

Institutional Information Request Form

Southern Region: Value of Extension Services and Experiment Stations

The Battelle Memorial Institute is working with the leadership of the *Association of Southern Region Extension Directors* and the *Southern Association of Agricultural Experiment Station Directors* in producing analysis and a high-profile report on the special value of extension and experiment stations in the development of the 21st Century agbioscience economy. Each of the land grant universities in the 13 state and 2 U.S. territory southern region is collaborating in performance of this important project.

For each of the land-grant institutions participating in this project, Battelle is requesting information, data, project examples, etc. that will help illustrate the value of experiment stations and extension services. Completion of this information request is an important step in the information gathering required for this project. We are requesting that at each institution, the Experiment Station Director and the Extension Director **jointly** complete each section to the best of your collective ability. Note that within this form, Agbiosciences includes all aspects of agricultural, environmental, and biological sciences; as well as forestry, fisheries, wildlife, agro-tourism, and recreation; which are within the purview of the experiment station and/or extension service. Also, if you have additional supporting documents, reports, statistical summaries, etc. that you believe would be helpful to this project please forward them to the consulting team at Battelle together with your completed form. The form is set-up using MS-Word tables so you can type directly into the table boxes.

Please return the completed form to Simon Tripp at Battelle via email to tripps@battelle.org If you have questions please direct them to Simon at:

Simon J. Tripp
Senior Director
Battelle Memorial Institute
Technology Partnership Practice
6 Jaycee Drive
Pittsburgh, PA 15243
412-276-1986
Cell: 412-523-6895
tripps@battelle.org

Section 1: Institutional Profile

University Name	University of Puerto Rico
Extension Service Director (name, phone, email)	Hector Santiago Anadón 787-832-4040 (Ext. 5978, 5975, 5976), hector.santiago15@upr.edu
Experiment Station Director (name, phone, email)	Hector Santiago Anadón

Personnel

Number of Personnel in Extension (FTE)	410
Number of Personnel in Experiment Station (FTE)	350.5

* Please do not include student employees, graduate assistants or temporary personnel

Battelle

The Business of Innovation

Section 2: Income/Revenue Sources

Income Source	2011 \$ Income Received by Extension	Funding Trend for Past 3 Years	2011 \$ Income Received by Experiment Stations	Funding Trend for Past 3 Years
Federal Formula Funds	\$6,329,018	<input type="checkbox"/> Increasing <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$4,456,924	<input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
State Appropriations	\$19,101,743	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input checked="" type="checkbox"/> Decreasing	\$16,628,850	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input checked="" type="checkbox"/> Decreasing
Local Government Appropriations (Counties, etc.)		<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Federal Grants and Contracts	\$1,131,510	<input type="checkbox"/> Increasing <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$953,413	<input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
State Grants and Contracts	\$254,000	<input type="checkbox"/> Increasing <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$216,464	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Local Grants and Contracts	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Industrial Grants and Contracts, including grants and contracts from commodity groups	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$594,154	<input checked="" type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Foundation Grants and Contracts	\$72,500	<input type="checkbox"/> Increasing <input checked="" type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
All Other Grants and Contracts	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Sales of Products and Services	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$616,410	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input checked="" type="checkbox"/> Decreasing
Intellectual Property Revenues	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Gifts	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
Other	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing	\$	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input type="checkbox"/> Decreasing
TOTAL	\$26,888,771	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input checked="" type="checkbox"/> Decreasing	\$23,466,215	<input type="checkbox"/> Increasing <input type="checkbox"/> Stable <input checked="" type="checkbox"/> Decreasing

Are these income/revenue numbers based on a cash or accrual accounting basis? Cash

Battelle

The Business of Innovation

Income Trends:

During the past five years, what trends have been observed in the funding for extension and experiment station activities? What are key funding challenges? Where have the most notable funding declines or increases occurred?

During the past 5 years the state funds have decreased 10%. We received the state funds by formula, based on the total gross income, which has decreased during the last 4 years. Also forty three percent in Program Income and Sales of Products and Services.

Section 3: Research and Extension Activities

Key Initiatives, Institutes and Programs:

Please provide a description of FIVE key centers, institutes, programs or initiatives that are true signatures of experiment station and extension work at your institution. Here we are looking for descriptions of initiatives, centers, programs, etc. for which your university is internationally or nationally well-recognized as a leader.

1. Research- Tropical plant germplasm evaluation and development of improved cultivars program for the humid tropics - Through the development of improved cultivars and better management practices, the University of Puerto Rico Agricultural Experiment Station (UPRAES) plant breeding and production systems research program contributes to a more productive and competitive local agriculture sector. Breeding programs for crops such as pigeon peas, tropical pumpkin, dry bean, tanager, sweet cherry peppers do not exist in the private-and very limited in neighboring countries- The technology produced is also valuable to producers in Central America and the Caribbean.

UPR Extension- Highly Quality Production Units (UCAR, for its acronym in Spanish)- This is an intensive project to train and advise farmers to increase quality and yield on coffee, tangerines, yams, sweet potatoes, plantains, citrus fruits, hogs and beef cattle. It is carried out in cooperation with the PR Department of Agriculture. Food Safety is another signature Extension Program. Its main components are the "Fight BAC !" campaign, for consumers; the Food Safety Certificate course, for persons in charge of food handling establishments; and Train-the-trainers, for university personnel and professionals from government agencies and NGO's.
2. Soil and Water quality program – The UPRAES is the only local institution with and active research program and lab facilities dedicated to evaluating the impact of nutrients on the integrity of surface waters, and promoting environmentally sound management practices of nutrients in agricultural and natural landscapes. Active areas of research include:
Establishment of numeric nutrient criteria for surface fresh waters (rivers, reservoirs),
Evaluation of the impact of anthropogenic activities on the nutritional status of waters, and
Development of environmentally sound animal waste management practices.

