2017 University of Puerto Rico Combined Research and Extension Annual Report of Accomplishments and Results

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I. Report Overview

1. Executive Summary

This accomplishment report covers the period from October 1, 2016 to September 30, 2017. During this fiscal year, the Puerto Rico Agricultural Extension Service (PRAES) used 155.06 FTEs, a decrease of 3.6 FTEs from the 158.67 reported for FY 2016.
Towards the end of FY 2017, Puerto Rico was slammed by two hurricanes: Irma on September 7th and Maria on September 20th. Hurricane Maria had a catastrophic effect, raking the entire island. The agricultural sector was devastated. The consequences of both hurricanes will be felt during the 2018 fiscal year. Extension personnel immediately responded to the areas most affected and they will continue helping those in greatest need throughout the year.
1. Plant Production Systems
There is an urgent need to prepare new people in agricultural businesses to increase the number of farmers. Coffee is a very important agricultural product on the island with potential global markets. A five-day training, entitled "Quality Coffee: from the farm to the cup," was given to future coffee farmers in collaboration with the Department of Agriculture, USDA-ASM-FIMPS and the Specialty Coffee Association of America,. The training was directed to Millennial Generation Coffee Growers, offspring of coffee producers on the island, who in the future could continue their parent's coffee business. Eighteen future farmers were trained in specialty coffees and marketing.
Training in special coffee production is targeting young coffee producers on the island, providing them with vital information. Two women from Maricao are now venturing into the coffee agribusiness, beginning to develop a new coffee crop with high expectations of learning about coffee processing.
The "Huertos del Sur" project was begun in October 2016 in Yauco, PR as an initiative to establish an economic vegetable enterprise. This business made a family self-sufficient economically and provided 10 indirect jobs, offering consumers more choices.
The Fruit Specialist in close collaboration with Extension agents has developed a 4-step protocol to train growers to control citrus greening disease and improve production. During field days at the farms of affected growers, they are learning how to cope with this lethal disease. Seventy three percent (73%) of the trained growers increased production on their farms after adopting at least two of the recommended practices for integrated crop management.
The PRAEXS will produce seeds of improved cultivars, as well as vegetative planting materials of plantains, banana, and root & tuber crops at the Corozal and Gurabo Substations. PRAEXS also distributes grafted fruit trees of avocado, mango, soursop, West Indian cherry, and seedlings of various other fruits at the Fortuna Substation. At the Adjuntas Substation, coffee, citrus and cover crops are produced for distribution to the PRDA, farmers and the general public. At the Isabela Substation, 63,200 pounds of tanier planting material was distributed to farmers for the planting of 35 acres. Also, the farm area planted with improved germplasm continues to increase. At the Isabela Substation, dry beans, pigeon peas, tropical squash and other basic grains are sold to farmers.

2. Animal Systems
The bees are known for their contribution as pollinators but its population has been diminishing for decades. About 25 of our clientele were trained in topics related to biosecurity, animal welfare and bee record keeping; however, only 36% of participants reported implementing recommended practices at their farms. Extension Agents (AA) reported that the normal reproductive behavior of bees has been altered in the past years because of changes in rain patterns and plant blooming seasons, which affect nectar availability for honey production. In addition, socioeconomic factors negatively influenced

Extension clients' ability to acquire the materials and equipment required to incorporate these practices. Currently, our AA are developing training sessions to teach farmers about beehive construction and use of available materials to reduce the expenses associated with bee farming. Close collaboration with extension volunteers has greatly impacted other farmers and the community.

Local population interest in meats other than beef and chicken has increased in recent years. A group of small ruminant farmers has been working alongside Extension Service specialists to assess the agro-economic relevance of topics, such as nutrition, mastitis, internal parasites and genetics. Seventy-six farmers were trained in recommended practices to increase the efficiency, quality, and nutrition in goat and ewe production in Puerto Rico. From these farmers, 71% reported adopting practices learned at Extension courses and on farm visits.

Among the greatest challenges of the dairy industry are reducing the effect of heat stress on cow performance, controlling diseases such as mastitis and tick-borne diseases and improving the poor management of tropical pastures. During FY 2017, more than 300 farmers were trained in recommended practices. As a result, dairy farmers increased milk quality (reducing bulk tank milk bacteria and somatic cell counts), improved nutritional management of their animals, gaining direct economic benefits: and learned about genetic strategies to reduce heat stress, such as cross-breeding the Puerto Rican slick Holstein cow.

Our Extension agents continue to work with the beef industry focusing their training on biosecurity, management of records, internal parasites and animal wellbeing. We trained more than 70 farmers, among which 56% reported adopting one or more management practice associated with animal wellbeing, 53% on improving records, 57% in climate change and 30% in alternative forages to improve nutrition strategies.

3. Climate Change, Natural Resources and Environment

Puerto Rico is an island located in hurricane alley. Hurricanes start their initial formation in western Africa, crossing the Atlantic and getting energy from warm ocean waters of the tropics. Since 1867, NOAA has compiled information on hurricanes. But the combination of La Niña in the Pacific Ocean and higher CO2 levels in the atmosphere has worsened the situation.

During FY 2017, we continued to collaborate with the Caribbean Area Climate Change Hub. Considering the devastation caused by Hurricanes Irma and Maria, a comprehensive assessment of the effects on agriculture and forestry was begun. The goal is to develop ways to effectively reduce risks and help in a speedy recovery, besides providing practices for farmers to implement. Also, Extension specialists compiled a series of recommendations for agricultural recovery that will be available in 2018. Educational efforts continued, offering information on climate change that was disseminated through mass media. Several training sessions and workshops were also offered to farmers and others.

Through our non-formal educational efforts during the fiscal year, 656 people participated in courses using the curricular guide on climate change; 56% (367) adopted recommended practices, such as water use efficiency, solid waste management, animal feeding and others. The need and interest for water harvesting continues. This year a total of 122 people participated in different training sessions offered throughout the island and 62% (76) of participants reported adopting water harvesting practices. One hundred and four (104) people were engaged in capacity development on soil and water regulations; 65 of the participants (62.5%) were able to comply with the regulations. Training continues to be offered on brush/forest; this year 63 people participated. Among participants, 30 (57%) reported adopting fire prevention practices. Two hundred and six (206) people participated in educational activities on how to prepare a contingency plan and the importance of farm insurance. As a result, 85 participants (41%) indicated they prepared a contingency plan or obtained farm insurance.

The primary goal of the Climate Change Natural Resources and Environment (CCNRE) research program is to continue to develop, perform and support scientific research regarding the impact of agricultural practices on the environment and natural resources of Puerto Rico. CCNRE research grants continue to address 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: 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. Activities included an assessment of environmental management on soil organic matter, carbon storage on soil landscapes, ecosystem services to improve Puerto Rico water quality and greenhouse gas emissions and

solutions to point and non-point sources of contamination in watersheds. Watershed protection and management, conservation and efficient use of water and management account for nearly 25% of current research efforts. Other activities also include a study of the insect fauna biodiversity to determine optimal integration of metadata to protect natural enemy guilds of harmful insect pests, increasing native tree biodiversity in novel forest type and integrated management of poultry manure and birds to compost processing. Continued research on these topics will provide reliable scientific data to quantify the contribution of agriculture in comparison to other pollution sources and to measure the short- and long-term impact of agricultural management systems on the environment. CCNRE's research is vital to meeting sustainable natural resources management and protection in the face of diminishing land and water resources and a progressive climate change.

4. Integrated Pest Management

Early detection of plant pathogens and pests is essential to implement adequate management practices. Puerto Rico imports most of the food consumed including fruits, horticultural products and tuberous crops, enhancing vulnerability to new diseases and pest introductions. Retail sales of ornamental plant materials host a variety of diseases and pests to challenge agriculture on the Island. Farmers and households with accurate diagnoses of pests and diseases have reduced pest damage by implementing recommended management practices. The Puerto Rico Diagnostic Clinic in Juana Diaz (PRPDC) distributes a questionnaire to collect qualitative data from stakeholders. Approximately 110 growers that submitted samples to the Plant Diagnostic Clinic have implemented recommendations for disease and pest prevention management, and based on follow up-phone calls, they reported success in disease management.

About 1,000 acres of tomatoes are grown under the field and greenhouse conditions. The incidence of bacterial diseases increased significantly in greenhouses. Under field conditions, viral diseases are on the rise. The tomato producers have used the Diagnostic Clinic for early detection of bacterial and viral diseases. More than fifty samples were analyzed to detect viruses using an Immunoblot kit for Xanthomonas and Immunostrips. Growers were able to eradicate infected plants before transplanting tomato seedlings that tested positive for bacterial or viral diseases. Producers growing tomatoes under greenhouse conditions selected biological control agents to decrease the inoculum for bacterial diseases. Plants testing positive for virus were eradicated from the fields.

5. Global Food Security and Hunger

Puerto Rico is highly dependent on food imports (more than 80%). In addition, the island is located on the hurricane path. We need to reduce risk and increase local production to increase our food security. One available alternative is to encourage post-harvest practices. As a result of educational efforts, 228 farmers adopted one or more recommended post-harvest practice, 188 farmers adopted value-added practices, and 40 new value-added products were created. This provides more food diversity in the market. When we talk about food security, we refer to food availability, food access, utilization and food supply chain stability. Food consumption through adequate diet, clean water, sanitation and health care achieves a state of nutritional well-being where all physiological needs are met. The PR Recommended Food Basket presents an excellent guide to healthy food. A total of 2,493 consumers adopted the Recommended Food Basket to identify, acquire and prepare healthy food. Fifty thousand thirty-nine (50,039) adults around the island participated in educational activities to gain knowledge and improve their skills in food systems. Among those, 37,504 (75%) reported improved knowledge about food systems.

The Puerto Rico Land Use Plan identified 619,181 acres of agricultural land to produce food. The Home Garden Curriculum Guide offered 195 courses in vegetables and starchy crops. A total of 4,063 vegetable gardens were established. Also, through CRD, family and 4-H programs, 3,488 people completed a home gardening course. As a result, 2,692 or 77% of participants established a vegetable garden at home.

6. Sustainable Energy

The population of Caguas's Borinquen ward is 7,953. The community is primarily comprised of low income, older residents; small farmers, single mothers and people with disabilities. In past years, this area has experienced water shortages due to its geographical location (mountainous southern area of Caguas). Through the Extension Community Development Program, coordination was achieved with community leaders. Approximately 180 families were identified as having issues with water availability. Two community meetings were organized to identify possible solutions and alliances. Leaders were trained in the use of renewable energy to power the treatment of the water system. Alliances were forged to assist this community. Allies included the Municipality of Caguas, the Puerto Rico State Department, the Toyota Foundation, PR Health Department, EPA and Extension Service.

The Toyota Foundation and the Municipality of Caguas donated $130,000. The community contributed another $30,000 for a total of $165,000. The existing water tank was reconditioned and a new solar system installed to power the filtration system (20 solar panels and 18 batteries). No fuel emissions are produced, and the community received a fixed low energy rate of approximately $1,100 monthly. Plans are under evaluation to improve and expand the community's solar system.

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

The CRD program focused on strategies to promote self-employment through entrepreneurship training and diverse occupational and craftsmanship skills training. Regarding community organizational development, PRAES CRD focused on community-oriented initiatives that fostered sustainability, self-reliance, and disaster and emergency management readiness, resulting in better-organized communities with better decision-making systems.

Through the Community Entrepreneurial Tool Box, PRAES Consumer and Family Sciences Educators and Agricultural Agents work hand in hand with participants to envision, design and develop a business plan to put their marketable skills to work. As a result, 14 new business that generate earnings were established and 8 business proposals were funded.

Puerto Rico is a Caribbean island susceptible to weather extremes and new pest diseases such as chikungunya and Zika. In 2017, a total of 437 community leaders and residents were trained in Climate Change and Emergency (i.e., natural disasters) and safety plans. In the last 2 years 20 community and 136 family emergency and safety plans were developed and are in place in communities prone to floods, tidal waves, ground displacement and forest fires.

8. Strengthening Youth Life Skills, Leadership and their Community

According to the national "Healthy People 2020" initiative, teens who can handle the changes and associated risk factors of the adolescence growth stage become successful young adults. Adolescence is a critical time for the development of lifestyle habits, attitudes and beliefs related to health and well-being. The power of health was the metaphor to developing the 4-H State Conference and 4-H activities that promoted and strengthened the health work with 4-H youth and communities. We prepared 4-H youth to take responsibility for their actions (self-care) and assume the responsibility to make a difference in their communities by helping to attain better health and services. In a collaborative effort with the PR Health Department, Department of Sports and Recreation, UPR College of Agricultural Sciences and private organizations we offered an educational program to reinforce 4-H youth health knowledge and to disclose new concepts and health projects.

In the 4-H State conference we provided an interactive space for 80 4-H youth members where they shared with health professionals and received collective and individual recommendations. Youth had the opportunity to practice these professional's various educational strategies to promote healthy communities. Dr. Bernier, a specialist in family medicine and 4-H alumnus stated that "It was a great privilege to be part of this conference, youth needs more spaces to interact with peers and adults. You have a new supporter because I believe in youth, I believe in the 4-H program to raise healthy communities. I know that, because 4-H gave me the tools to choose a career in medicine." Seventy-five (75) young health promoters reached 2,546 youth who demonstrated an improvement in heathy lifestyle skills. Five hundred ninety (590) participants took action and responsibility as result of their involvement in 4-H healthy projects, and 950 use reliable resources to make healthy decisions. Darielis, a 13-year-old 4-H health promoter learned about and began to incorporate new foods in her diet. Her extension mentor said "It was a big step, now she feels better."

The Office of Adolescent Health understands that adolescents need five essential components for growing healthy: positive connections with supportive people, safe and secure places to live, learn and to play; access to high-quality, teen friendly health care; opportunities to engage as learners, leaders, team members and workers; and access to adolescent and family centered services. Through our educational program, we assure adolescents a safe place to learn, to establish positive connections and opportunities to develop skills for a successful life.

During the year, we put youth in contact with supportive people, health professionals and educators to expand their skills in health education and promotion. We recruited three 4-H alumni in health to serve as mentors. Using the curriculum "El camino a la buena salud" (Pathways to healthy living), we celebrated the first 4-H intergenerational lifestyles summit "Together promoting a healthy life." Fifty-seven (57) adults and 15 youth benefited from the summit. 4-H Youth health promoters, Extension educators and 4-H volunteers formed a team to plan and develop the summit. Luis Caraballo a 4-H health promoter said, "It

was a great experience; the elderly have a lot of memories and experiences that helped me understand how health matters were addressed years ago. I want to share these experiences with other adolescents. Working with elderly people is amazing." We empowered extension educators to include 4-H members in the organization and planning of 4-H activities. As a result, 1,005 4-H members developed better planning skills, 639 worked successfully with adults, 1,195 participated actively in service activities organized to supply community needs, and 961 youth took action in activities that make a difference in their communities.

9. Family Well-being

According to estimates from the U.S. Census Bureau (2016), nearly 23.3% of Puerto Rico's population is 65 and older. Studies reported that 40% of seniors 65 and older have low incomes that place them below the poverty level. A curriculum on aging was developed to address the specific needs of the elderly. Consequently, 1,636 elders benefited, and 826 people reported gaining knowledge in aging. Also, a statewide educational campaign was developed in May (National Elder Month) to promote caregivers and awareness of senior citizen needs among the general public.

Chronic diseases such as: cardiovascular disease, cancer, diabetes, and Alzheimer's are the leading causes of disability in Puerto Rico (Department of Health, 2015). Educational campaigns and materials on chronic diseases were developed at state level. Likewise, training was given to the FCS educators to disseminate the information to the population at risk. As result, 3,079 people benefited through educational campaigns and 1,848 people completed short courses of which 63% reported changes in nutrition, health, and physical activities and behavior.

10. Adult and Childhood Obesity

The Youth Risk Behavior Surveillance System (2013) reported that 25.8% of Puerto Rican adolescents were overweight or obese, 8.9% of adolescents (grades 9th through 12th) did not eat fruit and 18% did not eat vegetables. In addition, 29.2% did not participate in at least 60 minutes of physical activity "on at least one day."

During FY 2017, two major nutrition educational activities focusing on prevention of childhood obesity were conducted across the island. These included the short course "Move to Healthy Eating" in which 1,505 children participated, and 2969 4-H members took part in "Project Route 4-H for a Healthy Life." Through these programs, kids participated in experiential learning activities including MyPlate, nutrition labeling and healthy snacks.

After the nutritional interventions, 41% of participants increased their fruit consumption, 22% increased vegetable consumption and 21% increased consumption of whole grain cereals. In addition, 34% decreased the intake of sugary beverages and 38% increased water intake. Participants also learned about the importance of physical activity, and after the intervention, 49% of participants reported increasing their physical activity levels. These results show positive changes in behavior towards the prevention of childhood obesity.

11. Food Safety

Foodborne illness is a public health issue. The CDC (Center for Disease Control and Prevention) estimated that 1 in every 6 Americans becomes ill, 128,000 are hospitalized, and 3,000 die because of foodborne illnesses. Cairnduff, et. al (2016) establish that consumers do not know how important safe food handling practices are when trying to prevent foodborne illnesses. Many think that manufacturers are responsible for food safety.The Be Food Safe! curriculum has been implemented in courses offered to the general public as well as At-Risk population. This year we added to this curriculum lessons on how to prevent cross contamination when using reusable grocery bags. One hundred and twenty-six (126) courses were offered with 1,840 participants completing the course, from which 72% adopted at least one safe food handling practice. Food handler training is seen as a way to increase food safety (Adesokan,H K., 2015) and to reduce critical food safety violations (Kassa,H. et al, 2010). Food safety training could offer long-term benefits to the food industry. Food establishments with a food safety certified manager have lower risk of outbreaks. With the participation of a Health Inspector in our courses, Food Managers gained knowledge about how to comply with the Food Code. Food mangers see the Inspector as a facilitator more than a compliance officer. This fiscal year, we trained 2,735 Food Managers, and nearly all (2,664) passed the course test.

