: an increase in local agricultural production, the development of risk management plans, monitoring the food supply chain's vulnerability and risks, the promotion of a food security public policy, and the establishment of public/private partnerships to attend this situation.

### **2. Ultimate goal(s) of this Program**

Increase food security at the national and household levels by:

1. Increasing local food production and competitiveness
2. Establishing a network of enterprises working as a food supply chain system and not as individual enterprises that negotiate together.
3. Developing home gardens
4. Establishing a nutritious and safe food supply for the household

## **V(E). Planned Program (Inputs)**

### **1. Estimated Number of professional FTE/SYs to be budgeted for this Program**

Year	Extension		Research	
	1862	1890	1862	1890
2016	3.7	0.0	0.0	0.0
2017	3.7	0.0	0.0	0.0
2018	3.7	0.0	0.0	0.0
2019	3.7	0.0	0.0	0.0
2020	3.7	0.0	0.0	0.0

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

**1. Activity for the Program**

- Capacity building workshops
- Technical training meeting
- Establish collaborations between the government, the private sector and the academia
- Use of mass media to disseminate information

**2. Type(s) of methods to be used to reach direct and indirect contacts**

Extension	
Direct Methods	Indirect Methods
<ul style="list-style-type: none"> <li>• Education Class</li> <li>• Workshop</li> <li>• Group Discussion</li> <li>• One-on-One Intervention</li> </ul>	<ul style="list-style-type: none"> <li>• Newsletters</li> <li>• Web sites other than eXtension</li> <li>• Other 1 (Radio Program)</li> </ul>

**3. Description of targeted audience**

County extension personnel, farmers, agro entrepreneurs, government professionals, housewives, and youth

## V(G). Planned Program (Outputs)

NIFA no longer requires you to report target numbers for standard output measures in the Plan of Work. However, all institutions will report actual numbers for standard output measures in the Annual Report of Accomplishments and Results. The standard outputs for which you must continue to collect data are:

- Number of contacts
  - Direct Adult Contacts
  - Indirect Adult Contacts
  - Direct Youth Contacts
  - Indirect Youth Contact
- Number of patents submitted
- Number of peer reviewed publications

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.

## V(H). State Defined Outputs

### 1. Output Measure

- Number of agricultural enterprises feasibility studies.
- Number of youth participating in food system educational program.
- Number of adults participating in food system knowledge and skill enhancement programs.
- Number of first detectors trained in early detection and rapid response of plant pests, animal pests and diseases.
- Number of communities trained in agricultural disaster preparedness.
- Number of food security extension publications and presentations.

Clicking this box affirms you will continue to collect data on these items and report the data in the Annual Report of Accomplishments and Results.



**V(I). State Defined Outcome**

O. No	Outcome Name
1	Number of public policy issues related with national food security that were reviewed or proposed.
2	Number of farmers that adopted one or more recommended post-harvest practices.
3	Number of fallow "cuerdas"(acres) sowed or prepared for animal production or other agricultural production.
4	Number of consumers that adopted the food basket as a guide for food security at the household level.
5	Number of home gardens established.
6	Number of acres in conservation tillage or other BMP.
7	Number of new or improved value-added products that can be sold by producers (and other members of the food supply chain).
8	Number of marketing agreements established between local farmers and distributors or other components of the food supply chain.
9	Number of producers and other members of the food supply chain that have increased revenue.
10	Number of communities that have written agriculture and food considerations into disaster preparedness plans or procedures.
11	Number of networks prepared to mitigate biological and abiotic disruptions
12	Number of youth that improved knowledge of food systems.
13	Number of adults improved knowledge of food systems.
14	Number of food councils and institutes created to promote practical food systems policies.
15	Number of research and extension advisory councils and boards.
16	Number of communities that retained farm lands due to educational interventions.

**Outcome # 1**

**1. Outcome Target**

Number of public policy issues related with national food security that were reviewed or proposed.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 610 - Domestic Policy Analysis
- 704 - Nutrition and Hunger in the Population

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 2**

**1. Outcome Target**

Number of farmers that adopted one or more recommended post-harvest practices.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 610 - Domestic Policy Analysis
- 704 - Nutrition and Hunger in the Population

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 3**

**1. Outcome Target**

Number of fallow "cuerdas"(acres) sowed or prepared for animal production or other agricultural production.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 4**

##### **1. Outcome Target**

Number of consumers that adopted the food basket as a guide for food security at the household level.

**2. Outcome Type :** Change in Action Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 307 - Animal Management Systems

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 5**

##### **1. Outcome Target**

Number of home gardens established.

**2. Outcome Type :** Change in Action Outcome Measure

##### **3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 704 - Nutrition and Hunger in the Population

#### **4. Associated Institute Type(s)**

- 1862 Extension

#### **Outcome # 6**

##### **1. Outcome Target**

Number of acres in conservation tillage or other BMP.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 307 - Animal Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 7**

**1. Outcome Target**

Number of new or improved value-added products that can be sold by producers (and other members of the food supply chain).

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 8**

**1. Outcome Target**

Number of marketing agreements established between local farmers and distributors or other components of the food supply chain.

**2. Outcome Type** : Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 501 - New and Improved Food Processing Technologies
- 603 - Market Economics

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 9**

**1. Outcome Target**

Number of producers and other members of the food supply chain that have increased revenue.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 603 - Market Economics

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 10**

**1. Outcome Target**

Number of communities that have written agriculture and food considerations into disaster preparedness plans or procedures.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 501 - New and Improved Food Processing Technologies
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 11**

**1. Outcome Target**

Number of networks prepared to mitigate biological and abiotic disruptions

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 205 - Plant Management Systems

- 307 - Animal Management Systems
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 12**

**1. Outcome Target**

Number of youth that improved knowledge of food systems.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 704 - Nutrition and Hunger in the Population

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 13**

**1. Outcome Target**

Number of adults improved knowledge of food systems.

**2. Outcome Type : Change in Knowledge Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 501 - New and Improved Food Processing Technologies
- 603 - Market Economics
- 704 - Nutrition and Hunger in the Population

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 14**

**1. Outcome Target**

Number of food councils and institutes created to promote practical food systems policies.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 501 - New and Improved Food Processing Technologies
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 15**

**1. Outcome Target**

Number of research and extension advisory councils and boards.

**2. Outcome Type : Change in Action Outcome Measure**

**3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 205 - Plant Management Systems
- 307 - Animal Management Systems
- 501 - New and Improved Food Processing Technologies
- 603 - Market Economics
- 610 - Domestic Policy Analysis

**4. Associated Institute Type(s)**

- 1862 Extension

**Outcome # 16**

**1. Outcome Target**

Number of communities that retained farm lands due to educational interventions.

**2. Outcome Type :** Change in Action Outcome Measure

**3. Associated Knowledge Area(s)**

- 131 - Alternative Uses of Land
- 205 - Plant Management Systems
- 307 - Animal Management Systems

**4. Associated Institute Type(s)**

- 1862 Extension

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

**1. External Factors which may affect Outcomes**

- Natural Disasters (drought, weather extremes, etc.)

**Description**

Puerto Rico is identified by the IPCC as a hot zone due to threats posed by climate changes like droughts, increase in the sea level, and extreme weather.

**V(K). Planned Program - Planned Evaluation Studies**

**Description of Planned Evaluation Studies**

No data entered