UPR Extension- The planned program Management of Rangeland and Forestry/Soil, Water and Air is devoted to promoting the education of farmers and people related with agriculture

through activities addressed to establish conservation practices to promote the protection of our forests, trees, and watersheds; increase appropriate fertilization practices, conserve water, and mitigate emissions of particles from agricultural practices to the air. We also emphasize on better soil management on the flood plains, the recharge of groundwater, and new alternatives to ensure compliance of air and water quality regulations. Community groups, students and farmers around the island accepted the challenge and adopted practices on their farms, communities, and schools. Watersheds protection, recycling of paper and waste material, and preparation of compost were some of the practices adopted. UPRAES also promoted and helped to develop reforestation projects to enhance the natural environments around communities in joint efforts with the Department of Natural Resources and Environment (DNRE), PR Regulations and Permits Administration, Natural Resources Conservation Service and), non-government agencies, community, volunteers, and schools. Seventy-three per cent (73%) of the landowners and community members trained adopted practices on fire prevention in forests and rangelands. Property owners and communities joined forces to meet those challenges in protecting property and lives.

3. Pest and Plant Disease Clinic (PPDC) – The detection and identification of pests and diseases of plants has historically been one of the areas for which the UPRAES provides island-wide leadership and expertise. These efforts were better organized and enhanced through Puerto Rico's incorporation, since 2003, into the Southern Regional Plant Diagnostic Network (SPDN) lead by the University of Florida. As part of this biosecurity network, interactions between first detectors, identification specialists, and state and federal regulatory agencies have been accelerated. Besides its diagnostic capabilities the PPDC is an important training center for both students and researchers, from Puerto Rico and other Caribbean countries, in the use of a Distance Diagnostic Identification System (DDIS).

UPR Extension- The UPR Extension Program promote the adoption of the best plant protection management practices and to develop IPM systems that protect the environment, conserve the natural resources, and contribute to the competitiveness, profitability, and sustainability of Puerto Rico's agriculture. Farmers, home gardeners, agriculture amateurs, and 4-H are being trained and advised on plant management, products quality, value-added, pesticide use, IPM, pesticide application, and commercial pesticide application.

4. Center of Excellence for Invasive Species Prevention and Preparedness (CEISPP) – The CEISPP is UPRAES most recent key initiative, still under development in a cooperative effort with USDA APHIS PPQ, geared towards improving our local and national preparedness for managing invasive species. Puerto Rico is located in a region where the probability of interception of new pests coming to the US mainland is high. When fully operative, the Center will house an off-shore, certified quarantine facility that will generate research and provide appropriate training on target pests and potentially beneficial organisms.

5. USDA certified Organic Fields – UPRAES has initiated innovative research and outreach to promote organic farming in Puerto Rico. Two fields were certified at Lajas and Gurabo research substations in which Agreements with State Department of Agriculture and NRCS has being initiated to promote this growing commodity.

Battelle

The Business of Innovation

Please provide a description of FIVE special assets or infrastructure investments that support agbioscience and related development at your institution. Examples might include pilot plant facilities, unique scientific research infrastructure, biosecurity facilities, camps, etc.

1. Certified Quarantine and Beneficial Insect Laboratory in Río Piedras, Puerto Rico. –The UPRAES, in collaboration with USDA-APHIS PPQ, is reconverting laboratory space and greenhouses in the Río Piedras Research Center into a certified quarantine facility for invasive species research and management approaches. The renovated facilities will enable the laboratory to develop biological control technologies for invasive pest entering or threatening the USA through the Caribbean pathway.

2. Museum of Entomology and Tropical Biodiversity, Río Piedras (METB) – The METB maintains a collection of insects that dates back to 1910. At present, the museum owns a collection of more than 250,000 specimens, representing 29 orders of insects present in Puerto Rico. Systematic Entomology and entomological collections provide for the identification of species and knowledge of the relationships of species to each other. The new facilities will be inaugurated before the end of 2012. In its new home, the METB will continue and expand upon its goals of safeguarding the UPRAES insect collection, continue surveying the entomological fauna of Puerto Rico, develop a computerized and comprehensive database of the insects of the island, and facilitating the entomological research of faculty and students. It will also be used for the education of school children and 4-H members in agbioscience.

3. Agro-Industrial Innovation and Technology Center (CITAI), Mayaguez - The CITAI is a multidisciplinary research center focused in Food Science and Technology Development, involving the participation of several departments of the College of Agricultural Sciences and of the UPRAES. The CITAI has several laboratories geared towards working with the microbiology, chemistry and processing of fermented products and beverages, meat and milk products, and fruit and vegetable products. It also has an experimental kitchen and a pilot plant for the elaboration and processing of fruits, vegetables and canned products. The CITAI facilities support UPRAES work in the following areas: (1) development of products and processes that add value to agricultural goods; (2) characterization and reutilization of harvest, slaughter or food processing wastes, residues and effluents for the development of value added goods; (3) development or adaptation of postharvest and packaging technology and practices to maintain the safety and quality of agricultural goods in the supply chain; (4) definition or evaluation of quality parameters for fresh and processed goods, including chemical properties, safety and nutritional value.