Total Actual Amount of professional FTEs/SYs for this State

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	154.9	{No Data Entered}	50.1	{No Data Entered}
Actual	155.1	0.0	48.1	0.0

II. Merit Review Process

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

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

2. Brief Explanation

The Merit Review process continued to be conducted through four committees which represent our four major program areas: Agriculture, Marketing and Natural Resources; Family and Consumer Science; 4-H and Youth Development; and Community Resource Development. Each committee is comprised of External University and External Non-University Personnel. They met twice during the year. In the first meeting, Extension staff presented the Preliminary Plan of Work for the year. Committee members were asked to present recommendations related to the POW. Also, priorities were set, both in terms of goals and activities. Program area leaders, together with other Extension staff, defined the educational strategies to address the recommendations offered by committee members. These were then incorporated in the final POW as needed. During the second committee meeting, program area leaders presented an oral and written report which indicated how the committee recommendations were addressed in the Annual Report of Accomplishment.
For this year, there were no significant changes in the PRAEXS merit review process. A part of the Hatch funds was allocated for competitive project grants. The funded proposals were selected on the basis of the year's revised priorities published in our annual call for proposals. The annual call for proposals was prepared and distributed by PRAEXS Research Office. The proposals were submitted to the Assistant Dean for Research with the endorsement of Department Heads.

III. Stakeholder Input

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

- Use of media to announce public meetings and listening sessions
- Targeted invitation to traditional stakeholder groups
- Targeted invitation to non-traditional stakeholder groups
- Targeted invitation to traditional stakeholder individuals
- Targeted invitation to non-traditional stakeholder individuals
- Other (Target individuals to collaborating municipal government agencies)

Brief explanation.

At the municipal level, the Local Extension Advisory Committees main task is to gather input information from our local stakeholders. The committees are composed of at least two participants from each of the program areas (Agriculture, Marketing and Natural Resources; Family and

Consumer Sciences; 4-H and Youth Development and the Community Resource Development) and a minimum of two representatives from local agencies that work with similar Extension audiences. To encourage their participation, potential members received an invitation letter explaining the importance of the process and their participation to contribute improving Extension educational programs and general well-being of the people.
The PRAEXS has yearly commodity group meetings where our stakeholders identify the most pressing needs that should be addressed by our research program. Even when all issues can't be dealt simultaneously, annual meetings are held. In addition, most planned programs include work groups between researchers and extension specialists. Both, researches and extension specialists identify and invite members of producers association, individual farmers, faculty and students. In addition, the College of Agriculture Sciences integrated academic departments continue to organize thematic workshops, seminars and field days where research results are shared among all interested parties. Participation in these thematic activities is encourage through internal university communications, emails sent to previously identified stakeholders, press releases and personal invitations by organizers.

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

1. Method to identify individuals and groups

- Use Advisory Committees
- Open Listening Sessions
- Other ((consultations with local extension agents and commodity leaders))

Brief explanation.

The members of these committees were selected by the Extension personnel at the local office from among their target audience, based on their experience and participation in the Extension programs. They are invited by letter and follow-up visits to participate in the committee.
Research stakeholders are identified through commodity leaders, extension personnel and through local advisory committees established by the College of Agriculture Science 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 was used by the recipient institution to identify individuals and groups who are stakeholders and to collect input from them

1. Methods for collecting Stakeholder Input

- Meeting with traditional Stakeholder groups
- Meeting with traditional Stakeholder individuals
- Meeting with the general public (open meeting advertised to all)
- Other (Focus group, electronic communications)

Brief explanation.

The process to collect the stakeholder input took place through meetings. The committee met twice during the year to discuss critical issues locally, as well as to identify emerging issues that could be addressed by Extension. Each local committee identified priority issues in each of the four program areas. The input collection is not limited to the meetings, since in some instances a focal group or a survey has been used to confirm and/or prioritize the needs/issues.

Input from research stakeholders is collected at the meetings organize by the commodity and programatic area leaders. Stakeholders are asked about the most critical issues affecting their commodities and local areas and research priorities. Each commodity and program area leader

summarizes these results. In addition, stakeholders contact researchers and program leaders through the internet. Preferences and concerns voiced though digital media 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.

Most of the input received from our Extension stakeholders relates to the needs and situations affecting individuals, communities and our society in general. Most of the issues identified from previous years, continues to be of concern for most people. For 2017, the most predominant aspect is the precarious economic situation of the Island. Which can be exemplified by the lack of job opportunities and the significant migration of people to the United States.

Most people is aware of our poor Food Security. Through our Planned Programs, there has been a greater interest in vegetable gardening, both at the household level and at the community and at school garden level. Obesity is another issue of great concern as identified by our stakeholders, particularly among children and youth. Stakeholders coincide that contributing factors are mainly bad food choices and lack of physical activity. Extension has been addressing these issues through two of the National Initiatives; Childhood Obesity and Food Security. The situation persists and is widespread through the population since these are long term issues. Therefore, we will continue to work on these issues in our Planned Programs for the upcoming years.

People are also concerned about extreme weather events and their effect in local food production, mainly drought, hurricanes and excess precipitation. There has been an increased demand for water harvesting and storage for both home and farming.

Among agricultural issues, our stakeholders coincide in the importance of food security at our state level. They have also mentioned the importance of promoting sustainable agricultural practices, protecting our agricultural lands and natural resources, water and soil conservation, developing efficient marketing strategies as well as issues related to agricultural financing. All these are issues addressed by Extension through our Agricultural related Planned Programs but there is the need to continuously update them. They are still ranked as priorities. These are long term issues.

Issues affecting children, youth and families, in addition to obesity, stakeholders are mainly concerned with the domestic violence affecting our women, children and the elderly. This continues to strengthen the importance of our state level Family Well-being Planned Program which emphasize parenting skill and social and personal values through our different educational curriculum directed at adults, youth and the elderly. Stakeholders also recognized the contribution of Extension targeting these and other issues affecting our youth, through our 4-H clubs organized in schools and communities.

Our community and agencies collaborators continue identifying unemployment and the lack of economic opportunities as our most pressing challenge to community prosperity. Training and mentorship in marketable skills and entrepreneurial mindset is seen as a short time relieve and longtime solution of the current economic crisis. Also, attention has also given to natural disaster preparedness and emergency plan preparation.

The input received in PRAEXS meetings from all stakeholders is summarized, evaluated and presented in a meeting of commodity leaders, program coordinators and research administrators. Here is where the final decisions are taken. The list of priorities assembled through this process guides the years call for proposals or new Hatch and special projects. It is also considered by researchers when applying for external funds. When there are issues in need to be emphasized, programs are redirected to address these issues.

Brief Explanation of what you learned from your Stakeholders

The majority of the issues identified by the Stakeholders from previous years, still continues to be of concern. For 2017, the most predominant aspect is the precarious economic situation of the Island. Which can be exemplified by the lack of job opportunities and the significant migration of people to the United States.
Most people is aware of our poor Food Security, Obesity and how it relates to health issues is well known. Stakeholders coincide that contributing factors are mainly bad food choices and lack of physical activity besides aggressive fast food advertising. The situation persists and is widespread through the population since these are long term issues.
Extreme weather events and how to cope with it effect is a great concern. Extension has traditionally worked with community leaders to provide educational assistance on this subject matter. People recognized this effort and are preparing emergency plans both at family and community level.
Our agricultural production is very diversified and mostly conducted in small farms, where the average farmer's age is over 55 years old. These a very vulnerable population to extreme weather events.
In terms of research the issues of most concern for our stakeholders are new and emerging pests, development of climate change resistant crops, easy to use field tests for detection of diseases, soil erosion and fertility among others.

IV. Expenditure Summary

1. Total Actual Formula dollars Allocated (prepopulated from C-REEMS)			
Extension		**Research**	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
{No Data Entered}	{No Data Entered}	{No Data Entered}	{No Data Entered}

2. Totaled Actual dollars from Planned Programs Inputs				
	Extension		**Research**	
	Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
Actual Formula	6762910	0	6826813	0
Actual Matching	3381457	0	4776376	0
Actual All Other	0	0	0	0
Total Actual Expended	10144367	0	11603189	0

3. Amount of Above Actual Formula Dollars Expended which comes from Carryover funds from previous				
Carryover	0	0	0	0

V. Planned Program Table of Content

V(A). Planned Program (Summary)

Program # 1

1. Name of the Planned Program

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

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
201	Plant Genome, Genetics, and Genetic Mechanisms	0%		4%	
202	Plant Genetic Resources	5%		38%	
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants	0%		26%	
204	Plant Product Quality and Utility (Preharvest)	20%		4%	
205	Plant Management Systems	20%		28%	
403	Waste Disposal, Recycling, and Reuse	10%		0%	
405	Drainage and Irrigation Systems and Facilities	10%		0%	
601	Economics of Agricultural Production and Farm Management	15%		0%	
602	Business Management, Finance, and Taxation	10%		0%	
604	Marketing and Distribution Practices	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	19.9	0.0	10.5	0.0
Actual Paid	22.4	0.0	8.1	0.0
Actual Volunteer	0.0	0.0	1.5	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
978716	0	3883614	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
489358	0	2752275	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Developed and released improved cultivars of crops of economic importance.
- Introduced and evaluated the performance of starchy crops and fruit crops.
- Created electronic publication describing germplasm collections.
- Distributed germplasm to scientists and the public. Release of one new white bean variety, "Bella".
- Evaluation of germplasm of starchy vegetables, fruit crops, coffee and vegetables, and basic grains was continued.
- Conducted research and published technological packages describing best management practices for crops of economic importance.
- Increase on farm research to validate new technology
- Published research results in bulletins and local newspapers for farmers, and in refereed journals for scientists.
- Presented research results at scientific meetings.
- Collected information from stakeholders on critical issues of importance to this program. This Information will help to establish future research priorities.
- Upgraded research facilities for the establishment of a micropropation program.
- Conducted technical production training meetings.
- Organized capacity building workshops
- Demonstrate methods
- Conducted meetings, visits and guidance to farmers. Collaborate with state, local and federal government agencies.
- Use of mass media to disseminate information.
- Prepared technical plans (IPM, irrigation systems, cultivation practices)
- Prepared curricula and other educational materials
- Completion of six M.S. Thesis
- Sales of seeds and grafted fruit trees of improved varieties at the substations
- Distribution of 2,882 paper copies of technological packages for the production of crops and of the Journal of Agriculture of the UPR.
- Watch time of 12.98 years, 27 days and 1.15 million views on internet blogs on plant systems.
- Full day commodity meetings were held for the starchy vegetables, coffee, fruit crops and vegetables/basic grains between researchers, farmers, Extension agents, Extension specialists, professors, students and persons from the public and private sector.
- Research continued for a second year on the use of drones to evaluate crop health of coffee and citrus.

2. Brief description of the target audience

- Citrus and vegetable growers
- Banana and plantain growers

- Banana Growers Association
- Coffee growers
- Vegetable growers
- Fruit growers
- Ornamental growers
- Puerto Rico Department of Natural Resources
- International Institute for Tropical Forestry. USDA-FS
- Puerto Rico Department of Agriculture
- Ornamental, Landscaping, Plant Nursery Industry Growers

3. How was eXtension used?

www.eXtension.org has been used as a source of information by Extension Specialists and Agents to complement training presentations, material offered to Extension Agents and Farmers, as well as professional development material.
The Vegetable Specialist, Ermita Hernandez Heredia, posted a webinar titled The Use of Compost as Soil Amendment in Vegetable Corp Production in Puerto Rico on December 14, 2016.
https://learn.extension.org/events/2918

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	2912	4112	0	0

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

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	11	18	29

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of producers trained in integrated coffee management.

Year	Actual

2017	1090

Output #2

Output Measure

- Number of producers trained in integrated banana and plantain management

Year	Actual
2017	1248

Output #3

Output Measure

- Number of producers trained in integrated starchy crops management.

Year	Actual
2017	364

Output #4

Output Measure

- Number of producers trained in integrated vegetable management.

Year	Actual
2017	1637

Output #5

Output Measure

- Number of producers trained in integrated tropical fruits management.

Year	Actual
2017	481

Output #6

Output Measure

- Number of producers trained in integrated citrus management.

Year	Actual
2017	255

Output #7

Output Measure

- Number of persons trained in vegetable gardening.

Year	Actual
2017	3488

Output #8

Output Measure

- Number of collaborations established to improve outreach.

Year	Actual
2017	343

Output #9

Output Measure

- Number of educational activities offered (e.g. meetings, demonstrations, field days, press releases, workshops).

Year	Actual
2017	28

Output #10

Output Measure

- Number of participants in field days.

Year	Actual
2017	1100

Output #11

Output Measure

- Number of participants in on-farm demonstrations.

Year	Actual
2017	1100

Output #12

Output Measure

- Number of students attending field days to seed production fields, germplasm collections and other experimental fields.

Year	Actual
2017	202

Output #13

Output Measure

- Number of non-refereed publications.

Year	Actual
2017	28

Output #14

Output Measure

- Number of presentations in scientific meetings.

Year	Actual
2017	28

Output #15

Output Measure

- Number of research and/or extension proposals submitted addressing Global Food security and hunger.

Year	Actual
2017	9

Output #16

Output Measure

- Number of MS Thesis related to Global Food Security and Hunger.

Year	Actual
2017	6

Output #17

Output Measure

- Number of new/improved varieties developed and released.

Year	Actual
2017	1

Output #18

Output Measure

- Number of activities to inform stakeholders about established projects and their benefits

Year	Actual
2017	16

Output #19

Output Measure

- Number of producers trained in integrated basic grain management.

Year	Actual
2017	26

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 publications distributed on 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 produced and distributed from organic plots at the substations.
16	Number of producers that increased production of basic grains.
17	Number of locally produced fruits with increased output according to Extension Specialist/Commodity Leader reports
18	Land area in coffee and forage crops or under storm damage as characterized by drone applications

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	390

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
More than 65% of farmers in Puerto Rico are over 55 years old. The 2012 agricultural census reflects a dramatic decline in the number of new farmers reducing from 90 in 2007 to 20 in 2012.

What has been done
A five-day training was given to future coffee farmers in collaboration with the Department of Agriculture, USDA-ASM-FIMPS and the Specialty Coffee Association of America, titled "Quality Coffee: From the Farm to the Cup". The training was directed to Millenial Generation Coffee Growers, sons of coffee producers in the Island that in the future can continue their parent's coffee business. Eighteen young future farmers were trained in specialty coffees and marketing.

Results
Development of a training in special coffee production provides vital information directed to young coffee producers in the Island. Two young women from Maricao are now venturing into the coffee agribusinesses, beginning to develop a new coffee crop with high expectations to continue learning about coffee processing.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #2

1. Outcome Measures

Number of producers that increased production and quality of coffee.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	172

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	991

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #4

1. Outcome Measures

Number of producers that increased production in plantain.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	384

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1690

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There is a great need for new agricultural businesses to supply the food demand of Puerto Rico. On average, 85% of all PR agricultural products are imported. There is an urgent need to prepare new people in agricultural businesses to increase the number of farmers producing and selling their products.

What has been done
The Guayanilla Extension Service with participation of Agricultural Economy Specialists offered training on business plan, needs assessment, establishment registrations, economic assistance, marketing, farm security, vegetable varieties, agronomic practices and basic principles to establish an agricultural business to a vegetable producer and a lamb meat producer.

Results
The project "Huertos del Sur" was opened on October 2016 in Yauco, PR, as an iniciative to economically develop a new vegetable enterprise. This business made a family economically self-sufficient and provided 10 indirect jobs, increasing the supply of fresh vegetables to local consumers. The agribusiness "Agro-Cordero Puerto Rico" was opened to sell lamb meat in Lana Farm in Guanica. This business improved the economy of the town. Also, it was a major success for Mrs. Ivelisse Arroyo who was a victim of domestic violence and this project gave her the tools for self-management to improve her quality of life.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #6

1. Outcome Measures

Number of producers that increased production of vegetable crops.

2. Associated Institution Types

● 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	342

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems
601	Economics of Agricultural Production and Farm Management

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

● 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	187

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Citrus Greening Disease is the major constraint to citrus production. The psyllid vector and the associated citrus greening disease remains a big issue, and the industry in Puerto Rico has lost thousands of dollars.

What has been done
The Fruit Specialist in close collaboration with Extension Agents has developed a 4 step protocol to train growers to achieve good control of the disease and improve production. By means of field days in farms of affected growers they are learning how to cope with this disease. A proposal was submitted to NIFA in 2017 to develop demonstrational projects and evaluation of different types of fertilization, management of psyllids with insecticides and disease monitoring with a drone. Follow up meetings with affected farmers will be done as experiential learning.

