

University of Puerto Rico
Mayagüez Campus
COLLEGE OF AGRICULTURAL SCIENCES

**Strategic Plan to Foster Sustainable Agriculture in
Puerto Rico**

September 2001

STRATEGIC PLAN TO FOSTER SUSTAINABLE AGRICULTURE IN PUERTO RICO

COLLEGE OF AGRICULTURAL SCIENCES (CCA)
MAYAGÜEZ CAMPUS
UNIVERSITY OF PUERTO RICO

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STRATEGIC PLAN TO FOSTER SUSTAINABLE AGRICULTURE IN PUERTO RICO

**College of Agricultural Sciences (CCA)
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- 6. Prof. Luis Mejía, Assistant Extension Specialist in Agricultural Economics**
- 7. Prof. Miguel Monroig, Extension Specialist in Coffee**
- 8. Prof. Carlos Nazario, Extension Specialist in Poultry**
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STRATEGIC PLAN TO FOSTER SUSTAINABLE AGRICULTURE IN PUERTO RICO

COLLEGE OF AGRICULTURAL SCIENCES (CCA) MAYAGÜEZ CAMPUS UNIVERSITY OF PUERTO RICO

INTRODUCTION

The College of Agricultural Sciences (CCA) of the University of Puerto Rico is committed to taking an active role in encouraging the development of sustainable agriculture in Puerto Rico. With this purpose in mind, the Dean and Director of the CCA organized a committee composed of researchers, extensionists, and professors to develop an effective strategic plan. The committee was named the *Sustainable Agriculture Committee of the College of Agricultural Sciences (CASCCA)*.

The nature of agricultural production is complex and requires an ample understanding of the many types of relationships that farmers have with consumers, crops, animals, soils, pests, climate, technology, production costs, marketing, public policies, farm infrastructure, and local ecosystems. To take care of the needs of farmers and consumers efficiently and to safeguard agricultural land for the use of future generations, the CCA has set as its immediate goal the development of a strategic plan to encourage sustainable agriculture in Puerto Rico. This plan will help to coordinate relevant agricultural research and development, education, and the disclosure of information for the implementation of sustainable agriculture practices. The purpose of this plan is to facilitate the dissemination of information and create the mechanisms to make responsible decisions related to sustainable agriculture within the island's complex social-economic-political-environmental-technical framework.

By creating this plan, the CCA recognizes that changes must be made in the performance, management, and implementation of current agricultural practices that will promote sustainability. The CASCCA has adopted from the Food, Agriculture, Conservation and Trade Act of 1990, Section 1603, the official United States Department of Agriculture (USDA) definition of sustainable agriculture. It is defined as "an integrated system of plant and animal production practices having a site-specific application that will, over the long term:

- satisfy human food needs;*
- enhance environmental quality and the natural resources base upon which the agricultural economy depends;
- make the most efficient use of nonrenewable resources and on-farm resources and integrate, where appropriate, natural biological cycles and controls;
- sustain the economic viability of farm operations; and
- enhance the quality of life for farmers and society as a whole”

It should be pointed out that the stated proposal is a pragmatic plan to develop a sustainable agriculture initiative within the CCA. It does not pretend to be an overall plan for the agricultural development of Puerto Rico. The **Strategic Plan to Foster Sustainable Agriculture in Puerto Rico** should not be mistaken for the comprehensive Strategic Plan of the College of Agricultural Sciences. Nevertheless, its intentions are complementary to those of the Strategic Plan of the CCA, as it contributes specific strategies that are related to the sustainable agriculture initiative. This plan should be adopted as a working agenda for the next five years but without imposing limits on the academic personnel’s creativity and imagination. It is of vital importance that the CCA achieve the acceptance and recognition among farmers, professors, students, government officials, and society as a whole of the social, nutritional, environmental, and economic benefits that can be derived from the implementation of a sustainable agriculture program for Puerto Rico.

SCOPE OF THE STRATEGIC PLAN

This plan is directed at:

- **farmers and farm workers of Puerto Rico** – to enable them to improve their standard of living and working conditions;
- **agriculture professionals** – to gain support for a program of sustainable agriculture information flow and exchange;
- **all of the agricultural sector** – to develop environmentally friendly, economically viable, and sustainable agricultural systems;
- **students** – to offer learning opportunities (at the university and high school levels) focused on sustainable agriculture;

* The definition of sustainable agriculture as stated in the Federal Food, Agriculture, Conservation and Trade Act of 1990 includes “satisfy human food and fiber needs.” However, to adapt the definition to Puerto Rico’s characteristics the element of “fiber needs” was eliminated because there is no production of textile fibers in Puerto Rico.