4. Soil and Water Chemistry Laboratory - The Soil and Water Chemistry Laboratory of the UPRAES is exclusively dedicated to evaluating the impact of nutrients on the integrity of surface waters and promoting environmentally sound management practices of nutrients in agricultural and natural landscapes. Also deal with the determination of numeric criteria for nitrogen and phosphorus applicable to the conditions prevailing in PR's streams and rivers. All water analyzes are conducted through EPA certified methodology.

5. Dairy Farm Research and Training Center– Dairy production is the primary animal husbandry activity in PR despite the high input costs faced by the industry in the last three to four years. The UPRAES and the PRDA have invested considerable amounts of money to improve facilities for training graduate and undergraduate students on dairy production and cattle care. Although research is reduced, we want to keep this dairy farm because it is the only public facilities of this

Battelle

The Business of Innovation

type in PR.

Battelle

The Business of Innovation

Most Notable Assets, Centers, Programs or Initiatives by Category

For each of the areas of focus listed below, please provide what you consider to be the top TWO most notable strengths (programs, assets and infrastructure, centers, etc.) of your institution:

Plant Sciences, Crop Science, Plant Genetics and Agronomy

1. Research and Extension Program on Plant genetic resources, breeding and production systems on the tropics.

2. Research substations in different agroecological zones: Adjuntas (west-central region, coffee), Corozal (central region, farinaceous crops), Gurabo (east-central region, farinaceous and certified organic horticultural crops), Isabela (northern region, grains and farinaceous crops, seed production), Juana Diaz (south coast, fruits and vegetable farming), Lajas (south west, fruit and vegetable, grain producing region, certified organic horticultural crops).

Animal Sciences, Animal Health, Livestock

The Beef Cattle Project of the College of Agricultural Sciences (CAS) located in Finca Montaña (Aguadilla, PR) - In August 1984 the College of Agriculture became the 55th member of the Senepol Cattle Breeders Association. Today through our rigorous selection and the use of artificial insemination, the Beef Cattle Project the College of Agricultural Sciences (CAS) has 185 registered purebred cows and heifers and 13 sires. Three of these sires have already achieved the distinction of being selected as genetic trait leaders for birth and weaning weight. The genetic value of the herd has been recognized locally and internationally. In 2010, for the first time, the CAS exported 50 animals to the Dominican Republic. As the Senepol breed spreads throughout the south region of the USA, the Caribbean, and Central and South America our group expects to have an impact on the local and international beef cattle industry by exporting high quality live animals, semen and embryos. Dairy Herd Health is another Extension signature program that focuses on recordkeeping, and the control of mastitis and other diseases and parasites to improve milk production and quality. With this program Extension personnel help dairy farmers to keep the best productive animals, which increases farm income and reduce operational costs.

2. Lab facilities for the Assessment of Minimal Postmortem Maturation for Acceptable Beef Tenderness Profiling– UPRAES expect to validate the beneficial effect of aging over the palatability of beef in general, with special interest in tenderness. Specific recommendations for carcass handling (refrigeration period), as it relates to the postmortem tenderization of beef (aging) depending of the sex and age of the animals, or a combination of both will be achieved. That ultimately can potentially ensure a consistent beef product that the consumer would perceive as acceptable in tenderness, therefore providing a desired for its consumption.

3. The Slick-Hair Dairy Cow of Puerto Rico research program– This is a heat tolerant genetic line. Characterization of this line of cattle will have a great impact for the future development of the dairy industry in the Southern Region to the vis-à-vis expected global warming effects.

Food Science, Food Product Development, Advanced Nutrition and Health Products

Education: Graduate master multidisciplinary program with 47 active students which have graduate 103 students since its opening, and is among the top five in applications and admitted

Battelle

The Business of Innovation

students. There is a minor in Food Science with approximately 60 active students enrolled in the program. Students come from the following feeder programs: Biotechnology, Chemical Engineering, Biology, Industrial Microbiology, Chemistry as well as from several disciplines in the faculty of Agricultural Sciences such as: Animal Sciences, Agronomy, Horticulture, Crop Protection and Technology Mechanical. There are 15 faculty members from 7 different Departments and three Colleges.

Infrastructure: A building that houses the Food Science and Technology Program and the Agroindustrial Innovation Center for Product Development. The laboratories are equipped with the most recent and modern equipment. The general pilot plant has a small learning factory that is run by students and professors. Health and Childhood Obesity are new initiatives that are being integrated in the nutrition curriculum.

1.

Food Safety and Biosecurity

1. The Food Safety Institute of the Americas is a Distance Learning Center that has two training rooms: one for thirty seats and one for thirteen seats. It is the main center for food safety training and Biosecurity in Puerto Rico reaching local and international audiences. This year we provided near thirty two seminars and reaching approximately 800 persons. Topics of food safety and biosecurity from farm to table: Biosecurity in the animal production, GMP/SSOP, HACCP, Food Defense, Good Transportation Practices, Traceability, Food Safety Training for the Food Managers, Control of Allergens Program, Better Process Control School, Meat and Poultry Inspection Workshop for International Government Officials in Spanish, Safe Quality Food, Implementation of a food Safety and Quality Program, FDA Control of Salmonella Enteritidis Program, among others.

2. Infrastructure: 1,700 square feet area that houses two Polycom system for distance learning, 32 computers, tow projectors, smart board and photocopier/printer. Two video cameras, computer for video editing, teleprompter and lights for videos recording.