Results
73% of trained growers increased production in their farms after adopting at least two of the recommended practices for integrated crop management.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #8

1. Outcome Measures

Number of producers that increased production of citrus.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	48

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #9

1. **Outcome Measures**

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

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2017	2911

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

Issue (Who cares and Why)
People in the Island are eager to learn how to grow fresh vegetables and to have access to all information regarding their varieties, use of IPM, application of natural pesticides, preparation of compost, use of companion plants and other sustainable practices.

What has been done
The use of the Vegetable Gardening Curriculum and multiple activities developed by Extension Agents, like festivals, communities and school visits to promote knowledge in vegetable gardening. As a way of promoting the development of this trend, the Extension Facebook page and the Extension newsletter "SEA del Oeste" published different success stories about people producing their own veggies in gardens.

Results
83% of trained producers increased their knowedge after completing a non-formal education course in vegetable gardening.

4. **Associated Knowledge Areas**

KA Code	Knowledge Area
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #10

1. **Outcome Measures**

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

2. **Associated Institution Types**

● 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2775

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Ricans need to grow their own fruits and vegetables by establishing a vegetable garden to reduce expenses in food costs and improve their health.

What has been done
2,775 persons established a vegetable garden after completing a non-formal course. Multiple activities, including field days, trainings, and festivals were conducted in order to develop understanding about production of vegetables, fruits, and herbs in vegetable gardens.

Results
More persons have understood the importance of growing their own vegetables, fruits and herbs. 80% of the persons that were trained established a vegetable garden. Training of a diverse audience was achieved, and the suitability of vegetable gardening throughout the Island was proven. Also, alternate methods to produce vegetables, farinaceous crops, fruits and herbs in different settings such as car tires, self-watered containers, and other media were recommended in communities and schools. The use of a curriculum for vegetable gardening by Extension Agents provided vital information to fulfill public needs in different settings.

4. Associated Knowledge Areas

KA Code	Knowledge Area
205	Plant Management Systems

Outcome #11

1. Outcome Measures

Number of publications distributed on Best Management Practices.

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Farmers in Puerto Rico need to sustainably increase yields and reduce production costs in order to compete in an open market economy.

What has been done
Printed copies of technological practices for different crops are distributed to farmers, extension agents, and specialists, PR and Federal Government officials, educators, private sector professionals in agriculture and the general public. Drafts of technological packages for cucumbers, melons (honeydew and cantaloupe), citrus and tankers are in an advance stage of completion.

Results
The PRAEXS distributed 2,882 paper copies of technological packages, Journal of Agriculture of the UPR and other bulletins and publications in 2017. Internet blogs by researchers received over 1.15 million views, with a watch time of 12.98 years in the internet. PRAEXS provides vital support for the continued production of traditional crops because seed is not available from the private sector. Most of the starchy vegetables are propagated by vegetative planting material.

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
203	Plant Biological Efficiency and Abiotic Stresses Affecting Plants
205	Plant Management Systems

Outcome #12

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	226840

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Lack of seeds of improved germplasm continues to be one of the major constraints to production identified by extension agents and growers in our yearly commodity meetings with stakeholders.

What has been done

The PRAEXS produced seeds of improved cultivars, as well as vegetative planting materials of plantains, banana, and root & tuber crop at the Corozal and Gurabo Substations. It also distributed grafted fruit trees of avocado, mango, soursop, West Indian cherries, and seedlings of various other fruits at the Fortuna Substation. At the Adjuntas Substation, coffee, citrus, and cover crops are produced for distribution to the PRDA, farmers and the general public. At the Isabela Substation, 63,200 pounds of tanier planting material was distributed to farmers for the planting of 35 acres.

Results

The area in farms planted with improved germplasm continues to increase. At the Isabela Substation, dry beans, pigeon peas, tropical squash and other basic grains are sold to farmers.

4. Associated Knowledge Areas

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

Outcome #13

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Production of root & tuber crops has decreased by more than 80% during the past 60 years, while consumption has decreased by a much lower percent.

What has been done

PRAEXS has an active research program in starchy crops. New varieties have been developed locally or introduced and evaluated. Improved management practices have also resulted in improved yields. Research results together with outreach by the extension specialist and agents have resulted in increased production. Vegetative materials for the planting of 35 acres of tanier were produced at the Isabela Substation and distributed to farmers through Puerto Rico Department of Agriculture
personnel.

Results

Puerto Rico Department of Agriculture statistics are not available for the 2016/2017 year. The commodity Leader for Starchy crops reports that production has increased less than 8% over the previous year.

4. Associated Knowledge Areas

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

Outcome #14

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Diseases and insects are major constraints for tropical vegetable production. Crop management practices need to the evaluated. A supply of certified seed of traditional vegetables (tropical squash, eggplant, sweet chili pepper and others) should be stored at PRAEXS.

What has been done
Germplasm evaluation of new hybrids and traditional varieties has continued. Shade houses established at the Fortuna and Lajas Substations to conduct research in an insect free environment were destroyed by Hurricane Maria, but some vegetable research work was accomplished prior to the hurricane.

Results
Production increased for sweet pepper (215%), eggplant (117%), and cabbage (102%); and decreased for onions (99%), tropical squash (7%), watermelon (17%) and pigeon peas (65%) between the 2015-16 and the 2016-17 seasons.

4. Associated Knowledge Areas

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

Outcome #15

1. Outcome Measures

Amount of certified organic seeds produced and distributed from organic plots at the substations.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	200

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Organic farmers need productive, reliable corn hybrids adapted to their farming systems with better grain quality. Their options are decreasing due to increasing industry consolidation and fewer elite lines available to organic seed companies.

What has been done

A winter nursery planting of 2000 lines of corn was planted, harvested, dried and shelled, and the clean seed was shipped to breeders from Iowa, Illinois, Wisconsin and New York.

Results
Reduce the time to develop organic corn seed by serving as a winter nursery as part of the USDA/NIFA/OREI project titled "Strengthening public corn breeding to ensure that organic farmers have access to elite cultivars".

4. Associated Knowledge Areas

KA Code	Knowledge Area
202	Plant Genetic Resources
204	Plant Product Quality and Utility (Preharvest)
205	Plant Management Systems

Outcome #16

1. Outcome Measures

Number of producers that increased production of basic grains.

Not Reporting on this Outcome Measure

Outcome #17

1. Outcome Measures

Number of locally produced fruits with increased output according to Extension Specialist/Commodity Leader reports

Not Reporting on this Outcome Measure

Outcome #18

1. Outcome Measures

Land area in coffee and forage crops or under storm damage as characterized by drone applications

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

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

Brief Explanation

Puerto Rico's economy has been severely impacted and sought for a bankruptcy relief with approximately $123 millions in debt. The state provides a significant portion of the University of Puerto Rico's funds. The University has experienced several consecutive years of funding reduction. The extreme weather conditions in the Island, also affected the

agricultural production promoting pest and disease outbreaks.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Each of the substations produced and distributed (free of charge or sold) planting materials and seeds of improved cultivars and varieties to the PRDA and growers. Total sales amounted to $226.841. They included seeds of coffee, pigeon peas, corn, pumpkin, as well as grafted trees of mango, avocado, soursop, Barbados cherry, citrus and others. Vegetative propagated planting materials of plantains, bananas, and root of crops were also distributed. For taniers, enough planting materials to plant 35 acres was distributed.
Meetings of dual moderator focus groups (commodity meetings) were held during the Spring semester of 2016-2017 for coffee, farinaceous crops, fruits, and vegetables and basic grains.
The short evaluation forms for the dual focus group on vegetables recommended the following research priorities: 1) multiplication of quality seeds of germplasm developed by PRAEXS; 2) evaluation of management systems in different agricultural regions taking into account climatic change, systems and time of planting, fertilizers and others; 3) evaluation of new varieties and their fertilizer and nutrient requirements; 4) evaluation of postharvest practices; 5) evaluation of sustainable practices for organic production.
The evaluation of the basic grain dual focus group recommended four priorities: 1) multiplication of certified seeds of traditional crops (beans, pigeon pea, corn); 2) evaluate postharvest practices for storage and value added; 3) evaluate improved lines or varieties for conventional growers; and 4) economic analyses of production factors, markets and budget models.
The evaluation of the coffee dual focus group identified low yields, scarcity of hand labor, diseases and low government established price for coffee grain as the major constraints of the industry. Fifteen priorities were identified. The top six were: 1) Seed production of high quality for planting; 2) Coffee grain quality traits according to ecological zone; 3) Registration (identification) of Puerto Rico as place of origin; 4) Economic evaluation and development of value added products and services to increase farmers' profits; 5) Field management methods for the coffee rust disease; and 6) Evaluation of varieties resistant to coffee rust.

Key Items of Evaluation

1. Use of focal groups composed of researchers, extension agents, farmers and producers to help determine the PRAEXS research priorities.
2. The PRAEXS Administration has the responsibility to identify each commodity and its priorities.

V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Animal Systems

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
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%	
305	Animal Physiological Processes	0%		5%	
306	Environmental Stress in Animals	8%		5%	
307	Animal Management Systems	2%		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%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	11.4	0.0	4.0	0.0
Actual Paid	14.2	0.0	3.8	0.0
Actual Volunteer	0.0	0.0	1.5	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
619766	0	1094090	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
309883	0	768659	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Conducted seminars, meetings, trainings, extension agent certifications, and workshops.
2. Local and international visits (with similar environments and agricultural systems) to exchange farm management practice experiences and research findings.
3. Educational material (publications, newsletters, CDs)
4. Developed proposals to find external resources as a means to conduct applied research to address the current needs in livestock production.
5. Offered counseling and orientation.
6. Worked in collaboration with communications media.
7. Established 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).
8. Improve collaboration with our partners at the University of Puerto Rico and other educational institutions.
9. Developed educational material comprising of model plans and educational material (publications, newsletter, videos, CDs).

2. Brief description of the target audience

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

3. How was eXtension used?

www.eXtension.org has been used as a source of information by Extension Specialists and Agents to complement training presentations, material offered to Extension Agents and Farmers, as well as professional development material.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	3474	54720	359	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	3	11	14

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- 1. Number of farmers trained in recommended bio-security practices as a means to mitigate diseases and increase animal production.

Year	Actual
2017	368

Output #2

Output Measure

- 2.Number of farmers trained in practices in animal welfare and protection.

Year	Actual
2017	660

Output #3

Output Measure

- 3. Number of farmers trained in recommended practices in recordkeeping.

Year	Actual
2017	595

Output #4

Output Measure

- 4. Number of farmers trained in efficient practices against internal and external parasites.

Year	Actual
2017	82

Output #5

Output Measure

- 5. Number of farmers trained in the means of mitigating the effects of climate change on livestock production.

Year	Actual
2017	200

Output #6

Output Measure

- 6. Number of farmers trained in the implementation of alternative crops/forages as a means to improve nutrient utilization.

Year	Actual
2017	227

Output #7

Output Measure

- 7. Number of farmers trained in recommended economic practices associated with business efficiency.

Year	Actual
2017	209

Output #8

Output Measure

- 8. Number of meetings held with stakeholders to discuss the situation of each livestock industry and corresponding research priorities.

Year	Actual
2017	5

Output #9

Output Measure

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

Year	Actual
2017	30

Output #10

Output Measure

- 10. Number of publications in refereed scientific journals.

Year	Actual
2017	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 adopted recommended recordkeeping procedures.
4	Number of farmers that adopted practices for the control of internal and external parasites on their farms.
5	Number of farmers that adopted one or more practices for heat stress control.
6	Number of farmers that improved the nutrient utilization practices in their herds.
7	Number of farmers and agricultural entrepreneurs that used tools to make effective economic decisions to improve their business.
8	Number of producers participating in field days or training sessions who adopted or expressed intentions to adopt recommended management practices on their farms.
9	Number of rabbits, pigs, and dairy and beef cattle of genetically improved breeding stocks, from the University of Puerto Rico herd, sold to local producers to improve the genetic quality of their herds.
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.
11	Quantitative description of breeding stock of purebred Senepol and crossbreds of Senepol with other beef breed from th University of Puertorico herd, sold to local beef produers to improve the genetic quality of their herds.

Outcome #1

1. Outcome Measures

Number of farmers that adopted a bio-security program.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	70

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	207

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The bee population in the Island had decreased substantially due to deforestation and agricultural practices associated to pesticide misusage. Bees that move to urban areas due to the aforementioned practices are usually destroyed. These practices directly affect bees welfare and protection. It is well known that bees are the most important group of pollinators.

What has been done

Mrs. Rosa Tirado, an agri-entrepreneurship woman, was interested in learning about how bees could help increase her crop production (strawberries and grapes) and means to help increase bees population. As an active Extension Voluntary, she visited the Extension Office of Las Piedras municipality, where Extension Agent Aida Maldonado coordinated various apiculture courses. Among these, a general course in apiculture at the Apiculture School of the East and an additional course in apiculture with the Department of Agriculture of Puerto Rico.

Results

During the last years, Mrs. Rosa Tirado have propelled the urban and rural protection of bees through workshops and conferences in Head Start schools and communities, reaching more than 300 kids and young people. She has trained 22 women of the Agri-entrepreneurship Women Association about bee protection and general management. She also planned an annual community fair "Seed Exchange", disseminating information to more than 3,000 people in the last three years. In addition, Mrs. Tirado personally has rescued 3 beehives from urban areas and rescued 5 beehives after Hurricane Maria. These were established in her farm where she provides essential sugars and proteins, protecting the local bee population. 660 farmers were trained in animal protection and welfare, 31% of those farmers adopted the recommended practices in their farms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
133	Pollution Prevention and Mitigation
303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases
315	Animal Welfare/Well-Being and Protection
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #3

1. Outcome Measures

Number of farmers that adopted recommended recordkeeping procedures.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	62

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Mastitis is the most important disease in the Dairy Industry. Elevated somatic cells counts (SCC) and bacterial numbers reduce milk yield. One of the most significant problems in managing mastitis in Dairy Farms in Puerto Rico is the misusage of antibiotics to treat mastitis. This leads to reduced efficacy of treatments and increased probability of developing antibiotic resistance, among others.

What has been done
A dairy farmer in Camuy,PR, received notifications from the Regulatory Office related to elevated bacterial counts (120,000 CFU/mL) and SCC (560,000 cells/mL). The local Agent visited the dairy farmer to evaluate the milking routine. A report was submitted highlighting the deficiencies providing training to the milkers, milk samples were collected and submitted to a mastitis lab to diagnose the ethological agent and incorporate these in their records. Consultation with the Dairy Specialist was done to identify the source of contamination.

Results
The source of contamination was suggested to be a muddy area were cows laydown post milking, suggesting that the mastitic pathogens were environmental. Laboratory results reported elevated bacterial number of other Strepts and Prothoteca. The Extensionist provided further visits to train milkers in performing CMT. All positive cows were isolated and treated accordingly and the muddy area was fenced. After two weeks, the dairy farmer reduced bacterial counts (<10,000 CFU) and SCC acceptable levels (<750,000), and notifications from the DIRO ceased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	114

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
311	Animal Diseases
313	Internal Parasites in Animals
315	Animal Welfare/Well-Being and Protection
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	71

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
132	Weather and Climate
301	Reproductive Performance of Animals
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
305	Animal Physiological Processes
306	Environmental Stress in Animals
307	Animal Management Systems
308	Improved Animal Products (Before Harvest)
315	Animal Welfare/Well-Being and Protection
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #6

1. Outcome Measures

Number of farmers that improved the nutrient utilization practices in their herds.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
About 50-60% of the production costs in dairy farms is related to feeding. This is mainly due to the high prices of concentrate feed. In addition, the nutrient and energy profile of the commercial concentrate greatly varies, causing milk production fluctuations; therefore, causing substantial economical losses in addition to predispose cows to metabolic diseases.

What has been done
The local Extensionist provided several visits to train the Dairy Farmer about proper collection of feed samples, nutrition of dairy cattle and feed analysis interpretation. Concentrate feed was collected. Consultation with the Dairy Nutritionist Specialist was done to interpret feed analysis reports. The administrator and owner were met to be oriented about the results, its implications on milk yields and options. Among these, preparation of their own concentrates.

Results
The owner invested in a mill to prepare and balance his own concentrate feed. He was able to reduce the cost of feeding and produce a more constant nutritional profile. Prior to the investment, the dairy farmer was paying $16.50 per 100 pounds of commercial concentrate. The commercial feed averaged an energy content of 0.85 MCal/lb of Net Energy of Lactation (NEL). Now, his own concentrate has 0.88 MCal/lb of NEL. The cost of producing his own concentrate is $13.75, saving $21,252 annually.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
132	Weather and Climate
202	Plant Genetic Resources
205	Plant Management Systems
213	Weeds Affecting Plants
302	Nutrient Utilization in Animals

303	Genetic Improvement of Animals
305	Animal Physiological Processes
307	Animal Management Systems
315	Animal Welfare/Well-Being and Protection
403	Waste Disposal, Recycling, and Reuse

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	20

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
601	Economics of Agricultural Production and Farm Management

Outcome #8

1. Outcome Measures

Number of producers participating in field days or training sessions who adopted or expressed intentions to adopt recommended management practices on their farms.

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	6

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #9

1. Outcome Measures

Number of rabbits, pigs, and dairy and beef cattle of genetically improved breeding stocks, from the University of Puerto Rico herd, sold to local producers to improve the genetic quality of their herds.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals

Outcome #10

1. Outcome Measures

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. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	46

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Most of the research developed by our investigators at the Experimental Station (AEE) and Extension Service (AES) were intended mostly for the scientific community. This approach limits the information that farmers can used for their benefit.