- **consumers and society as a whole** – to encourage the production of nutritious fruits, vegetables, grains, and other food items to satisfy most of the local demand; and
- **the environment**– to conserve and improve the quality of the environment and preserve the natural resources.

This plan consists of the following elements: mission, vision, and goals; justification; process to create the strategic plan; challenges, strengths, and opportunities; time span and evaluation; goals, objectives, and strategies; and schedule and budget.

MISSION

The mission of the College of Agricultural Sciences in the field of sustainable agriculture is to coordinate all efforts that are being or will be made to encourage the education, research and development, and the disclosure of information for the implementation of a sustainable agriculture in Puerto Rico.

VISION

The College of Agricultural Sciences is an entity which generates and provides information and knowledge about sustainable agriculture through its connections with farmers, agricultural workers, researchers, extensionists, professors, students, consumers, government agencies, nongovernmental organizations, and society as a whole.

GOALS

1. To increase the understanding, knowledge, and acceptance of the sustainable agriculture concept among agricultural professionals, farmers, university and lower level students, and society as a whole.
2. To support a permanent educational program in order to spread knowledge among Puerto Rico's population about the importance and benefits of agriculture to them.
3. To strengthen the research and extension programs focused on the generation and dissemination of information and technology needed for the sustainable development and utilization of farmland, hydroponics, home fruit and vegetable gardens, urban land for agricultural production, plant nurseries, and forests in Puerto Rico.

JUSTIFICATION

During the 1950s, the Government of Puerto Rico began a vigorous and successful development of the industrial, tourism, and construction sectors of its economy. The best human and capital resources were employed; and, in only three decades, the economic base of Puerto Rico became industrial rather than agricultural. However, contrary to other industrialized countries, Puerto Rico did not upgrade and modernize its agricultural sector during this time.⁵⁻²²

Even though during the last 15 years the agricultural sector has improved and updated its technology, and production has slowly but consistently increased in some crop enterprises, its gross income is still far below that of other economic sectors.²⁴ According to the *Informe Económico al Gobernador, 1998*,¹⁸ (*The Governor's Economic Report, 1998*), agricultural production represented only 0.75% of the gross internal product. Approximately 70% of the food consumed in Puerto Rico is still imported.

As in the United States, Puerto Rico lives under the constant pressure of urban and industrial development. The reduction of the quantity of land available for agricultural use is a consequence of the continual construction of highways, horizontal low-density housing facilities, and industrial and commercial complexes. The rate of loss of land suitable for agricultural use is disproportionate for such a small, densely populated country.* According to the 1997 soil inventory of the U. S. Department of Agriculture (USDA), from 1982 to 1992 the United States lost 1.4 million acres per year of both agricultural land and open areas. However, from 1992 to 1997, the loss increased to 3.2 million acres per year, which is more than double what it had previously lost per year. Puerto Rico observed a similar pattern for the same periods. From 1982 to 1992, approximately 12,460 acres per year were lost and, from 1992 to 1997, 30,620 acres per year. Statistics from the National Resources Inventory of the USDA indicate that, from 1982 to 1999, Puerto Rico lost more agricultural land and open areas than

* Puerto Rico has a geographic area of approximately 3,435 square miles, and its topography is highly mountainous. In 1994, the population density was approximately 1,077 people per square mile. For the year 2025, the population is expected to rise to 4.7 million, with a density of 1,368 people per square mile.

Oregon, Montana, Idaho, Colorado, Utah, Iowa, Nebraska, South Dakota, Wyoming, North Dakota, Nevada, Delaware, Vermont, Rhode Island, or Hawaii. These states, with the exception of Delaware and Rhode Island, each have a geographic area several times larger than that of Puerto Rico. Except for the valleys of Lajas and Aguada, which were recently reserved through public policy exclusively for agricultural use, cultivable land in Puerto Rico is threatened by constant development pressures from both the private and public sectors.