Industrial Bioeconomy, Biofuels, Biobased Chemicals, Biobased Materials and Fibers

1.

2.

Environmental Sciences, Natural Resources, Sustainability

1. Soil and water quality program and soil and water chemistry laboratory (see description above). Certified organic farms in Gurabo and Lajas. Forestry research program (with McIntyre and International Forestry institute funding).

2. Use solar energy to dehydrate coffee beans and fruits.

Agritourism and Recreational Hunting and Fishing

1. We are in conversation with the State Agencies to settle an agreement of cooperation for agritourism.

2.

Family Development

1. The Family and Consumer Science program targets families, children, youth, elders, new

Battelle

The Business of Innovation

couples, and employees of the public and private sectors. Its goal is to empower families to nurture, support, and guide their members throughout their lives and motivate them to improve their quality of life and well-being in addition to increasing their financial stability through knowledge, skills and self- confidence.

2. Coalitions with state and local government and NGO have strengthened the program.

Youth Development

1. The Puerto Rico 4-H and Youth Development Program is designed to provide youth with positive opportunities to learn and interact with peers and adults, provide leadership development, and focuses on the enhancement of life skills.

2. The 4-H Clubs and Youth worked with the food security and childhood obesity initiatives by promoting the production of nutritive food in home and community ecological vegetable gardens.

Community and Economic Development

1. The CRD program has developed the “Community Economic Development Toolbox” a series of workshop designed to help communities and families design and establish economic ventures such as micro-enterprises, associations and cooperatives. All this with the objective of promoting self-employment and an increase in employment opportunities in the unemployment afflicted Puerto Rican society. With the support of an interdisciplinary faculty staff composed of Rural Sociologists, Nutritionists, Physical Education, and Psychologist, the CRD program developed a community oriented approach to attend the problem of child obesity. As part of the methodology being implemented, community members with the support of the above mentioned staff, designed strategies to promote a “healthy community lifestyle” through food intake modification, increase recreational activity and self-efficacy attitudes that included the acceptance of people of every size and reduction in stigmatization of obese people.

2.

Other, including multi-focus:

1.

2.

Intellectual Property

	2009	2010	2011
<i># of Invention Disclosures</i>	0	0	0
<i># of Patents Applied For</i>	0	0	0
<i># of Patents Awarded</i>	0	0	0
<i># of Licenses Executed</i>	0	0	0
<i># of Business Start-Ups</i>	0	0	3
<i># of Plant Variety Protection Certificates Applied For</i>	0	0	0
<i># of Plant Variety Protection</i>	0	0	0

Battelle

The Business of Innovation

<i>Certificates Awarded</i>			
<i>\$ Value of Income received from Plant Variety/Germplasm Development</i>	36,505.00	24,549.00	56,355.00
<i>\$ Value of Income received from all other Intellectual Property</i>	0	0	0

Company Spin-Offs and Commercialization

Please provide examples of any start-up companies located in your state or the southern region that resulted from research discoveries, innovations or technologies developed at your institution in the past 10 years:

In 2011, 58 community-based businesses were established. These stakeholders were widely trained on the Community Entrepreneurial Toolbox workshop series together with other marketable skills in the areas of artisanship, craftsmanship, tailoring, children and elderly services and agricultural production. In the Gurabo research substation two horticultural projects began to operate in 2011 related with tissue culture plantain, sweet pepper, and spiny coriander production. These business start-ups are implementing the technological practices developed by the UPRAES for these crops and are our first pilot projects in a prospective business incubation initiative being planned for the Gurabo research substation. In a third agreement, a cacao orchard not being use in research was leased to a farmer. The farmer established a small business using cacao fruits to produce chocolate stuffed with tropical fruits such as papaya, mango and guava. All three cases, the first year lease was granted at no cost to the farmer.

High Impact Innovations and Technology Development

Please provide FIVE examples of innovations or technology developments that have had a substantial impact on the field of agbioscience and/or associated agbio industries in the past 10 years. Examples might include crop varieties with enhanced yield characteristics, new processes or technologies introduced that significantly enhance productivity in industry, etc.

1. Release of “Taina Dorada and Soler” tropical pumpkin cultivar
2. Release of “Verano” white bean cultivar with heat tolerance and virus tolerance
3. Testing and release in the near future of three citrus rootstock tolerant to Phytophthora and “tristeza” virus
4. Testing and release in the near future of a tanager hybrid “Nazareno” (white flesh x yellow flesh) – The PRDA is promoting this cultivar and has established two agreement with UPRAES to produce vegetative propagation material to be distributed to farmers.
5. Development of an Economically Feasible Food Processing Plant Model for Minimally Processed Agricultural Crops – still in its final stages of development, this model will allow rural communities to establish small agro-industrial enterprises for adding value to their crops that comply with regulatory, quality and safety restriction while remaining economically viable.
6. Establishment of nutrient levels associated with ecological thresholds of impairment in reservoirs of Puerto Rico - Numeric nutrient criteria represent the cornerstone of protection/restoration efforts in surface waters of the US and territories. Research undertaken by the PRAES in the last decade in this area is generating the technological framework needed for the eventual adoption of

Battelle

The Business of Innovation

numeric nutrient criteria in reservoirs of Puerto Rico.

Additional comments or items of note regarding experiment station and extension impacts:

Research and extension regarding the adoption of drip irrigation and fertigation for fruit and vegetable production in southern PR. This technology is used by almost 100% of farmers in the region.