What has been done

The AEE and AES personnel extracted the most pertinent and appropriate information from their researches and published them in a popular vocabulary through our various local journals. These include the "Res Informativa" and "SEA del Oeste".

Results

Due to the information published in non-referred articles, farmers regularly contact AES agents requesting that our AEE and AES researchers provide additional information and recommendations. In various occasions, this has helped Extension agents to strengthen interactions with investigators when farmers request farm visits to evaluate their management practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
305	Animal Physiological Processes
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

Outcome #11

1. Outcome Measures

Quantitative description of breeding stock of purebred Senepol and crossbreds of Senepol with other beef breed from th University of Puertorico herd, sold to local beef produers to improve the genetic quality of their herds.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	18

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The beef industry of Puerto Rico has traditionally been at a disadvantage in competition with imported meat, which is partly due to low genetic performance potential of the local cattle. Therefore, genetic improvement is one of the essentials needed to enhance the competitively of locally produced beef and increase its sales valve to benefit the producer.

What has been done
Starting from a few Senepol cattle imported by the UPR 35 years ago, the institutional Senepol herb developed to the point where it is now one of the outstanding sources of breeding stock in the world. Senepol cattle are a Bostaurus type, naturally polled, of a docile natural, produce good-quality beef and are well-adapted to the local tropical conditions.

Results
The willingness of beef producers in PR to use Senepol animals (purebred and crossbred) in their herbs has been a positive factor all along. Every year breeding stock of the UPR herb are auctioned off to owners of herbs located in practically all parts of the island where beef cattle are raised. When provided with good management Senepol cattle are yielding beef of highly acceptable quality. During Fiscal Year 2017, a total of 18 purebred Senepols were sold for reproductive purposes (8 sires, 2 bood cows and 7 heifers). Due to animals needed for research, these numbers represent fewer than are typically sold each year, and are below the level of demand. However, the policy is not to sell cull animals except for slaughter, thus to maintain a high genetic standard of the local Senepol population.

4. Associated Knowledge Areas

KA Code	Knowledge Area
303	Genetic Improvement of Animals
308	Improved Animal Products (Before Harvest)

V(H). Planned Program (External Factors)

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

Brief Explanation

Puerto Rico undergone a significant drought during the monts of May through October. In addition, the PR government initiation of bankruptcy process and the appointment of a Fiscal Oversight Board impacted on our agricultural stability.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Affiliation with the Dairy Herd Improvement Association to collect variables of interest from dairy farmers. Continuous evaluation of the quality and accuracy of the data collected in our online report system (SISE). In addition, together with personnel of the Agricultural Experimentation Station, we are trying to increase efforts to improve the record keeping of other animal production systems.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 3

1. Name of the Planned Program

Integrated Management of New and Emerging Pests and Diseases

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
211	Insects, Mites, and Other Arthropods Affecting Plants	50%		30%	
212	Pathogens and Nematodes Affecting Plants	10%		10%	
215	Biological Control of Pests Affecting Plants	0%		20%	
216	Integrated Pest Management Systems	40%		40%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	4.4	0.0	3.2	0.0
Actual Paid	3.5	0.0	2.5	0.0
Actual Volunteer	0.0	0.0	0.7	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
154396	0	670543	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
77198	0	511768	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Develop partner-mediated Pest Management Strategic Plans for the crops of Puerto Rico.

- Foster the use of cutting-edge technology to implement IPM.
- Enhance our capacity to conduct fast pest and disease diagnosis.
- Disseminate research results through publications, seminars, field days, conferences, and any other method deemed appropriate to reach our target audiences: Extension Agents, Government partners, students, producers, consumers and environmental groups.
- Technical production training meetings.
- Capacity building workshops.
- Demonstration of methods
- Meetings, visits, and guidance to farmers
- Collaboration with state, local and federal government agencies.
- Use of mass media to disseminate information.
- Preparation of technical plans (IPM, irrigation systems, cultivation practices)
- Prepare curricula and other educational materials

2. Brief description of the target audience

- Citrus and Vegetable growers
- Banana and Plantain growers
- Ornamental growers
- Puerto Rico Department of Natural Resources
- U.S. Fish & Wildlife Service - Caribbean Regional Office
- International Institute for Tropical Forestry, USDA-FS
- Puerto Rico Department of Agriculture
- Ornamental, Landscaping, Plant Nursery Industry Growers of Cucurbits South of USA and Puerto Rico
- IPM Specialists

3. How was eXtension used?

www.eXtension.org has been used by Extension Specialists and Agents as a source of information to complement trainings, field days and other activities with their clientele and as a tool for professional development.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	184	400	0	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	5	3	8

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of abstracts and oral presentations in professional scientific meetings resulting from program activities.

Year	Actual
2017	26

Output #2

Output Measure

- Number of joint Research-Extension activities that include pest diagnostics and identification.

Year	Actual
2017	5

Output #3

Output Measure

- Number of field days, farm visits, symposia, workshops, topic conferences, and open houses that emphasized in IPM practices that impact food security.

Year	Actual
2017	296

Output #4

Output Measure

- Number of people who participated in IPM non-formal education courses.

Year	Actual
2017	952

Output #5

Output Measure

- Number of Extension Specialists that provide training manuals, field days, talks, newspaper articles, conferences, and design web site resources in integrated pest management aiming at food security.

Year	Actual
2017	10

Output #6

Output Measure

- Number of Faculty and Extension Specialists that provide information and recommendations on best management practices for pest and disease control.

Year	Actual
2017	10

Output #7

Output Measure

- Number of stakeholders with increased knowledge on emerging pests and aware of reduced risk pesticides.

Year	Actual
2017	300

Output #8

Output Measure

- Number of articles published in newspapers.

Year	Actual
2017	1

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Number of farmers that adopted one or more recommended practices for integrated management of Citrus Greening.
2	Number of persons that increased knowledge about IPM in the vegetable garden after completing a non-formal education course.
3	Number of persons that implemented integrated management recommendations after receiving a pest or disease diagnose for their crops.
4	Number of emerging pests identified as a result of research activity.
5	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.
6	Number of farmers that acquired knowledge in integrated management of vegetable diseases in shade houses.
7	Number of farmers that adopted one or more recommended practices for Black Sigatoka Management.
8	Number of farmers that acquired knowledge in integrated management of Citrus Greening.
9	Number of persons who adopted reduced risk pesticides and practices
10	Number of farmers reporting decreased losses due to key and emerging diseases.

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	89

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Citrus growers are aware of the importance of managing the Citrus Greening disease in their orchards and practice good management practices that include proper fertilization, pruning and vector control.

What has been done
A field guide about citrus greening, psyllid vector and nutritional management were developed by the Fruit and IPM Specialists and delivered to growers. Production of citrus pest free plants is enforced by a Certified program as part of the integrated approach developed.

Results
Based on results obtained through the Extension Report System for accountability of outcomes, 89 of farmers adopted (98%) one or more recommended practices for integrated management of Citrus Greening as a direct result of Extension Agents advice during farm visits to the orchards and through field days and result demonstrations made in collaboration with the Extension Fruit Specialist.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #2

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	573

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The number of persons establishing a vegetable garden in their homes had a dramatic increment in the last year. There are many pests and diseases that affect vegetables and other crops in vegetable gardens. People need to know how to identify them and apply integrated practices like roughing, repellent plants, biological and botanical pesticides, and crop rotation to manage them. As a result, Extension personnel was required to educate people in IPM practices.

What has been done

The Vegetable Specialist and Extension agents trained homeowners in IPM in the home garden. The Vegetable Gardening Festival included IPM with trainings about Identification and Management of Pests and Diseases, and Use of Companion and Natural Pesticides for Pest Control. The Vegetable Gardening curriculum lessons in IPM are actively being used by Extension agents to educate people in IPM. About 500 persons were reached directly in the conferences. Information distributed by the Vegetable specialist through the Vegetable Commodity UPRM Facebook page reached 1,698 people.

Results

573 persons increased their knowledge in IPM after completing a non-formal course in IPM in the vegetable garden. People around the Island are more informed about the application of integrated management practices to control pests and diseases in their vegetable gardens, including the use of natural pesticides and promoting the presence of biological control agents with the use of companion and aromatic plants in association with their crops.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants
216	Integrated Pest Management Systems

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	187

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Early detection of plant pathogens and pests is essential to implement adequate management practices. Retail sales of ornamental plant materials host a variety of diseases and pests. The seed industry requires constant screening to prevent pathogens transmitted by seeds in corn and soybeans. Thousands of tourists visiting every year can transport plants and other inorganic commodities contaminated with seeds and arthropods.

What has been done

The Puerto Rico Plant Diagnostic Clinic in Juana Diaz (PRPDC) trained the APHIS/PPQ personnel in new diseases and pests, like bacterial leaf streak in corn and viral diseases in soybeans, affecting crops in winter nurseries. The PRPDC diagnosed 919 plant samples and provided management recommendations to more than 100 growers. The Extension IPM staff conducted 6 workshops, 12 presentations, and diagnosed insect and disease specimens.

Results

Farmers and households with accurate diagnosis for pests and diseases have reduced pest damage by implemented recommended management practices. The PRPDC includes in their analysis a questionnaire to collect qualitative data from the stakeholders. Approximately, 110 growers that submitted samples to the Plant Diagnostic Clinic have implemented recommendations for disease and pest prevention management and based on follow-up phone calls have reported success with the management of the disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The detection of "Candidatus" Phytoplasma aurantifolia subgroup A affecting Roystonea (R.) borinquena is the first report of this Phytoplasma group worldwide. Early detection is vital to control these pest and the protection of Puerto Rico agriculture and natural resources.

What has been done
The abundance of aphid species associated with orange orchards and citrus leaf flush phenology was assessed weekly from 2 orchards between April 2016 and April 2017. The presence of phytoplasmas in R. borinquena, confirming Pigeon Pea Witches Broom Phytoplasm. DNA sequences obtained from R. borinquena palm and in the potential vector, Haplaxius crudus Van Duzee (Cixiidae) was confirmed, indicating that H. crudus may act as potential phytoplasma vector.

Results
The presence of A. spiraecola, A. gossypii, T. citricida in citrus at 3 locations was confirmed, with relative abundance varying by site. The presence of aphidiine braconid parasitoids with new records for Lipolexis oregmae in Puerto Rico was confirmed. The syrphid fly Pseudodoros clavatus and several coccinellid beetles have been identified as important predators. Candidatus Phytoplasma aurantifolia subgroup A in 3 R. borinquena and 2 Leucothrinax morrisii, represents the first report of this phytoplasma group in palms worldwide. Indications are high that both palms and fulgoroidea vectors may simultaneously harbor 7 different phytoplasmas of multiple 16 Sr groups.

4. Associated Knowledge Areas

KA Code	Knowledge Area
211	Insects, Mites, and Other Arthropods Affecting Plants
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants

216	Integrated Pest Management Systems

Outcome #5

1. Outcome Measures

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. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	120

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

New and emerging pest and diseases can severely limit vegetable production. Cucurbits and solanaceous crops are susceptible to viral and bacterial diseases and a great number of insects. The climatic conditions had changed in a dramatic way in the last years, magnifying the damage caused by pathogens and arthropods to the crops.

What has been done

The UPRM Expo Hort field days and Extension exhibitions impacted 118 participants. The Extension Diagnostic Clinic provided an exhibition and trained participants about sample collection to improve detection of new pests. Various publications were distributed and participants' contact info recorded for future activities. A workshop about pumpkin, cherry pepper and melon production, and IPM was delivered to the Incubadora Bieque. A field day on Plantain production and 2 conferences about banana rust thrip and black sigatoka were offered.

Results

120 producers 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. Producers are aware of the importance of learning about pests and diseases that affect their crops so they can manage and incorporate biosecurity practices to prevent spread of diseases in their farms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

Outcome #6

1. **Outcome Measures**

Number of farmers that acquired knowledge in integrated management of vegetable diseases in shade houses.

2. **Associated Institution Types**

- 1862 Research

3a. **Outcome Type:**

Change in Knowledge Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2017	12

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

Issue (Who cares and Why)
Vector transmitted diseases limit vegetable production in Puerto Rico. The Puerto Rico Department of Agriculture has promoted the use of shade houses as an alternative to reduce the effect of pests in vegetables.

What has been done
The effect of the population dynamics of the diamondback moth (Plutella xylostella) on cabbage, and the effect of pepper weevil (Anthonomus euginii) on pepper growing under a shadehouse was evaluated.

Results
A difference of 2 degrees Celsius (less) of air temperature was recorded during the experiments inside of the shade house compared to outdoors. The diamondback moth and the pepper weevil were reduced when these crops were grown under a shadehouse and outdoors. Yields of cabbage were reduced under the shadehouse when compared to the outdoor crop. In contrast pepper yield significantly increased.

4. **Associated Knowledge Areas**

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #7

1. **Outcome Measures**

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

2. **Associated Institution Types**

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	73

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Black sigatoka is the most important disease in plantain in the municipalities of the central region of the Island, where the climatic and soil conditions promote the disease. The source of contamination is infected plantations with poor management and use of infected planting material (suckers). The primary mean of dissemination of the disease is ascospores that are spread during extended periods of rain and are readily disseminated by air currents. Farmers need to implement good IPM practices to control the disease.

What has been done
An integrated disease management program involving both cultural and chemical measures was delivered by Extension Agents. The recommended practices are: cultural practices aimed to reduce spore levels in the plantations and humidity levels around the leaves, removal of infected leaves (deleafing) regularly throughout the year, placement of pruned leaves on the soil surface to promote decomposition, and use of clean and disease free suckers. The recommended fungicide program includes the alternate application of protectant and systemic fungicides.

Results
73 farmers adopted one or more practices for the control of Black Sigatoka. As a result of the educational program delivered by Extension agents, farmers are implementing the management practices. In addition, farmers understand that good management will allow them to increase efficiency of production and, therefore, increase their profits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #8

1. Outcome Measures

Number of farmers that acquired knowledge in integrated management of Citrus Greening.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Citrus growers understand the importance of managing the Citrus Greening disease in their orchards and practice good management practices that include proper fertilization, pruning and vector control.

What has been done
Orchard visits to discuss citrus plant management in nurseries to support citrus growers the adoption of IPM.

Results
Activities resulted in increased adoption of IPM practices in five private nurseries in Santa Isabel, Utuado, Las Marias, San Sebastian and Isabela. Growers in these nurseries adopted management practices for the control of diseases in citrus trees. These activities has resulted in improved collaborations among citrus growers, researchers and specialists at the University of Puerto Rico, Mayaguez Campus.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #9

1. Outcome Measures

Number of persons who adopted reduced risk pesticides and practices

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	210

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The presence of pests and diseases in vegetable crops, specially solanaceae and cucurbitaceae, is severe due to the continuous cultivation of crops in the same fields and the presence of persistent pests like the pepper weevil, and diseases like gummy stem blight and silvering caused by white flies in pumpkins.

What has been done

A field day was held in the Juana Diaz Experimental Station to educate growers in the use of shade houses to decrease the number of pests in pepper, cabbage and watermelon. The Extension Vegetable specialist and Extension agents from the southern municipalities of the Island, where the production of these vegetables concentrated, gave an on-farm orientations and held seminars and forums to train about vegetable production including IPM for pest and disease control.

Results

Increase yields were obtained in bell peppers and watermelons grown under a shade house, using plastic mulch and drip irrigation, when compared to open fields. This was not typically for cabbage that showed reduced yields. 210 persons adopted reduced risk pesticides and practices (sustainable agriculture) in their farms.

4. Associated Knowledge Areas

KA Code	Knowledge Area
216	Integrated Pest Management Systems

Outcome #10

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	67

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

About 1,000 acres of tomatoes are grown in Puerto Rico in open fields and screenhouses. However, the incidence of bacterial diseases increase significantly under screenhouses. In open field conditions, viral diseases are on the rise. Early detection of bacterial symptoms in seedlings before transplanting have helped in the prevention of bacterial outbreaks. Scouting for vectors and virus symptoms is also encouraged.

What has been done

An emergent disease in tomatoes is the bacterial spot caused by Xanthomonas campestris pv. vesicatoria. Tomato growers received training for disease detection based on symptoms and early detection of plants which shows early signs of infection, by submitting samples to the Diagnostic Clinic.

Results

The tomato producers have used the Diagnostic Clinic for early detection of bacterial and viral diseases. More than fifty samples were analyzed at the Clinic with an Immunoblot kit for Xanthomonas and Immunostrips for detection of viruses. Growers were able to eradicate infected plants before transplanting tomato seedlings that tested positive for bacterial or viral diseases. The use of biological control agents was selected by growers growing tomatoes under screenhouse conditions to decrease the inoculum for bacterial diseases. Plants positive for virus were eradicated from the fields.