Battelle

The Business of Innovation

Section 4: Extension Service Programs

Statistics: please provide basic metrics and statistical information for extension:

Metric	Number
Number of county/parish offices	60
Number of multi-county/multi-parish regional offices	5
Number of major 4H camps	35
Number of 4H participants	10,702 Members
Number of contacts with clients recorded by extension for the most recently completed year (include professional and volunteer contacts)	232,009
Number of volunteers for the most recently completed year and number of hours volunteered	1,550

Please provide selected examples of notable/high impact projects or programs of extension that you would like considered for inclusion within the Battelle report. Please give consideration to including both rural and urban programs.

Business Development Programs/ Impacts

--

Community Development Programs/ Impacts

During years 2010-11, a total of 58 new business and economic ventures, as well as 131 new jobs were established as result of people participating in the “Community Economic Development Toolbox” Workshop Series. DRC led interdisciplinary staff obtained the first ever R-01 grant from the National Institutes of Health conferred to UPR Mayagüez to attend the problem of child obesity. Preliminary results point that 65% of participants have increased the consumption of skim milk and 100% fruit juices and reduced the consumption of sweetened fruit drinks and soda beverages. Ninety percent of participants have significantly increased the amount of time dedicated to outside physical recreation (playtime), and 40% have demonstrated a reduction in stigmatization of obese people.

Family and Consumer Science Programs/ Impacts

A total of 14 courses were offered by home economists of the Family and Consumer Sciences Program to mother heads of households, low-income families, and disadvantaged individuals displaced due to disabilities, unemployment, and other personal and economic life changing situations. The main course was "Facing difficult times". Other topics were consumer rights and protection, savings planning, and family budget. Two hundred and sixty (260) families were benefited. Many of the participants were referred by insular government agencies. Seventy-seven percent (77%) of the beneficiaries increased their knowledge and developed skills in budget preparation, money use, financial planning, identification and establishment of priorities

Battelle

The Business of Innovation

according to their needs and resources. They also developed positive attitudes in controlling unnecessary expenses.

4-H and Other Youth Development Programs/ Impacts

During 2011, 1,503 youth/4-H members established vegetable gardens in their schools, homes and/or communities, and 4,243 participated in life skills and subject matter educational programs.

Other high impact/notable Extension programs

1. The Certification of Pesticide Applicators program in Extension is well recognized in PR. We train around 400 persons every year on commercial categories and most of them establish their own business.
2. The EFNEP has been developed in PR for 41 years.
3. The sustainable agriculture initiative has delivered information to the small farmers that they applied in the enterprises of coffee, plantains, citrus.
4. The centers of education for socially disadvantaged small farmers. Ten (10) centers have been established with computers and other educational material for the use of the small farmers.
5. The Women in Agriculture initiative reached 500 women doing farming. A course of 10 lessons was presented to the participants.
6. The CYFAR project impacted 2,000 youth during the five year of granting.

Additional comments or items of note regarding extension:

What diagnostic or other service facilities are operated by extension? What is the annual volume of business in number of clients and dollars?

The Clinic of plant diagnostic receives 200 consults annually. The service is free for the farmers.

Section 5: Off-Campus Experiment and Extension Stations, Research and Extension Farms, and Outlying Research and Extension Centers

Please provide a listing of your off-campus agricultural experiment and extension station locations, including those near the main campus but not on campus, and other key research and extension locations across the state where faculty conduct research and/or extension activities, together with key characteristics or focus areas of each. *Note: please cut and paste table as needed to create enough entry places for all of your experiment station sites.*

Station 1

Station name	<i>Río Piedras Research and Development Center</i>
Location (zip code)	<i>Rio Piedras, PR 00926-1118</i>

Battelle

The Business of Innovation

<i>Size (acres), including owned and long-term leased land</i>	189
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Research Labs and specialized centers, Administrative Offices (Human resource, Budget office etc.), water quality research and urban agriculture focus
<i>Notable or unique characteristics or assets</i>	soil and water quality lab, soil physics lab., Museum of Entomology and Tropical Biodiversity, pesticide lab, certified quarantine laboratory, etc.
<i>Number of personnel (FTEs)</i>	113 (19 professors excluding two emeritus professors, and one Ad-Honorem professors)

Station 2

<i>Station name</i>	Mayagüez Research and Development Center
<i>Location (zip code)</i>	Mayagüez 00681-9000
<i>Size (acres), including owned and long-term leased land</i>	UPR Campus Land
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Dean and Director and Associate Dean and Deputy Office; Labs related to Campus faculty disciplines (entomology, phytopathology, animal molecular genetics, etc.)
<i>Notable or unique characteristics or assets</i>	Soil chemistry lab, Agro-Industrial Innovation and Technology Center (CITAI), Mayaguez, main university campus
<i>Number of personnel (FTEs)</i>	26 (16 scientist and several Ad-Honorem professors; 30

Station 3

<i>Station name</i>	Juana Díaz (Fortuna) Research Substation
<i>Location (zip code)</i>	HC-04 Box 7115, Juana Díaz, P.R. 00795
<i>Size (acres), including owned and long-term leased land</i>	283
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	<i>Fruit and vegetable research.</i> We mostly work with fruit, vegetable and farinaceous crops, in areas such as introduction and evaluation of new crops, evaluation of fertilizers and irrigation managements, evaluation of composts, biological control and integrated pest management, evaluation of insecticides, fungicides and herbicides.
<i>Notable or unique characteristics or assets</i>	The Pest and Plant disease diagnostic clinic is housed at this substation. This station has the largest germplasm of mango varieties and quenips of the Caribbean. We have the Laboratory of Distance Diagnostic and Identified Systems in collaboration with University of Florida – IFAS.
<i>Number of personnel (FTEs)</i>	21 (3 scientist)

Battelle

The Business of Innovation

<i>Station name</i>	Isabela Research Substation
<i>Location (zip code)</i>	2990 Avenida Militar, Isabela, 00662
<i>Size (acres), including owned and long-term leased land</i>	305
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	grains and starchy crops, seed production, fruits
<i>Notable or unique characteristics or assets</i>	Pigeon pea, tannier and bean breeding program center
<i>Number of personnel (FTEs)</i>	34 (4 scientist)

<i>Station name</i>	Adjuntas Research Substation
<i>Location (zip code)</i>	HC 01, Box 4508 Adjuntas, 00601
<i>Size (acres), including owned and long-term leased land</i>	183
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Coffee, citrus, forest management, tropical exotic fruits research compost producing facilities
<i>Notable or unique characteristics or assets</i>	Coffee and citrus research, compost producing facilities World collection of coffee and citrus germplasm
<i>Number of personnel (FTEs)</i>	33 (2 scientist);

<i>Station name</i>	Lajas Research Substation
<i>Location (zip code)</i>	HC-2 Box 11656 Lajas, 00667
<i>Size (acres), including owned and long-term leased land</i>	573
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Dairy farm, vegetable and grain production, forage research, rice winter nursery, organic farming
<i>Notable or unique characteristics or assets</i>	Dairy farm, rice winter nursery, certified organic farming
<i>Number of personnel (FTEs)</i>	49 (6 scientist)

<i>Station name</i>	Corozal Research Substation
<i>Location (zip code)</i>	Corozal, 0083-9521
<i>Size (acres), including owned and long-term leased land</i>	325
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Root and starchy crops, citrus
<i>Notable or unique</i>	Banana and plantain germplasm collection

Battelle

The Business of Innovation

<i>characteristics or assets</i>	
<i>Number of personnel (FTEs)</i>	29 (4 scientist)

<i>Station name</i>	Gurabo Research Substation
<i>Location (zip code)</i>	: P.O. Box 1306, Gurabo, P.R. 00778
<i>Size (acres), including owned and long-term leased land</i>	494
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Starchy crops, organic research and outreach, dairy husbandry care Organic farm; research on sweet potato, banana, yucca, animal care (dairy industry)
<i>Notable or unique characteristics or assets</i>	Organic certified Farm Project, and Honey Bee Project.
<i>Number of personnel (FTEs)</i>	26 (4 scientist)

<i>Station name</i>	Isabela Research Substation
<i>Location (zip code)</i>	Isabela, 00662
<i>Size (acres), including owned and long-term leased land</i>	305
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	grains and starchy crops, seed production
<i>Notable or unique characteristics or assets</i>	Pigeon pea, tannier and bean breeding program center
<i>Number of personnel (FTEs)</i>	40 (3 scientist)

<i>Station name</i>	Adjuntas Substation
<i>Location (zip code)</i>	Adjuntas, 00601
<i>Size (acres), including owned and long-term leased land</i>	183
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Coffee and citrus research, compost producing facilities
<i>Notable or unique characteristics or assets</i>	Coffee and citrus research, compost producing facilities
<i>Number of personnel (FTEs)</i>	33 (2 scientist)

<i>Station name</i>	Lajas research Substation
<i>Location (zip code)</i>	Lajas, 00669
<i>Size (acres), including owned and long-term leased land</i>	576
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Dairy farm, vegetable and grain production, forage research, rice winter nursery

Battelle

The Business of Innovation

<i>etc.)</i>	
<i>Notable or unique characteristics or assets</i>	Dairy farm, rice winter nursery, organic certified farm
<i>Number of personnel (FTEs)</i>	49 (6 professors)

<i>Station name</i>	Corozal Research Substation
<i>Location (zip code)</i>	Corozal, 0083-9521
<i>Size (acres), including owned and long-term leased land</i>	325
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Root and starchy crops, citrus
<i>Notable or unique characteristics or assets</i>	Banana and plantain germplasm collection
<i>Number of personnel (FTEs)</i>	29 (4 scientist)

<i>Station name</i>	Gurabo Research Substation
<i>Location (zip code)</i>	Gurabo, 00778
<i>Size (acres), including owned and long-term leased land</i>	494
<i>Key focus area(s) (e.g. poultry, crop demonstration, etc.)</i>	Starchy crops, organic research and outreach, dairy husbandry care Organic farm; research on sweet potato, banana, yucca, animal care (dairy industry)
<i>Notable or unique characteristics or assets</i>	Organic certified farm
<i>Number of personnel (FTEs)</i>	26 (4 scientist)

Additional comments or items of note regarding off-campus experiment and extension stations, county offices, etc.:

--

Section 6: Industry Partnerships

Please provide a description of FIVE notable partnerships that your experiment station and/or extension service has with industry. Examples might include a joint engineering center with an agricultural equipment manufacturer, plant breeding or transgenics programs with seed companies, bioprocess development with chemical or biofuels companies, food product development with food manufacturing companies, etc.

Provide details on companies, groups of companies, commodity groups etc. worked with, key results achieved and thoughts on benefits provided.