4. Associated Knowledge Areas

KA Code	Knowledge Area
212	Pathogens and Nematodes Affecting Plants
216	Integrated Pest Management Systems

V(H). Planned Program (External Factors)

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

Brief Explanation

Puerto Rico has been severely impacted economically and sought bankruptcy relief from debt related consequences. The commonwealth/state provides a significant portion of the University of Puerto Rico funds which has scheduled consecutive years of budget reductions. The overall university budget gap in FY 2017 severely affected programs. Extreme wind and rain conditions occurring in Puerto Rico, have created abiotic stresses in the all crops and outbreaks of diseases due to excess humidity affecting the agricultural production in the Island.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Disease and Pest Diagnostics continued in hydroponics and herb nurseries with Extension Agents in 2017, a questionnaire was administered to 15 growers to know about common pests and diseases and adopted integrated pest management practices. Growers were from 6 municipalities of the northwest and central region of the Island. Herb and leaf vegetables

crops planted were coriander or cilantro, long leaf coriander, basil, loose leaf and romaine lettuce and arugula. Practices recommended consisted of cultural control methods, use of sticky traps, and application of low toxicity pesticides (biological and botanical). Growers perceived insect pests as the major production constraint, rating aphids, thrips, mites and caterpillars as the most serious pests. This survey demonstrated that growers are interested in knowing more about disease symptoms, pest identification and IPM strategies. More than 90% of growers used at least two techniques as part of their pest management strategies. Cultural control practices and the use of biological insecticides were the most popular techniques followed by using yellow sticky traps. All growers manage diseases and pests by spraying weekly with older and newer generation pesticides.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 4

1. Name of the Planned Program

Climate Change, Natural Resources and Environment

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources	0%		9%	
102	Soil, Plant, Water, Nutrient Relationships	0%		11%	
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%		14%	
112	Watershed Protection and Management	25%		11%	
121	Management of Range Resources	0%		1%	
122	Management and Control of Forest and Range Fires	0%		1%	
124	Urban Forestry	0%		7%	
125	Agroforestry	5%		0%	
132	Weather and Climate	5%		0%	
136	Conservation of Biological Diversity	0%		7%	
211	Insects, Mites, and Other Arthropods Affecting Plants	0%		8%	
212	Diseases and Nematodes Affecting Plants	0%		2%	
403	Waste Disposal, Recycling, and Reuse	15%		18%	
903	Communication, Education, and Information Delivery	0%		1%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	10.7	0.0	3.5	0.0
Actual Paid	9.6	0.0	2.9	0.0
Actual Volunteer	0.0	0.0	0.5	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
416958	0	1092499	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
208479	0	697820	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. An ongoing effort to provide non-formal education on soil erosion control continues in collaboration with the USDA-Natural Resource Conservation Services (NRCS) to encourage the adoption of recommended practices. Soils are the most important input in agriculture production besides being a crucial filter and buffer to contaminants, therefore protecting water resources.
2. Training continues to be offered on water harvesting and storage. Water harvesting and efficient use of water on the farm remains in high demand as part of the non-formal education course requests.
3. Collaboration with the Caribbean Climate Hub continues in the development of educational materials and activities for farmers.
4. Education continues on brush / forest fire prevention.
5. Education and assistance continues to be offered to farmers on solid waste management, carbon sequestration and soil management. Soils also acts as a pool of biodiversity and as a sink for atmospheric carbon dioxide.
6. Several articles were written for the Extension Magazine (SEA del Oeste) throughout the year. Also, in the newspaper Agrotemas, which is distributed free in the stores where farm equipment and materials are sold. In those articles information was written on soil erosion control, soil health as climate change adaptation measure. Besides, radio programs were offered too.
7. 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.
8. Develop pollution prevention and mitigation (practice, measure, thresholds) for protection of watershed and soil resources.
9. Develop soil improvement and maintenance practices.
10. Develop and promote sustainable agricultural practices as a key component to foster agricultural-led economic growth in the island.
11. Determine the factors that influence the sustainable agricultural production practices adoption in Puerto Rico.
12. Determine the pathways of entry, ecological impact, and management of non-native species on biodiversity.
13. Develop management approaches for conserving and restoring biodiversity.
14. Publish research advancements in journals, bulletins, newspaper articles, and popular magazines.

- Offer capacity building workshops.
- Use mass media to disseminate information.
- Collaborate with local, state and federal government agencies.

2. Brief description of the target 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, UPR Faculty members.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1264	15142	768	0

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	4	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of people who received capacity development (workshops, seminars, conferences) on water quality, watershed protection, and conservation.

Year	Actual
2017	496

Output #2

Output Measure

- Number of participants in non-formal educational courses on climate change.

Not reporting on this Output for this Annual Report

Output #3

Output Measure

- Number of people who received capacity development in agroforestry, soil erosion, and storm water runoff control.

Year	Actual
2017	491

Output #4

Output Measure

- Number of people who received capacity development on soil erosion and water environmental regulations.

Year	Actual
2017	104

Output #5

Output Measure

- Number of people who received capacity development on prevention of brush or forest fire.

Year	Actual
2017	53

Output #6

Output Measure

- Number of people who received capacity development on natural disasters and emergency management to reduce loses and maintain their farming operation.

Year	Actual
2017	206

Output #7

Output Measure

- Number of stakeholders receiving research information on best management practices for agricultural and natural ecosystems.

Year	Actual
2017	0

Output #8

Output Measure

- Number of oral or poster presentations at professional scientific meetings resulting from program activities.

Year	Actual
2017	17

Output #9

Output Measure

- Number of research proposals submitted.

Year	Actual
2017	4

Output #10

Output Measure

- Number of educational activities in collaboration with the Extension Service personnel to disseminate information to farmers and the general public about research results.

Year	Actual
2017	0

Output #11

Output Measure

- Number of graduate and undergraduate students involved in research projects.

Year	Actual
2017	0

Output #12

Output Measure

- Number of people who received capacity development on farm waste management and gas emission in farms.

Year	Actual
2017	133

Output #13

Output Measure

- Number of producers/persons that participated in joint Research-Extension activities (field days, on-farm demonstrations or oral presentations).

Year	Actual
2017	0

Output #14

Output Measure

- Number of people who participated in climate change in courses where the curricular guide was used.

Year	Actual
2017	656

Output #15

Output Measure

- Number of people who participated in a non-formal education course on water collection, storage and re-use for agricultural purposes.

Year	Actual
2017	122

Output #16

Output Measure

- Number of non-refereed publications resulting from program activities

Year	Actual
2017	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 trainings, research demonstrations, tours, surveys and meetings with stakeholders to discuss research results, critical issues and priorities.
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 people who increased knowledge on practices to improve soil quality through an integrated soil management system.
12	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.
13	Number of people reporting willingness to adopt best management practices to improve conservation and efficient use of water.
14	Number of people reporting gained knowledge through podcasts and web videos
15	Number of target audience that report an increased knowledge through trainings, research demonstrations, tours, surveys and meetings
16	The number of peer-reviewed and non-refereed publications resulting from program activities.
17	The number of people receiving training in Agro-ecology and adopting agro-ecological practices.
18	Development of guidelines to improve novel forests ecosystems services

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	367

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The consequences of climate change have been felt in Puerto Rico for some time now, such as floods, droughts, heat waves and others, where agriculture is one of the enterprises most affected experiencing income losses in millions of dollars.

What has been done

A comprehensive curricular guide was developed several years ago and is still been used to disseminate information about cause, effects and adaptation practices to provide alternatives to farmers to keep their business operation. Most recently, a curricular guide was developed on soil health.

Results

During 2017, 656 persons participated in courses using the curricular guide on climate change, where 56% (367) adopted recommended practices, such as: water use efficiency, solid waste management, animal feeding and others.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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
403	Waste Disposal, Recycling, and Reuse

Outcome #2

1. **Outcome Measures**

Number of people who established watershed protection practices.

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Action Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2017	84

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

Issue (Who cares and Why)

What has been done

Results

4. **Associated Knowledge Areas**

KA Code	Knowledge Area
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

Outcome #3

1. **Outcome Measures**

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

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	76

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agriculture production requires great amount of water, which is in competition with human demand. Besides, due to the current environmental conditions that favors a warmer climate that cause high soil moisture evaporation, limiting water availability for plants.

What has been done
Water harvesting courses continues to be offered and people keep interested in the subject as a practical and economical way to re-use water.

Results
This year a total of 122 persons participated in various training sessions offered throughout the Island and 62% (76) persons reported adopting water harvesting practices.

4. Associated Knowledge Areas

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

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	97

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
125	Agroforestry

Outcome #5

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	65

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Given an average precipitation of 53.01 inches (NOAA), soil erosion is of great concern. Also, the steep topography of the Island add to the increase of soil loss. Through the years, soils have been depleted and most of the organic matter is gone. Soil is a very important asset in agriculture production.

What has been done
Capacity development was offered to farmers on soil health, workshops in soil erosion control and conservation practices, as well as on existing regulations for water quality and soil conservation.

Results
One hundred and four (104) persons received capacity development on soil and water regulations; 65 of the participants (62.5%) were able to comply with the regulations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #6

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The practice of burning brush as means of weed control is wide spread around the Island.

What has been done
Training continue to be offered on brush and forest fires besides other educational activities presented in schools, communities and municipalities.

Results
This year 63 persons participated. From those who participated, 30 (57%) reported adopting fire prevention practices.

4. Associated Knowledge Areas

KA Code	Knowledge Area
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
125	Agroforestry
132	Weather and Climate

Outcome #7

1. Outcome Measures

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

2. Associated Institution Types

● 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	85

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The consequences of extreme weather events are heavily felt in the farms, dramatically reducing farm production.

What has been done
Training, courses and presentations were offered to create awareness and encourage people to understand the importance of preparing an emergency plan or take measures in case of a natural disaster.

Results
Two hundred and six (206) persons participated in educational activities on how to prepare a contingency plan and the importance of farm insurance. As a result, 85 persons (41%) prepared a contingency plan or get farm insurance.

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #8

1. Outcome Measures

Number of trainings, research demonstrations, tours, surveys and meetings with stakeholders to discuss research results, critical issues and priorities.

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To increase outreach efforts throughout diverse educational activities across disciplines and groups of interest.

What has been done
Outreach efforts incremented throughout different activities across disciplines and groups or interest. Major initiatives include workshops, seminars, field days, meetings, training and research demonstrations.

Results
The capacity building of the audience increased, public awareness and interest about the research program have grown as shown by the number of participants, stakeholders input and number of consultations reported.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
136	Conservation of Biological Diversity
403	Waste Disposal, Recycling, and Reuse

Outcome #9

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	35

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
To support the training of outstanding students at the undergraduate and Master?s levels, to fill national identified expertise areas in the Agricultural and Natural Resources Sciences. This initiative responds to the need to ensure the development of the intellectual capital of the Natural Resources and Agricultural Sciences workforce in areas relevant to College of Agricultural Sciences and USDA identified by both federal and local agricultural agencies.

What has been done
Undergraduate and graduate student have received training and work experience in this research program provided field and laboratory research experience for more than at dozens of undergraduate students. Training experiences varied among projects, e.g., undergraduates and graduate students received training in silvicultural research, reforestation and ecosystems services and the intervention in novel ecosystems.

Results
Research experience allows university students to understand published works better, learn to balance collaborative and individual work, determine an area of interest, and jump-start their careers as researchers. Six students completed their master degree, recruitment and retention of talented students interested in pursuing graduate studies have increased.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
104	Protect Soil from Harmful Effects of Natural Elements
112	Watershed Protection and Management
121	Management of Range Resources
124	Urban Forestry
136	Conservation of Biological Diversity
211	Insects, Mites, and Other Arthropods Affecting Plants
403	Waste Disposal, Recycling, and Reuse
903	Communication, Education, and Information Delivery

Outcome #10

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	188

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

Outcome #11

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #12

1. **Outcome Measures**

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.

Not Reporting on this Outcome Measure

Outcome #13

1. **Outcome Measures**

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

Not Reporting on this Outcome Measure

Outcome #14

1. **Outcome Measures**

Number of people reporting gained knowledge through podcasts and web videos

2. **Associated Institution Types**

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	200000

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The need to improve outreach for research awareness, and audience engagement.

What has been done
Our researchers used multiple online tools such as websites, podcasts, and blogs to reach different audiences. Content and new websites development have increased during the last year.Research groups such as the Agro-Ecological created their own webpage agroecologico.eea.uprm.edu for target audiences interested in knowledge improvement of environmentally friendly agricultural practices. Meanwhile, "Desde la EEA" podcast, Reclying and manure and sustainable agriculture websites continue to impact their audiences.

Results

Monitoring accounts and participating in discussions (e.g., answering questions in social media) was a key component for sustaining participation from followers and encouraging growth and engagement of their online community. Collectively, online outreach reached the milestone of 202,065 hits.

4. Associated Knowledge Areas

KA Code	Knowledge Area
103	Management of Saline and Sodic Soils and Salinity
104	Protect Soil from Harmful Effects of Natural Elements
111	Conservation and Efficient Use of Water
112	Watershed Protection and Management
124	Urban Forestry
136	Conservation of Biological Diversity
403	Waste Disposal, Recycling, and Reuse
903	Communication, Education, and Information Delivery

Outcome #15

1. Outcome Measures

Number of target audience that report an increased knowledge through trainings, research demonstrations, tours, surveys and meetings

Not Reporting on this Outcome Measure

Outcome #16

1. Outcome Measures

The number of peer-reviewed and non-refereed publications resulting from program activities.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Research and writing are critical components for the progress of science. Publishing is the most important means for communicating and increase awareness of scientific work. Implementing

research and publishing results is crucial for the development of best management practices of both agricultural, and natural ecosystems are an essential research output of the program.

What has been done
The CCNRE research program's publications cover a wide range of subjects, from the taxonomic classification of soils, soil management such as chemical and physical changes on compost amended neotropical soils, to specialties, such as biodiversity of Heteroptera in Puerto Rico. Significant publications include a Bulletin of an Updated Taxonomic Classification of Soils of Puerto Rico and a Monograph of Biodiversity of Heteroptera in Puerto Rico: Part I. A Conspectus of Pentatomorpha: Pentatomoidea. Both publications will be available in hard copy and pdf.

Results
Throughout both referred and non-referred publications AES scientific work availability and awareness increased in broader audiences.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
104	Protect Soil from Harmful Effects of Natural Elements
121	Management of Range Resources
122	Management and Control of Forest and Range Fires
124	Urban Forestry
136	Conservation of Biological Diversity
211	Insects, Mites, and Other Arthropods Affecting Plants

Outcome #17

1. Outcome Measures

The number of people receiving training in Agro-ecology and adopting agro-ecological practices.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	30

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The number of people receiving training in Agro-ecology and adopting agro-ecological practices.

What has been done
Several trainings, demonstrations, and meetings were celebrated to discuss the impact of soil conservation practices on soil organic matter management.

Results
Research results reached a diversity of audiences through personal communications, field days, seminars, and publications. An AgroEcological course was created for the general public interested in improving their knowledge in agricultural practices to enhance soil quality. Researchers also reached target audiences using a webpage agroecological .eea.uprm.edu.

4. Associated Knowledge Areas

KA Code	Knowledge Area
103	Management of Saline and Sodic Soils and Salinity

Outcome #18

1. Outcome Measures

Development of guidelines to improve novel forests ecosystems services

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico's novel forests are dominated by non-native species that produce little income to residents and landowners. Therefore. there is a need to improve ecosystems services provided by this forest type.

What has been done
Researchers are studying the effects of abiotic and biotic factors on the survival and growth of rare, native, fruit and timber tree species planted within novel forests. The study aims to produce guidelines to match native tree species success to novel forest type so landowners and regulatory agencies can better improve restoration and plantings in these forests, improving biodiversity, conservation, and enhancing food security and timber production.

Results
Nothing to report

4. Associated Knowledge Areas

KA Code	Knowledge Area
124	Urban Forestry

V(H). Planned Program (External Factors)

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

Brief Explanation

Early this year, we experienced heavy rainfall events in the eastern part and the San Juan metro area of the island which caused floods. Also, we experienced weather extreme conditions, such as the Sahara Dust (May 23-25 and a very intense episode in October 19th) which minimized the chance for rain in favor of higher temperatures (NOAA).
By the economic side, Puerto Rico is in a high debt that is affecting all social and productive sectors which forces a shift in public priorities.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

In February 2017, a survey was sent to get farmers perception regarding climate change. The target audience were farmers who have received assistance from Extension. 176 persons completed the survey. Most of the responders were from the northeastern part of the Island. The results showed that 94.74% have heard about climate change; 95.4% indicated that in their opinion, climate change is real. When asked, if they knew what was causing the climate change, they responded as follows: 83.5% it was due to pollution, 80.6% bad use of natural resources, 65.3% atmospheric gases, 54.7% people were causing it and 46.5% said it is a natural phenomenon. When asked, how you can detect climate change in Puerto Rico? Seventy nine percent (79.6%) responded by the changes in temperature (higher), 77.9 said by droughts, 72% by stronger rain fall. Another question was, what are you doing to cope with climate change? Thirty eight percent (38.7% responded planting trees, 29.8% management of runoff water; 29.2% said forage preservation, 28.6% water harvesting and storage, 27.4% soil management and 26.8% said crop rotation. Another question was, should you change your farm practices? Total response to this question was 155, where 56.1% answered yes. From those who responded on the affirmative, 54% mentioned they need to keep records, 56.8% said they need to improve soil management and 57.7% increase use of conservation practices. Regarding the question who influence you more in farm management decisions? The majority mentioned Extension personnel (61.7%) followed by the State Department of Agriculture (45.4%). Where do you get your weather information for decision making? Overwhelming majority responded Facebook (71%) followed by television (58%).
To identify and prioritize issues that will shape the CCNRE PREXS research program for the next years is a continuous endeavor of our personnel and staff work. Check out our current priorities to learn more about the needs and critical issues are shown to be of most significant concern by PREXS stakeholders, speak out of change, and leading research

addressing this challenge is essential to the fulfillment of the program goals. The research program evaluation will have a double purpose; a detailed 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 not achieved. The primary purpose of this evaluation is to fit the programming effort through the development of a management model that describes the factors that appear to enhance or detract from the completion of stated goals and objectives. The multiple data collection activities to compile input from the program participants and stakeholders: survey, workshops and seminars, website questionnaires, document review, and analysis, were not always successful. The most efficient were workshops, seminars, and website, particularly web-videos and podcasts. The audience has expanded exponentially.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 5

1. Name of the Planned Program

Food Safety, Science and Technology

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
501	New and Improved Food Processing Technologies	0%		20%	
502	New and Improved Food Products	0%		40%	
701	Nutrient Composition of Food	0%		20%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins	100%		20%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	4.4	0.0	1.8	0.0
Actual Paid	9.3	0.0	0.9	0.0
Actual Volunteer	0.0	0.0	0.5	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
404745	0	17076	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
202373	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Worked in collaboration with other agencies.
- Offered Safe Food Handling Curriculum for consumers. Curriculum includes at-risk population.
- Exhibits, information centers, radio shows, among others.
- Offered Food Safety Course to Food Managers
- Training in HACCP, GAP, GMP
- Research in new product development using waste from food industry and agricultural commodities.
- 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.
- Develop research proposals to address the problems of Puerto Rican farmers and Agro-industry.
- Training in HACCP, GAP, GMP
- Research in new product development using waste from food industry and agricultural commodities

2. Brief description of the target audience

- Extension Family and Consumer Science professionals and other professionals
- Parents and persons that plan/buy/prepare food for the family
- Consumers with an emphasis on at-risk population
- Food Managers
- Food Industry representatives
- Scientists in the public sector working with technology for minimally processed vegetables
- Plant breeders working with squash (Cucurbita)
- Consumers interested in new horticultural products
- Farmers

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	12416	74359	2883	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of consumers completing one Food Safety educational curriculum for consumers.