1. Food products characterization and value added

2. **Company:** Acadian Seaplants Limited, Nova Scotia, Canada

Partnership: Collaborative research project on "Effects of an *Ascophyllum nodosum* Extract on fruit Retention in Tahiti Lime and Avocado". *Ascophyllum nodosum* is a marine plant that provides extracts generally regarded as having the greatest biostimulatory effects of all marine plant species. These extracts are also regarded as important sources of mineral nutrients and plant growth regulators. Since 2009, when the collaboration with Acadian Seaplants was initiated, the partnership effort has expanded to include trials involving fruit yield and tolerance to pests and diseases in orange, melon, mango and banana, along with the initial ones in Tahiti lime and avocado.

Key results: This is an ongoing project. Results from previous years show reduced fruit abortion in mango, avocado and Tahiti lime. Results for orange have not been consistent. A new experiment in orange will be initiated and running experiments in mango, avocado, banana and Tahiti lime will be harvested in the Fall.

Benefits: This research studies the potential to reduce fruit drop and increase fruit yield and quality using bioregulators. Drop during fruit development is among the most important yield loss factors in fruit crops. Increasing fruit retention by means of biostimulants may result in significant yield and/or quality increase in avocado, orange, banana, orange, Tahiti lime and mango.

3. **Company:** Dow AgroSciences/Mycogen Seeds, Puerto Rico

Partnership: The Mycogen Seeds company sponsors, since 2008, a graduate research assistantship at the Crops and Environmental Sciences Department of the UPR-Mayaguez Campus, and associated expenses, to conduct research geared towards improving agroecosystem sustainability through the use of information technology and cover crops. Mycogen Seeds has about 400 acres under corn production in the south coast of Puerto Rico. These fields have been under continuous corn production for many years and, besides improving the agroecosystem sustainability, the company is interested in information for improving nitrogen management for corn inbred production. A continuing cooperation agreement between DOW and the University of Puerto Rico, administered through the UPRAES, has been developed to fulfill the research goals of the company and UPRAES research interests geared towards improving the agricultural sustainability of grain production farms. The overall product of the collaborative effort is to develop nutrient management recommendations to maximize crop yields and reduce potential environmental degradation.

Key results: During the initial two years of the agreement five cover crops were grown under irrigated and non-irrigated conditions. Crop yields, plant N uptake and growth rates were determined. The best two cover crops (Mucuna and Cowpea var. iron clay) were selected for further evaluation. Within the two cover crops and a fallow area, an experiment was conducted to test the effects of five fertilizer-N levels on maize yields and associated agronomic parameters. There was a strong cover crop effect with Mucuna and cowpea improving maize yields over fallow plots. The company was pleased with the results and planted 150 acres to cowpea var. iron clay. Further trials conducted during the past two years suggest that fertilizer-N application rates could be reduced when compared to inbred-maize production without previous cover crop and to previous year's fertilizer practices. Further work related to optimum fertilizer N management and maize seed response should be done with high and low-yielding seed inbreds and in different fields within the farms. The assays planned for 2011-2012 cropping season should document crop response fertilizer-N levels, encompassing a range of residual soil-N conditions.

Benefits: Before this cooperative agreement there was little or no work related to cover crop management in the soils of Puerto, and soil and climatic constraints for cover crop establishment under contrasting conditions had not been performed. Further still, there was very little quantitative data to

Battelle

The Business of Innovation

support fertilizer-N management of maize in the southern semi-arid coast of Puerto Rico. Results from this cooperative project are serving to improve nitrogen management in corn-production systems and enhance knowledge for improving cover crop management.

4.

5.

What areas of R&D at your institution do you believe hold the most promise for increasing industry engagement in the next five years?

1. Food technology, Development of new products, healthy snacks, products made with organic components
2. Animal production based on renewable systems that address environmental, animal welfare and social concerns and that can offer health conscious consumers a high quality product from a nutritional and organoleptic standpoint, while protecting natural resources. Under Puerto Rico's marketing situation this may be the only way in which local cattlemen and farmers can add enough value to their products so that they can compete with those imported from countries that heavily subsidize their agriculture or have low production costs. Example: Relying on grazing systems for beef production while reducing out of farm inputs and stressing differences in quality between the local and imported beef (freshness; product safety; quality).
3. Adding value to these safely produced high quality products through food technology and marketing strategies.
4. Research in the area of the "**The Slick Hair Dairy Cow of Puerto Rico**" holds the most promise for increasing industry engagement in the next 5 years. The characterization of the milk production potential of this cow and its feed efficiency will be valuable not only for Puerto Rico, but for the whole humanity and the earth environment continues to get warmer. Increasing the population of the Slick hair cow could have a positive impact on animal welfare increasing the longevity of dairy animals and as a consequence the sustainability of the dairy industry in the island. Studies directed towards the development of tropical grasses of greater digestibility or methods to improve the digestibility of the currently available species could also have a great positive impact on the dairy industry. Research in the production of tropical legumes, sorghum, and corn varieties better adapted to the tropics could not be overemphasized.

What agriculture, forestry, fisheries or wildlife and natural resource-related industries do you expect to see grow in the southern region during the next five years?

Vegetable production

-Agro-tourism

-Small Organic Farms and organic dairy is an industry with the potential to increase in the next 5 years. There is a market for organic milk and other dairy products. However, currently there is not a single organic dairy farm in Puerto Rico. The dairy industry needs to diversify as fresh milk consumption has been sluggish for at least the last 5 years. Cheese, powder milk, yogurts, and butter are some of the products that could be produce locally, and help the dairy farmers deal with the decrease in milk consumption in the island.

Additional comments or items of note regarding industry partnerships:

Battelle

The Business of Innovation



Battelle

The Business of Innovation

NRCS – Research and extension funding for organic farming at Gurabo and Lajas Research substation certified organic farms.

FSA- Extension has developed the Outreach Training and Technical Assistant program for small farmers in coordination with Farm Service Agency. Two thousands (2,000) small farmers have participated.

What state agencies do you partner with on major joint projects and programs? Please list the top 3 state agency initiatives you are engaged with.

PRDA, PR Environmental Quality Board, PR Natural Resources Department, PR Department of Agriculture and Extension have an agreement in order to educate the farmers on production on those commodities that they offer incentives.

What do you believe are some of the unique assets of the southern region that make it particularly well-suited to leadership in the 21st Century agbioscience economy?

PR has a great commodity diversity. We can also provide leadership in emerging alternative markets (organics, ethnic, urban farming, for example) and on agro-tourism opportunities. We are also in a position to provide strong leadership for programs enhancing our environment (ex. sustainable land use strategies, optimizing water quality, among others).

Additional comments or items of note regarding potential or existing partnerships with other institutions across the southern region:

Battelle

The Business of Innovation

Section 8: Education and Human Capital Development

Student Population

<i>Number of students graduated in most recent year with Bachelor's degrees in related field of study</i>	<i>Aprox. 100/year</i>
<i>Number of students graduated in most recent year with Master's degrees in related field of study</i>	<i>Aprox. 30/year</i>
<i>Number of students graduated in most recent year with Doctorate degrees in related field of study</i>	<i>0</i>
<i>Number of students graduated in most recent year with Associates or other less than baccalaureate qualifications in related field of study</i>	<i>0</i>

Education and Training Programs

In a science and knowledge-driven economy, skilled human capital is a critically important asset for our states. Please provide details pertaining to education and skills development in the sections below:

New or innovative education programs or degree programs developed (for example: bioprocessing or biorefinery operator training, biosecurity training, education programs in new fields such as functional foods, nutraceuticals, etc.)

Continuing education programs or training for producers or industry

Professional Certification Programs

Leadership training, including civic, commodity, government, youth, etc.

Entrepreneur training and other special training or education initiatives

National defense, including National Guard, training or educational initiatives

K-12 specific educational programs and initiatives

Additional comments or items of note regarding education and training:

Battelle

The Business of Innovation

Section 9: Into the Future

What key challenges does your institution face in the future:

Top 5 key challenges for the Experiment Station in your state

1. How to Increase the recruitment and retaining of scientific personnel in an era of continued budget constraints
2. Increase state, federal and private funding for research and development and own income
3. Convince farmers and the agro industrial food sector that the technology produced by UPRAES is a viable option to develop technology conducting to help them increase their gross income
4. Maintaining our network of research substations suited to the agroecological conditions of different regions in an era of rising costs and shrinking budget.
5. Maintain the relevancy of our research programs and experimental lands in the face of developmental pressures from different sectors (housing developments, private energy projects, government infrastructure, etc)

Top 5 key challenges for the Extension Service in your state

1.Funding
2.Reduction of crop land and farmers
3.Consolidation and Reduction of Extension offices
4.Social and human behavior
5.Retirement of employees

What emerging opportunities or trends do you see impacting your institution:

Top 5 emerging opportunities and trends for the Experiment Station

1.Growth of organic farming research and extension
2. Growth of specialty coffee and coffee- origin denomination research linked to government plans to establish a specialty coffee industry for export
3. Establish new partnerships with state and federal agencies to develop research on disease causing organism at the CEISPP facilities
4. Develop new food and value added products; develop health and obesity centered research and education based on local conditions and local crops; tailor production facilities to small processing industries.
5. Develop needed viability studies and socioeconomic research for the emerging agro-tourism sector and niche-specialty-product marketing

Top 5 emerging opportunities and trends for the Extension Service

1. Excellent collaborations with state and federal agencies.
2. Outstanding outreach programs for the farmers, 4 – H and families.
3.Education service centers at the experiment stations
4.Faculty staff trained on subject matters
5. Reorganization of local offices.

Battelle

The Business of Innovation

For the southern region overall, what do you see as the top five challenges/issues moving forward

1. Improving labor market opportunities for the region's population.
2.Reducing the cost of energy or reforming the energy industry.
3.Mobilizing financial backing for non-traditional business development and growth (particularly for ag-based industries).
4.
5.

What are the top five differentiating factors of the southern region in agriculture, agbiosciences, community/family/youth development, etc. What makes the region unique or provides key comparative advantages.

1. Tropical and subtropical climate and wide amount of commodities
2.
3.
4.
5.

Section 10: Interview Suggestions

Battelle would like to interview some key stakeholders (outside of the land-grant institutions) across the southern region to discuss their perspective on the importance of extension and agricultural research. Please provide the names and contact information for three individuals who you would suggest for interviewing in your state:

Name	Title	Organization	Telephone	Email
Agro. Damian Rivera Alfonzo	President	PR College of Agronomists (Colegio de Agrónomos de PR)	787-753-7222	info@colegiodeagronomos.com
Dr. José Torrado		Dairy Farmer	787- 396 - 8080	rejo97@prtc.net
Dr. Ferdinand Rivera		Owner La Luisa Coffee farm	(939) 642-4505	ferdyrv@aol.com

Section 11: Additional Comments

Please provide any additional comments, information, data, case-studies, impact assessment results, etc. that you feel may be useful or relevant for inclusion in this project and resulting report:

--

Battelle
The Business of Innovation