Year	Actual
2017	1840

Output #2

Output Measure

- Number persons in charge of food establishments completing Food Safety Course.

Year	Actual
2017	2735

Output #3

Output Measure

- Number of persons completing courses, workshops, and seminars offered by the program.

Year	Actual
2017	2735

Output #4

Output Measure

- Number of active research projects in the program.

Year	Actual
2017	5

Output #5

Output Measure

- Number of non-refereed publications based on research results.

Year	Actual
2017	2

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 products developed or improved as a result of research on active projects
5	Number of participants approving exam taken after completing courses, workshops, and/or seminars offered by the program. (Courses: Good Manufacturing Practices, Hazard Analysis and Critical Control Points, Good Agricultural Practices)
6	Number of farmers and agro-industries directly impacted by risk analyses conducted as part of research projects

Outcome #1

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1328

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Foodborne illness is an important public health issue. The CDC (Center for Disease and Prevention) estimates that every 1 in 6 Americans become ill, 128,000 are hospitalized, and 3,000 die because of foodborne illnesses. According to Cairnduff, et. al (2016) consumers do not know how important safe food handling practices are when trying to prevent foodborne illnesses. Many consumers think that food safety responsibilities rely on manufacturers.

What has been done
PRAES FCS Educators offered the Families Preparing and Cooking Food Safely curriculum including: most common foodborne illnesses, proper hand washing, cleaning and sanitizing, how to purchase safe food, food preparations, and how to use a food thermometer. Other topics included: At-risk population, food safety for expecting moms, food and water safety during emergencies, and vegetable gardens food safety. Due to a plastic bags law prohibition, this year we added lessons on how to prevent cross contamination when using reusable grocery bags.

Results
PRAES FCS Educators offered 126 courses about Families Preparing and Cooking Food Safely. A total of 1840 participants completed the course. 72% adopted at least one safe food handling practice. Among the practices adopted were: cleaning and sanitizing food contact surfaces (62.6%); proper handwashing (68%); separated raw food from ready-to-eat (53%); cooked at recommended cooking temperatures (42.6%); and held food at safe temperatures (41%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #2

1. Outcome Measures

Number of participants that approved the certification exam.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2664

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Food handler training is seen as a method to increase food safety (Adesokan,H.K., 2015) and to reduce critical food safety violations
(Kassa,H. et al, 2010). Food Safety training could offer long-term benefits to the food industry (Adesokan, H. K., et al., 2015). Between training and knowledge, there is a significant association.

What has been done
PRAES FCS Educators trained and certified in Food Safety, offered 134 courses (consisting on 12 lessons) throughout the year. Food Inspectors participated during the courses explaining the Inspection Report and how the recomendations provided in the course must be applied at their food establishments.

Results
2735 persons in charge of food establishments completed the course and 2664 (97%) approved PRAES Food Safety Course test with a score of 70% or more.

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2318

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to CDC (2014), 60% of outbreaks occur in restaurants. Food Safety training could offer long-term benefits to the food industry (Adesokan, H. K., et al., 2015). Food establishments with a Food Safety Certified manager have lower risk of outbreaks.

What has been done
PRAES prepared food safety courses that complies with the Food Code 2013 knowledge areas. With the participation of a health inspector collaborating in our courses, food managers had the opportunity to clarify any doubts on how to comply with the Food Code. Food managers see the Inspector as a facilitator more than a compliance officer because they get to ask questions without the pressure of an inspection. This year we trained 2735 Food Managers, of which 2664 approved the course's test.

Results
87% of the participants adopted at least 3 safe food handling practices. Among these are: hand washing (91%); prepared a Standard Operational Procedure for cleaning vomits and feces (76.5%); people that certify medical releases for employees that get sick (91%); thawed food using one of the recommended methods (91%); appropriate cooking temperature (135°F or above; 90.5%); the use of hot water for dishwashing (91%); the use utensils or disposable gloves when handling ready-to-eat-food (91%); and the usage of food thermometers (87%).

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #4

1. Outcome Measures

Number of products developed or improved as a result of research on active projects

2. Associated Institution Types

● 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Whey can be used in the production of food products. This work proposed the used of acid whey to develop a yogurt. This yogurt will have added fiber and low fat content. The use of extrusion as part of snack production has proved to be useful. The thermal and mechanical treatment generates a continuous and homogeneous cooking resulting in a change in shape, structure and in some cases in the composition. To demonstrate the versatility of the multipurpose flour of taro a snack product was developed. A new horticulture product was developed using curcubita flowers.

What has been done

Three different formulations using whey as base for yogurt production was achieved. Different types (16) of extrusion formulation were performed using taro corm flour and polenta (corn meal). From a surface response statistical analysis conducted, one of the formulation was the optimal. Starch modification (fermentation and extrusion) was conducted to compare physical and chemical characteristics of the native one. A canned product using curcubita flowers was presented at a horticulture Field Day.

Results

A sensory panel demonstrated that the formulation with the best acceptability was the one using whey and nonfat milk solids. The optimal formulation for the extrusion process was determined at: 12% humidity and a ratio of 78.8:21.2 (taro corm:corn meal). Both the taro corm and the corn meal had a particle size of 16 mesh. The modification process of the native starch of the taro corm generated changes. The physicochemical and functional properties obtained from the modified starches showed a high capacity of absorption as shown in the fermented ones and greater solubility for the extruded ones. The new product, canned edible flowers, was presented to 117 persons that attended to the horticulture Field Day.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies
502	New and Improved Food Products

Outcome #5

1. Outcome Measures

Number of participants approving exam taken after completing courses, workshops, and/or seminars offered by the program. (Courses: Good Manufacturing Practices, Hazard Analysis and Critical Control Points, Good Agricultural Practices)

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The taro of Nazareno cultivar (Xanthosoma spp.) is a new hybrid that gathers the best characteristics of this species. For this reason, a full use of the reserve organs, mainly the corm (central stem), is ideal. However, the corm cannot be consumed naturally due to its high content of calcium oxalate, which is an antinutritional factor and imparts bitterness and astringency to the product. The objective of this study was to elaborate multipurpose flour and obtain starch from the corm of the taro of the Nazareno cultivar in order to provide an added value to this crop and provide a potential alternative in the food industry.

What has been done

Removal of calcium oxalate was achieved through a soaking process of 72 hours at 28oC with constant agitation. After soaking, the flour was washed 5 times with distilled water and centrifuged. For the recovery of flour, the pellet was dried in a dehydrator at 45oC for 24 hours. Extraction of corm starch was also performed.

Results

An 81% of recovery was achieved for corm flour using the extraction procedure; however, a reduction of 79% of calcium oxalate was also achieved. After performing starch extraction, a 2.5% recovery of starch was obtained and the amount of antinutrient in starch was very low.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

Outcome #6

1. Outcome Measures

Number of farmers and agro-industries directly impacted by risk analyses conducted as part of research projects

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

V(H). Planned Program (External Factors)

- Economy
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

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 public policies and regulations. Many food businesses have shut down and many people have moved from the island.
One of the consequences of this financial crisis is the loss of employments. Families have left the Island searching for better opportunities. According to the US Census (July, 2017), Puerto Rico's population has had a 10% reduction since 2010. Puerto Rico has had a a 1.5% average reduction per year.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No evaluations were made.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 6

1. Name of the Planned Program

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

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
602	Business Management, Finance, and Taxation	20%		0%	
604	Marketing and Distribution Practices	0%		29%	
605	Natural Resource and Environmental Economics	0%		6%	
607	Consumer Economics	0%		21%	
608	Community Resource Planning and Development	40%		7%	
610	Domestic Policy Analysis	0%		37%	
803	Sociological and Technological Change Affecting Individuals, Families, and Communities	30%		0%	
805	Community Institutions, Health, and Social Services	10%		0%	
	Total	100%		100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	28.9	0.0	1.0	0.0
Actual Paid	27.4	0.0	2.3	0.0
Actual Volunteer	0.0	0.0	0.2	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
1196354	0	68991	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
598177	0	45854	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

CRD Program focused in strategies to promote self-employment through entrepreneurship training, and diverse occupational and craftsmanship skills training. Regarding community organizational development, PRAES CRD focused in community oriented initiatives that fostered sustainability, self-reliance, as well as disaster and emergency management readiness. Resulting in better organized communities with better decision-making systems.
Research was undertaken to explore the potential of new market niches for our new and traditional products, as well as to determine farmers' costs of production, consumer preferences, marketing margins, and farmers' and other participants' shares in the marketing channels of selected agricultural commodities.
A retail-level census was performed to identify and characterize the supply of coffee and non-alcoholic substitute beverages (juices, chocolates, tea, carbonated beverages and energy drinks) for selected municipalities in different regions of Puerto Rico.
Studies to determine the effect of the USDA SNAP and School lunch program on the food industry of Puerto Rico were continued.
Three focus group sessions with milk and coffee producers and selected consumers were conducted to calibrate the survey instrument that will be used to conduct choice experiments to estimate consumer willingness to pay for differentiated coffee and milk products.
Research on public policy issues in education was undertaken taking land use conflicts in a land-grant institution as a case study.
A survey to explore salient issues and priorities in local and regional food systems was undertaken, in collaboration with other southern region states, to help direct future Research and Extension activities in this area.
In collaboration with Extension faculty and agents, results and recommendations have been communicated to farmers and community organizers.
Information from the program has also been delivered through publications in academic journals, newspapers and a regular PRAEXS podcast program.

2. Brief description of the target audience

Farmers, community leaders and organizers, women and children living in poverty and other vulnerable populations, research and extension faculty, producer associations, land grant administrators, government officials and policy makers, consumers, food industry participants, coffee industry components (growers, roasters, coffee shop owners, etc.), community participants and organizations.

3. How was eXtension used?

eXtension was consulted in the literature review conducted for a new research and education project on local food systems.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	32550	5649	0	0

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

Patent Applications Submitted

Year: 2017

Actual: 0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	2	1	3

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of presentations in scientific meetings

Year	Actual
2017	8

Output #2

Output Measure

- Number of non-refereed publications (posters, newspaper articles, etc)

Year	Actual
2017	9

Output #3

Output Measure

- Number of new technology generated (models, software, processes)

Not reporting on this Output for this Annual Report

Output #4

Output Measure

- Number of persons trained in community-based business (at least four workshops)

Year	Actual
2017	131

Output #5

Output Measure

- Number of leaders trained in community organization and empowerment (at least four workshops).

Year	Actual
2017	686

Output #6

Output Measure

- Number of leaders trained in emergency and disaster situations (at least four workshops).

Year	Actual
2017	437

Output #7

Output Measure

- Number of students participating in extension and research activities

Year	Actual
2017	4

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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.
10	Number of new employments created.

Outcome #1

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	800

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The growing, processing and roasting of coffees differentiated by quality and origin, for domestic and export markets, has been identified as an alternative to increase the profits of farmers in Puerto Rico. While since 2000 coffee brands produced by small and medium farmers have doubled, information was still lacking on the retail market places in which the coffee brands produced by small and medium farmers had access.

What has been done

A census was conducted in different retail food sales establishments . The retail food stores included: megastores, members club stores, local supermarket chains with presence in almost the entire island, and supermarkets with only regional presence. The municipalities censed were: Adjuntas, Arecibo, Caguas, Fajardo, Mayagüez, and San Juan.

Results

The data collected in the census suggest differences in the supply of coffee brands by establishment and region. Coffee brands differentiated by origin and quality, produced by small and medium coffee growers, are more present in local and regional supermarket chains than in megastores and members club stores. This result has important implications for the design of market strategies and market mix compositions (product, price, place, and promotion) that might allow small and medium farmers? coffee brands access to profitable market segments and establishments.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics

607	Consumer Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis

Outcome #2

1. Outcome Measures

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. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	12

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

In 2016 a widespread outbreak of the banana red-rust thrips (Chaetanaphothrips signipennis) occurred in Puerto Rico. As a result of damage inflicted in the fruit by the feeding practices of nymphs and adults, the fruit peel exhibited reddish circles and stains, thus affecting the marketability of bananas. While the fruit quality was not impaired by the disease, significant economic and market losses were reported by farmers of the crop.

What has been done

Meetings with part of the affected farmers took place to discuss management strategies that could be implemented to reduce pest-associated damage. Two PRAEXS bulletins, a poster, and a radio program were produced targeted to farmers, retail outlets managers, and consumers, explaining the nature of the cosmetic damage inflicted by the pest and its lack of impact over the fruit's quality, nutrients, or taste.

Results

Farmers showed willingness to adopt bunch management strategies that could aid to reduce the cosmetic impact of the pest. As a result of the practices adopted and the campaign developed, consumer demand for the crop was gradually reestablished to former levels. On the research side, steps were taken to begin studies to locally register available chemical pesticides and to conduct more tests on their delivery methods.

4. Associated Knowledge Areas

KA Code	Knowledge Area

604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
607	Consumer Economics
608	Community Resource Planning and Development
610	Domestic Policy Analysis

Outcome #3

1. Outcome Measures

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

Not Reporting on this Outcome Measure

Outcome #4

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	74

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Starting a business is a process that requires dexterities not only in the area of business (i.e., ornamentals, baking, childcare), but business skills. At PRAES we provide participants with many marketable skills that let them become potential entrepreneurs. Through entrepreneurship education and mentoring our CRD program participants were able to learn and practice skills necessary to establish and effectively run their business ventures.

What has been done
Through the Community Entrepreneurial Tool Box, PRAES Consumer and Family Sciences Educators and Agricultural Agents work hand in hand with participants to envision, design and develop a business plan to put their marketable skills.

Results
14 new business that generate earnings were established and 8 business proposals were funded.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #5

1. Outcome Measures

Number of community-based businesses established.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	22

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico is under a U.S. Congress appointed Fiscal Oversight Board after the local government began the process of declaring bankruptcy. Since 2008, the government ended its role as the principal generator of economic activity and employment. The need to foster opportunities that leads to self-employment and community based economic initiatives are more important, yet more challenging, today than ever.

What has been done
Through individuals and community groups training in business creation and entrepreneurship skills development, using the curricular guide Community's Entrepreneurial Tool Box, a total of 22 new business initiatives (that reports income) have been created.

Results
In Cabo Rojo, a cattle ranch was able to expand its operations by adding 140 acres of grassing land and close to 100 heads of cattle. In Cayey a new association of hogs producers was established to share a business plan that will allow them to share cost, improve marketing and increase the number of farmers and profits; 18 artisans were certified in Cidra and are in the process of establishing an Artisan Market geared to the increasing number of tourists that visit the town of Cidra every year.

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation
608	Community Resource Planning and Development

Outcome #6

1. **Outcome Measures**

Number of community projects established to benefit the community.

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Action Outcome Measure

3b. **Quantitative Outcome**

Year	Actual
2017	74

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

Issue (Who cares and Why)

What has been done

Results

4. **Associated Knowledge Areas**

KA Code	Knowledge Area
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services

Outcome #7

1. **Outcome Measures**

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

2. **Associated Institution Types**

- 1862 Extension

3a. **Outcome Type:**

Change in Action Outcome Measure

3b. **Quantitative Outcome**

Year	Actual

2017	437

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
803	Sociological and Technological Change Affecting Individuals, Families, and Communities

Outcome #8

1. Outcome Measures

Number of communities that developed an emergency and safety plan.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	7

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services

Outcome #9

1. Outcome Measures

Number of families that developed an emergency and safety plan.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	65

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico is a Caribbean island susceptible to weather extremes such as droughts, hurricanes, earthquakes, tsunamis, and even pest diseases such as dengue, chikungunya, and most recently Zika. Our training curricula in Climate Change and Emergency (i.e., disasters) and safety plans has empower communities and families in vulnerable geographical areas to be equipped with skills that will allow them to be ready for, increase the chances of surviving, and become resilient after a national disaster or emergency.

What has been done
In 2017 a total of 437 community leaders and residents were trained in Climate Change and Emergency (i.e., disasters) and safety plans.

Results
In the last 2 years, 20 communities and 136 family emergency and safety plans in communities prone to floods, tidal waves, ground displacement and forest fires were developed and are in place.

4. Associated Knowledge Areas

KA Code	Knowledge Area
608	Community Resource Planning and Development
805	Community Institutions, Health, and Social Services

Outcome #10

1. Outcome Measures

Number of new employments created.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	33

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
602	Business Management, Finance, and Taxation

V(H). Planned Program (External Factors)

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

Brief Explanation

From 2014 to the summer of 2017, Puerto Rico experienced the worst drought in the last 100 years, representing it a mayor challenge to small farmers that cannot afford irrigation systems. This affected several strategic planning initiatives that were relegated to attend this problem. After 11 years of negative economic growth and government's initiation of a bankruptcy process, the U.S. Congress appointed Fiscal Oversight Board that is in charge of developing a restructuring economic plan that it is yet to be approved. Mass migration has increased to 85,000 plus a year. Those migrating are mostly the recent college graduate (i.e., the young, best educated and best qualified).

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No program evaluation was carried in 2017.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 7

1. Name of the Planned Program

Sustainable Energy

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.1	0.0	0.3	0.0
Actual Paid	3.0	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
129100	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
64550	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- In our workshops and meetings we covered aspects of sustainable energy with emphasis on

structures, waste management and irrigation equipment, and energy conservation.

• Established collaborations with government agencies (Environmental Quality Board, Puerto Rico Electric Power Authority, Department of Agriculture, Environmental and Natural Resources, Department of 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.

• Designed and developed plans to include and promote energy sustainability and efficiency in structures, waste management systems and irrigation systems (new facilities or improvement to existing facilities).

2. Brief description of the target audience

Extension professionals, government personnel (professional), professionals from the private sector and farmers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	220	711	17	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of clients that participated in workshops and meetings offered which include aspects of energy sustainability and efficiency.

Year	Actual

2017	197

Output #2

Output Measure

- 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.

Year	Actual
2017	20

Output #3

Output Measure

- Number of active research projects in the program.

Year	Actual
2017	0

Output #4

Output Measure

- Number of new proposals submitted targeting the program's priorities.

Year	Actual
2017	0

Output #5

Output Measure

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

Year	Actual
2017	0

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 Measures

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. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	109

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

The Borinquen Ward located in Caguas, Puerto Rico, has 7,953 people and a population density of 489.58 habitants per km2. The community is mostly composed of people of low income, older, small farmers, single mothers and disabled people. During the last years, this area has experienced drinkable water scarcity due to its geographical location (montainous southern area of Caguas).

What has been done

Coordination was established with Caguas' Borinquen Ward community leaders to visit the area. About 180 families were identified to have issues with water availability. Two community meetings were conducted to identify possible solutions and alliances. Leaders were trained in the use of renewable energy as a means to power the treatment and distribution of the water system for the community. Various alliances were achieved to assist this community.

Results

With a combined donation from the Toyota Foundation and the Municipality of Caguas of $135,000 with the community contribution of $30,000 for a total of $165,000, the existing water tank was reconditioned and a new solar system was istalled to power the filtration system (20 solar panels and 18 batteries). With this effort, no fuel emissiones are produced and the whole community was given a fixed low energy rate of approximately $1,100 montly. The community is currently considering the expansion of their solar energy system.

4. Associated Knowledge Areas

KA Code	Knowledge Area
402	Engineering Systems and Equipment

Outcome #2

1. Outcome Measures

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. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	25

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
401	Structures, Facilities, and General Purpose Farm Supplies

Outcome #3

1. Outcome Measures

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

2. Associated Institution Types

- 1862 Extension
- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
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

V(H). Planned Program (External Factors)

- Economy
- Public Policy changes
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

A weak economy is a factor that precludes people from investing in improving their infrastructures. The strong recession and increasing cost of inputs, may limit farmer's ability to adopt other types of technologies with long term payoffs. When a general feeling is that economy are strong, people tend to be more aggressive with infrastructure investments. The availability of economic incentives is decisive in making final decisions that require capital investment, and the government of PR have been decreasing the amount of incentives in the last 2 years. Changes in public policies also make people change priorities and postpone projects. Also, we experience emigration changes, where most of the labor and productive people leave the Island maybe to pursuit a better quality of life. These changes in population reduces the kind of people that can invest on renewable energy.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

Our Agricultural Agents offered various workshops and established 20 new collaborations with other universities or government agencies on the Island, which include aspects of renewable energy. In which they reported 724 direct contacts, 664 indirect contacts, and reported that 555 of them presented an increase in knowledge in the area. We planned that 155 people may adopt designs or improvement to existing facilities that promote energy sustainability, and PRAES Agents reported that 71 persons made changes, that's almost a 46%. The other outcome was the number of projects, initiatives as a result of partnerships between government agencies, the private sector, and the University of Puerto Rico that

collaborate to promote energy sustainability and efficiency; we planned 50 for the 2017 and the PRAES Agents reported 25 projects or initiatives that was developed or still been developing by those partnerships and collaborations.

Key Items of Evaluation

V(A). Planned Program (Summary)

Program # 8

1. Name of the Planned Program

Adult and Childhood Obesity

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

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

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	7.8	0.0	0.0	0.0
Actual Paid	6.6	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
286985	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
143493	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

1. Developed joint action at community level to promote and implement physical activity programs and nutrition education for adults, parents, caregivers and kids.
2. Taught participants about portion size control, adequate meal patterns, supermarket tours, meal planning, shopping lists to ensure healthy food choices within a budget.

3. Demonstrated easy, healthy food recipes to encourage the consumption of fruits, vegetables and whole grain foods.
4. Encouraged the importance of gardening to increase physical activity and the consumption of fruits, vegetables and healthy foods.
5. Demonstrated the importance of reducing refined sugars and saturated fats to prevent obesity and the development of chronic diseases.

2. Brief description of the target audience

Children, youth and their families, caregivers, and adults.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	12009	11730	17623	7878

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of children and youth that completed non-formal nutrition and physical activity education courses.

Year	Actual
2017	5723

Output #2

Output Measure

- Number of families/caregivers that completed non-formal nutrition and physical activity education courses.

Year	Actual
2017	3129

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 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 Measures

Number of children and youth that reported eating more healthy foods.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2366

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Data reported on the Youth Risk Behavior Surveillance System (2013) showed that 25.8% of Puerto Rican adolescents were overweight or obese, 8.9% of adolescents (grades 9th through 12th) did not eat fruits, and 18% did not eat vegetables. In addition, 29.2% did not participate in at least 60 minutes of physical activity "on at least one day".

What has been done
Two major nutrition educational activities were conducted during FY 2017 across the Island focusing on the prevention of childhood obesity. These included the short course "Move to Healthy Eating" with the participation of 1505 kids, and 2969 4-H members participated in "Project Route 4-H for a Healthy Life". Through these interventions, kids participated in experiential learning activities including MyPlate, nutrition labeling and healthy snacks.

Results
After the nutritional interventions, 41% of participants increase their fruit consumption, 22% increased their vegetable consumption and 21% increase the consumption of whole grain cereals. In addition, 34% decreased the intake of sugary beverages and 38% increases water intake. Participants also learned about the importance of physical activity. After the intervention, 49% of participants reported increasing their physical activity levels. These results show positive changes in behaviors towards the prevention of childhood obesity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #2

1. Outcome Measures

Number of families/caregivers that reported eating more of healthy foods.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1493

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #3

1. Outcome Measures

Number of children and youth that reported eating less of foods/food components which are commonly eaten in excess.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017	1460

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #4

1. Outcome Measures

Number of families/caregivers that reported eating less of foods/food components which are commonly eaten in excess.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	483

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #5

1. Outcome Measures

Number of children and youth that reported increasing their physical activity.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2199

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #6

1. Outcome Measures

Number of children and youth that reported engaging in 60 minutes or more of physical activity.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017	389

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

Outcome #7

1. Outcome Measures

Number of families/caregivers who gained knowledge about the importance of gardening to promote physical activity and improve nutrition.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	956

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
704	Nutrition and Hunger in the Population

Outcome #8

1. Outcome Measures

Number of children and youth that reported adopting healthy eating patterns

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	650

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
703	Nutrition Education and Behavior
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

- Economy
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

1. Puerto Rico's economic situation is facing a difficult time. Community participants are forced to find extra jobs and the attendance to education programs has been reduced. There are limitations in the amount of educational materials to be prepared due to reduced funds.
2. Many employees are retiring and the positions are vacant. It is more difficult to outreach communities. Also, there has been an increase in the migration of low income families to the United States, which has also resulted in a lower participation in the educational programs.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

A descriptive study was conducted among a sample of 4-H members that participated in the State Festival of Health and Nutrition. The purpose was to identify and understand the eating practices among young people from 11 to 18 years old. Participants answered a questionnaire administered on site. 4-H members were asked about frequency of consumption of the five food groups and about breakfast and lunch patterns. Participants were also specifically asked about their milk, juice, soda and water consumption. Types of physical activities were also identified by the participants. Results showed that 32% of participants eat vegetables and 50% eat fruits every day. School age children can consume two of their daily meals at school. This group of participants indicated that 55% eat breakfast at school while 89% eat lunch in school. Concerning their milk consumption, 31% indicated they drink at least one 8-ounce glass of milk every day. The average among this 31% of participants was 3 glasses of milk. Water consumption was higher where 77% reported consuming at least one eight-ounce glass. On average this group consumed 7 glasses of water daily. The average consumption of soda was 5 glasses among 18% of the participants that reported drinking soda on a daily basis. Concerning physical activities, 3% indicated they do no type of physical activity. Among the group reporting doing physical activity, the three major types of physical activity reported were: helping with household chores (85%), taking the stairs (81%) and sports (72%). These results showed that a large percent of these 4-H members follow healthy dietary practices. A limitation of this study is that it was a one-time measured and no behaviors changes could be measured. However, due to the fact that the children participating in this activity at the state level, were required to have a short course in nutrition, it can be suggested that this tendency towards healthier eating practices could have been the result of their participation in the nutrition education intervention.

Key Items of Evaluation

Nutrition, dietary intake in children.

V(A). Planned Program (Summary)

Program # 9

1. Name of the Planned Program

Family Well-being

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
607	Consumer Economics	10%		0%	
724	Healthy Lifestyle	40%		0%	
801	Individual and Family Resource Management	10%		0%	
802	Human Development and Family Well-Being	40%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	21.2	0.0	0.0	0.0
Actual Paid	22.2	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
969121	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
484561	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

Radio programs, educational campaigns, worshops, courses and trainings, curriculum and educational materials development, orientations, establishments of collaborations with government agencies and

institutions, exhibitions in malls and public places with informative brochures and other educational materials.

2. Brief description of the target audience

Extension Agents, FCS Educators, PRAES Specialists, professionals from other agencies, volunteers, low income families, elder people, at risk population, children, youth, and general public.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	18139	22228	5651	1903

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of persons that completed courses in parenting and related areas.

Year	Actual
2017	802

Output #2

Output Measure

- Number of persons that completed courses in aging aspects.

Year	Actual
2017	1636

Output #3

Output Measure

- Number of persons that completed courses in consumer education and family resource management

Year	Actual
2017	620

Output #4

Output Measure

- Number of persons that completed courses in health related issues.

Year	Actual
2017	1848

Output #5

Output Measure

- Number of educational campaigns in family and health related issues.
  Not reporting on this Output for this Annual Report

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
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 health behaviors.

Outcome #1

1. Outcome Measures

Number of persons that gained knowledge in aging aspects.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	826

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to estimates from the U.S. Census Bureau (2016), nearly 23.3% of Puerto Rico's population was 65 years and older. Studies showed that 40% of senior 65 and older have low incomes that place them at the poverty level.

What has been done
To attend this situation, the Extension's Gerontology Specialist developed a curriculum in aging aspects to address specific needs of elderly population. Fifty-two (52) FCS Educators were trained in aging aspects to provide with the necessary educational resources to assist this audience through different methodologies and educational strategies.

Results
As a result, 1636 elders were benefited and 826 people reported gained knowledge in aging aspects. Based on their needs, a state wide educational campaign was developed in May (Elder National Month) to promote the caregivers awareness, as well as the whole population.

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #2

1. Outcome Measures

Number of reported changes of family development behaviors.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	662

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
802	Human Development and Family Well-Being

Outcome #3

1. Outcome Measures

Number of reported changes in financial capability and/or consumer behavior

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	462

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
607	Consumer Economics
801	Individual and Family Resource Management

Outcome #4

1. Outcome Measures

Number of reported changes of health behaviors.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1159

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Chronic diseases such as: cardiovascular, cancer, diabetes, and Alzheimer are the leading causes of disability in Puerto Rico. (Department of Health, 2015)

What has been done
To assess health issues, the Extension Service Health Specialist developed educational campaigns and educational materials at state level such as "Conoce las diferencias entre Chikungunya, Dengue y Zika", "Sera Influenza?", Aedes Aegypti and "Lavarse las manos salva vidas". Also, training was provided to the FCS Educators to instruct the population at risk.

Results
As a result, 3079 persons gained knowledge from the educational campaigns and 1848 persons completed short courses in which 63% reported changes in nutrition, health, and physical activity behaviors.

4. Associated Knowledge Areas

KA Code	Knowledge Area
724	Healthy Lifestyle

V(H). Planned Program (External Factors)

- Economy
- Public Policy changes
- Populations changes (immigration, new cultural groupings, etc.)

Brief Explanation

The present economic crisis that Puerto Rico is facing, have shifted the priorities of low income families, individuals and elder people. This caused an increase in the migration of families and individuals, and public policy changes.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

During FY 2017, we conducted an evaluation process. The purpose was to evaluate that the short courses were implemented as originally planned. The methodology consisted of field visits. A questionnaire was completed by the evaluator based on the field observations. Five field visits were conducted on the sites where the FCS Educators meet the participants to offer the short courses. Four of the short courses observed were on the topic of family relations and one on topics about aging aspects. The observations showed that the majority of the participants in the short courses were receptive to the educational material. They participated actively and were very satisfied with the educational material and the methodologies used in the lessons offered. They demonstrated positive changes in attitude toward the importance of family relations, such as to spend more time with their children, eating together as a family, and expressed a positive change in their feelings toward their families and relatives. As a result, some of the participants were motivated to invite other persons to participate in these courses.

Key Items of Evaluation

- Processs Evaluation
- Family Relations

V(A). Planned Program (Summary)

Program # 10

1. Name of the Planned Program

Strengthening Youth Life Skills, Leadership and their Community

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
806	Youth Development	100%		0%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	33.9	0.0	0.0	0.0
Actual Paid	31.1	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
1355548	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
677774	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

- Conferences and workshops
- Training in life skills, leadership, and community services.
- Curriculum development in life skills, leadership, and community service.
- Camps and outdoor activities.
- Participate in mass communtication to promote 4-H as a positive organization for youth.
- Communications' projects in radio, press and TV.

• Projects where youth, adults and volunteers can develop skills that will enable them to make a positive contribution to society and strengthens youth/adult partnerships.
- Contest activities/events.
- Field trips/fairs/exhibition activities/events
- Research projects
- Youth Health Promoters projects
- Training for teen-teachers
- Gardening training
- Subject Matter Campaigns using multimedia
- 4-H Intergenerational Summit
- 4-H Alzheimer Forum
- 4-H State Conference

2. Brief description of the target audience

Youth and 4-H members, Extension professionals (Agricultural Agents, Extension Specialists, Family and Consumer Sciences Educators), professional government personnel, volunteers, and community members.

3. How was eXtension used?

www.eXtension.org has been used as a source of information by Extension Specialists, FCS Educators and Extension Agents to complement training presentations and educational materials offered to 4-H members.

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	5437	0	49539	18035

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	0	0	0

V(F). State Defined Outputs

Output Target

Output #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

Year	Actual
2017	6509

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 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
6	As a result of experiences in a 4H program or project, number of participants that used health information to make decisions.
7	As a result of experiences in a 4H program or project, number of participants that used technology to help express their ideas about health issues.

Outcome #1

1. Outcome Measures

As a result of experiences in a 4H program or project, the number of participants who take responsibilities for their actions.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	590

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
According to the national "Healthy People 2020" initiative, teens who can handle the changes and associated risk factors of growth stage (known as adolescence) become young adults and later successful, happy, and healthy adults. Adolescence is a critical time for the development of lifestyles practices, attitudes, and beliefs related to health and well-being.

What has been done
We prepared 4-H youth to take responsibilities of their actions (self-care) and assume the responsibility to make a difference in their communities by helping adolescents and their neighborhoods to have better health and services. In a collaborative effort with the Department of Health, Department of Sports and Recreation, the College of Agricultural Sciences and private organizations, we offered an educational program to reinforce 4-H youth health knowledge's and to present new concepts and health projects.

Results
At the 4-H State Conference we provided an interactive space for 80
4-H youth members where they shared with health professionals and received collective and individual recommendations. Youth had the opportunity to practice with these professionals various educational strategies to promote healthy communities. 75 young health promoters reach 2,546 youth who demonstrated an improvement in healthy lifestyles skills. 590 participants took action and responsibility as a result of their involvement in 4-H healthy projects and 950 use reliable resources to make healthy decisions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #2

1. Outcome Measures

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. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	1957

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #3

1. Outcome Measures

As a result of experiences in a 4H program or project, the number of participants who can work well with others youth.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2017	1148

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

To provide an opportunity for youth to develop social skills was part of the plan of work. We know that through peer's relationship, adolescents learn to cooperate with others, develop communication skills, learn to resolve conflicts and resist negative peer pressure. The Sugar Free Kids Foundation contacted us to develop a work with kids and adolescents dealing with Diabetes Type I condition. We decided to support and established a collaborative work with the organization.

What has been done

We presented the needs of Sugar Free Kids Foundation to our health promoters and Extension educators. Together we organized the activity "Voices of Youth Living with Diabetes Type I" to create awareness in our teen-teachers and health promoters about diabetes and how they can provide a positive support to children and youth with the condition. With this activity, we expected our youth to learn and practice the skills to improve their work and explore the idea of develop a community project to benefit youth with this health condition.

Results

As a result of our collaboration with Suger Free Kids Foundation, 15 youth leaders developed capacities on how to be caring and supportive peers for youth dealing with Diabetes Type I. We put our efforts to strengthen listening skills in our plan. We had 5,195 4-H participants that improved their listening skills. In the adolescence period, youth tends to look to other youth as role models and to establish relationships. This requires that we facilitate learning environments where youth can interact with positive and supportive peers. We assured through 4-H activities that we are committed to promote diversity, positive relationships and a sense of belonging.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #4

1. Outcome Measures

As a result of experiences in a 4H program or project, the number of participants who helped with a project that made a difference through community service.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	961

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #5

1. Outcome Measures

As a result of experiences in a 4-H program or project, number of participants who can work successfully with adults

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	639

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

Through our educational program, we assure a safe place to learn, establish positive connections and opportunities for adolescents to develop skills for a successful life.

What has been done

We recruited 3 4-H alumni in the health area to serve as mentors. Through activities like internships, conferences, workshops, and community service 4-H youth participating in health initiatives had the opportunity to get prepare for their responsibility to work as educators and community health promoters. We prepared 30 4-H health promoters in the evidence based curriculum "Pathways to Healthy Living".

Results

Using the curriculum "Pathways to Healthy Living" we celebrated the first 4-H Intergenerational Lifestyles Summit "Together Promoting a Healthy Life". In the summit, 57 adults and 15 youth were benefited.

4-H youth health promoters, Extension Educators and 4-H volunteers formed a team work to plan and develop the summit. We empowered Extension Educators to include 4-H members in the organization and planned 4-H activities. As a result, 1,005 4-H members developed better

planning skills, 639 worked successfully with adults, 1,195 participated actively in service activities organized to supply communities' needs, and 961 youth took action in activities that make a difference in their communities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #6

1. Outcome Measures

As a result of experiences in a 4H program or project, number of participants that used health information to make decisions.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	950

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

Outcome #7

1. Outcome Measures

As a result of experiences in a 4H program or project, number of participants that used technology to help express their ideas about health issues.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	261

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

What has been done

Results

4. Associated Knowledge Areas

KA Code	Knowledge Area
806	Youth Development

V(H). Planned Program (External Factors)

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

Brief Explanation

The Island's location in the Caribbean area placed us in the path of tropical hurricanes. Although, we completed the majority of activities planned for this year, we were not able to celebrate the last health events because of two major hurricanes have impacted the Island. We experienced an ustable economy that affects 4-H families' budget. Changes in the public school system also impacted our plan of work. More than 75 schools around the island had closed and unemployment rates soared. These situations stimulate Puerto Ricans to move to the United States, causing a big turnover in our 4-H memberships. New government regulations in the Island resulted in an increase in the expenses to organize camps' experiences.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

During FY 2017, a post evaluation study was conducted among a sample of 4-H members. The sample consisted of the 4-H members participants in the two major State activities: the State Annual Conference and the State Festival of Health and Nutrition. The purpose of the study was to evaluate the development of life skills among 4-H

members. The methodology consisted of a post-survey that was administered on-site. Questions from the post-survey were adopted from the National 4-H and Youth Development Outcomes and Indicators (Common Measures). Questions were framed to evaluate the outcomes after participating in the educational experiences of the 4-H program. RESULTS: The 4-H members' participants in this evaluation study vary on the time they have been part of their 4-H clubs: 44% have been 4-H members for 3 years, 24% for 2 years, and 31% were on their first year as 4-H members. This shows that these 4-H members had the opportunity to participate in the diverse educational experiences offered by the 4-H program that promote the development of life skills. Their mean age was 15 years old and 65% were female and 35% were male. The following data presents the mean for 7 life skills or outcomes according to the following scale: (4) strongly agree; (3) agree; (2) disagree; (1) strongly disagree. Life skills or outcomes measured were: I respect people from other cultures (3.69); I am a person that wants to help others (3.67); I can make a difference in my community through community service (3.57); I can work successfully with adults (3.49); I have a plan for reaching my goals (3.54); I talk to my friends about issues affecting my community, state or world (3.25) and I like science (3.10). These results show that this group of 4-Hers agree or strongly agree that they have developed or improved these life skills due to their participation in the 4-H experience. In terms of how often they put in action another set of life skills, the 4-Hers answered based on the following scale: (4) always; (3) usually; (2) sometimes and (1) never. The life skills measured were: I take responsibility for my actions (3.72); I use information to make decisions (3.51); I listen well to others (3.53); I work well with other youth (3.47); I consider the consequences of my choices (3.57); I can resist negative social pressures (3.25), and I have the confidence to speak in front of groups (2.81). These results show that always or almost always these 4-Hers put in practice these life skills on their daily lives. The 4-H program provides our youth with a diversity of educational and experiential activities that allows the opportunity to learn, develop and strength important skills that can help youngsters make better decisions in their adult life. In addition, the findings of this study will help the administrators of the 4-H program, make better decisions to strengthen the technical matters and educational activities that contribute to promote life skills among the youth 4-H members.

Key Items of Evaluation

4-H, common measures, life skills

V(A). Planned Program (Summary)

Program # 11

1. Name of the Planned Program

Global Food Security and Hunger

☑ Reporting on this Program

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
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%	
	Total	100%		0%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2017	Extension		Research	
	1862	1890	1862	1890
Plan	3.4	0.0	0.0	0.0
Actual Paid	5.8	0.0	0.0	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

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

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
251221	0	0	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
125611	0	0	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	0	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The Global Food Security and Hunger Initiative was worked using the two PRAES Food Security Curricular Guides and the Home Garden Curricular Guide. With these, we offer food security courses, trainings, participate on radio and TV programs, and attended press interviews. We, also, coordinated work with state and federal agencies.

2. Brief description of the target audience

Farmers, government professionals, county agents, agricultural entrepreneurs, home owners, housewives, children, youth, 4-H members, volunteers and private professionals.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2017	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	52293	10371	8179	0

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

Patent Applications Submitted

Year:	2017
Actual:	0

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2017	Extension	Research	Total
Actual	5	0	5

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- Number of agricultural enterprises feasibility studies.

Year	Actual
2017	41

Output #2

Output Measure

- Number of youth participating in food system educational program.

Year	Actual
2017	5972

Output #3

Output Measure

- Number of adults participating in food system knowledge and skill enhancement programs.

Year	Actual
2017	50039

Output #4

Output Measure

- Number of first detectors trained in early detection and rapid response of plant pests, animal pests and diseases.

Not reporting on this Output for this Annual Report

Output #5

Output Measure

- Number of communities trained in agricultural disaster preparedness.

Year	Actual
2017	76

Output #6

Output Measure

- Number of food security extension publications and presentations.

Year	Actual
2017	163

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

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 home gardens established.
5	Number of acres in conservation tillage or other BMP.
6	Number of new or improved value-added products that can be sold by producers (and other members of the food supply chain).
7	Number of marketing agreements established between local farmers and distributors or other components of the food supply chain.
8	Number of communities that have written agriculture and food considerations into disaster preparedness plans or procedures.
9	Number of networks prepared to mitigate biological and abiotic disruptions
10	Number of youth that improved knowledge of food systems.
11	Number of adults that improved knowledge of food systems.
12	Number of food councils and institutes created to promote practical food systems policies.
13	Number of research and extension advisory councils and boards.
14	Number of communities that retained farm lands due to educational interventions.

Outcome #1

1. Outcome Measures

Number of public policy issues related with national food security that were reviewed or proposed.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	33

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The farmers and community organizations are vital educate citizens about public policy issues.

What has been done
Through meetings and individualized counseling, PRAES promoted the organization of farmers and communities to attend situations related to the protection of agricultural resources, food security, incentive opportunities, marketing risk and others. Assistance was provided to the organizations to coordinate meetings with state and federal agencies like PR Department of Agriculture and USDA.

Results
Thirty three (33) public policy issues were attended.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
610	Domestic Policy Analysis
704	Nutrition and Hunger in the Population

Outcome #2

1. Outcome Measures

Number of farmers that adopted one or more recommended post-harvest practices.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	188

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
We import more than 80% of the local food consumption. We need to reduce the risk of post-harvest contaminatin of food and increase the local prodution to upsurge our food security. One available alternative is to incorporate recommended post-harvest practice.

What has been done
Materials and information were gathered and several training sessions were offered, in which 377 farmers participated in trainings on value-added.

Results
As a result, 228 farmers adopted one or more post harvested recommended practices, 188 farmers adopted value-added practices and 40 new products with value-added were created. This represents more food diversity in the local market.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

Outcome #3

1. Outcome Measures

Number of fallow "cuerdas"(acres) sowed or prepared for animal production or other agricultural production.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	3146

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico has a high dependence on food imports.

What has been done
PRAES county agents and specialists offered to farmers food security and agricultural production trainings, coordinated field trips and developed other educational activities to promote new sow and animal enterprise establisments and expasion.

Results
A total of 3,055 new fallow acres were sowed or prepared for agricultural production.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

Outcome #4

1. Outcome Measures

Number of home gardens established.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	4063

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
In Puerto Rico we import more than 80% of our food consumption. Our main supplier is the USA from where the food travels 2800 miles in average. To increase our food security, we need to increase local production. We can do that by commercial farms and with home gardens.

What has been done
USDA (NRCS, Rural Development and FNS) and PRAES worked together to promote home gardens establishment. In Camuy, Puerto Rico, county agents and Family and Consumer Sciences professionals offered educational activities to housewives, single mothers, seniors citizens, children, children with learning disabilities, and families with limited resources about home gardens and nutrition.

Results
Thirty four (34) people participated in the trainings. They prepared their own community garden, increased vegetables (lettuce, broccoli, peppers, tomatoes, onions and others) consumption and created a small enterprise to sell some of the production. A total of 4063 home gardens were established in Puerto Rico. Also, through CRD, FCS, and 4-H programs, 3488 persons completed a home gardening course. As a result, 2692 or 77% of the participants established a vegetable garden in their home.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land
704	Nutrition and Hunger in the Population

Outcome #5

1. Outcome Measures

Number of acres in conservation tillage or other BMP.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	2509

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Our high dependence on imported foods, high population density and the loss of agricultural land forces us to increase efficiency on farm production through sustainable practices.

What has been done
PRAES county agents and agricultural specialists offered 626 Integrated Crop Management educational activities (trainings, conferences, individual advisories and others) in which 2563 farmers participated.

Results
As a result, 415 farmers adopted sustainable practices, 399 farmers developed new products, and 566 farmers reported an increase in production. Also, 2509 acres were managed using conservational tillage or other BMP.

4. Associated Knowledge Areas

KA Code	Knowledge Area

205	Plant Management Systems

Outcome #6

1. Outcome Measures

Number of new or improved value-added products that can be sold by producers (and other members of the food supply chain).

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	40

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Many agricultural products have a short shelf life and in many occasions, farmers have over production. The farmers will have more income if they adopt value-added practice.

What has been done
PRAES county agents and agricultural specialists offered educational activities on agricultural value-added products.

Results
As a result, 40 new products with value-added practices were developed.

4. Associated Knowledge Areas

KA Code	Knowledge Area
501	New and Improved Food Processing Technologies

Outcome #7

1. Outcome Measures

Number of marketing agreements established between local farmers and distributors or other components of the food supply chain.

2. Associated Institution Types

● 1862 Extension

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	89

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Another Food Security issue is the accessibility of nutritious food. Access by individuals to adequate resources (entitlements) for acquiring appropriate foods for a nutritious diet. Fresh products provide adecuate nutrients for a healthy diet. Local farmers can provide more accessibility to fresh products considering different marketing alternatives.

What has been done
PRAES county agents and specialists coordinated meetings with food supply chain members to provide farmers with marketing strategies.

Results
As a result, 89 new marketing agreements were established.

4. Associated Knowledge Areas

KA Code	Knowledge Area
603	Market Economics

Outcome #8

1. Outcome Measures

Number of communities that have written agriculture and food considerations into disaster preparedness plans or procedures.

2. Associated Institution Types

● 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	11

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico is positioned in a climate change high vulnerability zone and our fragile food security requires to be considered in any disaster recuperation plan.

What has been done
PRAES county agents and specialists trained 76 communities on agriculture and food considerations within a disaster recuperation plan.

Results
As a result, 11 communities included food security aspects in their Disaster Recuperation Plan.

4. Associated Knowledge Areas

KA Code	Knowledge Area
704	Nutrition and Hunger in the Population

Outcome #9

1. Outcome Measures

Number of networks prepared to mitigate biological and abiotic disruptions

Not Reporting on this Outcome Measure

Outcome #10

1. Outcome Measures

Number of youth that improved knowledge of food systems.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	13421

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Like adults, the young people are unaware about the Puerto Rico food system, its risks and vulnerability.

What has been done

PRAES personnel offered educational activities about food system and food security using the Food Security Curricular guide. Also, they coordinated field trips to the farm and visits to agricultural markets. Worked with "Ruta Saludable" Initiative and Agro Science Camp in which youth were exposed to local food systems.

Results
As a result, 13421 children, youth and 4-H member's acquired knowledge about food systems, supply chain, food security and healthy fresh food.

4. Associated Knowledge Areas

KA Code	Knowledge Area
603	Market Economics
704	Nutrition and Hunger in the Population

Outcome #11

1. Outcome Measures

Number of adults that improved knowledge of food systems.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	37504

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico has a highly vulnerable food system. We need to increase knowledge about food security to help develop a local food system.

What has been done
PRAES personnel presented 163 Food Security courses, participated on radio programs, and offered conferences where 63580 adults were educated.

Results
As a result, 50039 adults around the Island participated in educational activities to gain knowledge and improve their skills in food systems. From these, 37504 (75%) reported that improved their knowledge about food systems.

4. Associated Knowledge Areas

KA Code	Knowledge Area
603	Market Economics

704	Nutrition and Hunger in the Population

Outcome #12

1. Outcome Measures

Number of food councils and institutes created to promote practical food systems policies.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	5

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The farmers and community organizations can help promote practical food system policies.

What has been done
PRAES personnel coordinated meetings and trainings about policies, evaluations, and organizations to promote farmers and community organization. Also, meetings with agricultural, food, nutrition, and consumer policies stakeholders were arranged.

Results
As a result, 5 organizations were created to promote food security policy.

4. Associated Knowledge Areas

KA Code	Knowledge Area
610	Domestic Policy Analysis

Outcome #13

1. Outcome Measures

Number of research and extension advisory councils and boards.

Not Reporting on this Outcome Measure

Outcome #14

1. Outcome Measures

Number of communities that retained farm lands due to educational interventions.

2. Associated Institution Types

- 1862 Extension

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2017	8

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Puerto Rico is one of the countries with the highest population density in the world. It has lost thousand of acres dedicated to agriculture in the last decades.

What has been done
PRAES personnel coordinated meetings to promote community and farmers organizations to protect farmlands.

Results
As a result, 8 communities retained farm lands.

4. Associated Knowledge Areas

KA Code	Knowledge Area
131	Alternative Uses of Land

V(H). Planned Program (External Factors)

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

Brief Explanation

Puerto Rico was identified by the Intergovernmental Panel on Climate Change (IPCC) as part of the world's hot zones, where many of the climate change dynamics can be manifested. The Island is located in the Atlantic's hurricane zone. According to the IPCC, the projection is that we will be exposed to more intense hurricanes and severe drought seasons that will

cause serious damage to the infrastructure, crops, and animal enterprises. Currently, the Island is in a critical fiscal situation and there has been changes in the local government. Also, the environmental regulations limit our local production.

V(I). Planned Program (Evaluation Studies)

Evaluation Results

No evaluations were made.

Key Items of Evaluation

1. NIFA Selected Outcomes and Indicators

Childhood Obesity (Outcome 1, Indicator 1.c)	
2366	Number of children and youth who reported eating more of healthy foods.
Climate Change (Outcome 1, Indicator 4)	
0	Number of new crop varieties, animal breeds, and genotypes whit climate adaptive traits.
Global Food Security and Hunger (Outcome 1, Indicator 4.a)	
0	Number of participants adopting best practices and technologies resulting in increased yield, reduced inputs, increased efficiency, increased economic return, and/or conservation of resources.
Global Food Security and Hunger (Outcome 2, Indicator 1)	
0	Number of new or improved innovations developed for food enterprises.
Food Safety (Outcome 1, Indicator 1)	
0	Number of viable technologies developed or modified for the detection and
Sustainable Energy (Outcome 3, Indicator 2)	
0	Number of farmers who adopted a dedicated bioenergy crop
Sustainable Energy (Outcome 3, Indicator 4)	
0	Tons of feedstocks delivered.