However, at the present time, Puerto Rico has an excellent opportunity to rescue and develop its agriculture. Fortunately, certain political groups on the island have shown an interest in strengthening its agriculture. Resources for the development of a vigorous agricultural system such as land, water, infrastructure, capital, markets, management capacity, and professional and scientific personnel are available. If they are used efficiently, Puerto Rico could produce a large percentage of the food its residents consume, which would contribute significantly to its gross internal production and elevate its economy. According to the 1998 Agricultural Census of the USDA, there were still 865,478 cuerdas in 19,951 farms at that time. The agricultural work force in Puerto Rico is composed of approximately 41,000 workers, and several thousand other jobs are created indirectly through the manufacturing sector of the economy utilizing agricultural products.

Although the agricultural segment is vital to the development of a healthy economy, the CASCCA is conscious of the difficult task involved in the recovery and development of agriculture in Puerto Rico. To rehabilitate agriculture will require serious and continuous commitment from the public sector, researchers, extensionists, professors, farmers, students, consumers, and society as a whole. This effort cannot simply utilize conventional methods of improving production based on intensive use of fertilizers, pesticides, animal feed, and other imported materials, which reduce the economic viability of agricultural enterprises. The technological packages and financial models developed by the College of Agricultural Sciences show that the direct costs for concentrated fertilizers and synthetic pesticides represent 35% of the production costs. In the cattle and poultry enterprises, the use of imported, concentrated feed surpasses 50% of these costs.

The redevelopment of agriculture must focus on all parameters of sustainability, which are: use nonrenewable and local resources efficiently; integrate biological cycles and controls into farm management practices; encourage and support self-sufficient farm economic viability; and improve the general standard of living of farmers and society as a whole. The agricultural sector should be reorganized into new areas of production that are profitable and highly competitive with imported food products, such as intensively operated small farms; gourmet food production; urban agriculture; organic food production; hydroponics; and the development of intelligent marketing systems and agribusinesses for local commodities. Also, it is necessary to redevelop cooperatives within the agricultural community. The cooperative movement has been and is an efficacious tool for the successful production and marketing of agricultural products. Also, the adoption of sustainable agriculture practices in Puerto Rico is feasible because approximately 40% of the farms are small (20 cuerdas or less). According to the USDA, sustainable agriculture is the only solution for the survival of small farms.¹⁶ All of these initiatives must be supported by an efficacious agrarian policy in order to protect agricultural land and keep it productive. It is of vital importance to protect this valuable natural resource in order to develop the agriculture that Puerto Rico needs now and will need in the future.

To utilize available natural resources (climate, land, and water) effectively to increase food production and related jobs and economic benefits, it is imperative to develop a vigorous, sustainable agricultural system for the island. The importation of agricultural products, which amounts to approximately \$4 billion per year, can be reduced dramatically, allowing for investments in other sectors of the economy. The development of the agricultural sector will improve the total economy of Puerto Rico since each dollar earned in agricultural production at the farm level has a multiplier effect and will benefit not only the farmers but other segments of the population as well. With a greater agricultural production, there will be fewer imports of raw materials, and a higher percentage of the farmer's income will remain in Puerto Rico. However, the importance of the development of the agricultural sector is not just the generation of income and creation of jobs. Agriculture is the only sector of the economy that can provide food, which is essential for human life. It is also an intrinsic part of our culture and way of life. The local production and consumption of fresh, nutritious, high-quality food items contribute to the development of high esteem among their producers and a healthy population.

Because of its large population and the great distance that separates this island from the rest of the continent, it is imperative that Puerto Rico has an agricultural sector which can satisfy the food needs of the majority of its people. In the event of a hurricane or any other natural or human made disaster, the population could suffer from hunger. Also, U. S. agricultural production, which supplies Puerto Rico with the majority of its goods, has an uncertain future. It is expected that, by the year 2025, the increase in population (approximately 1.1% annually) and the loss of land suitable for agricultural use (approximately 1 acre per additional inhabitant) will force the U. S. to stop the exportation of agricultural products as they will be needed for local consumption.²⁰ In addition, it is expected that food prices in the U. S. will increase and be 3 to 5 times higher than they are currently.

The College of Agricultural Sciences of the University of Puerto Rico at Mayagüez has the capacity and the resources to contribute significantly to the recovery and sustainability of our agriculture. It is the only academic institution in Puerto Rico supported by the Morrill Law, which created Land Grant colleges in the U. S. This law, signed by Abraham Lincoln in 1862, authorized land and Federal grants for the development of agricultural sciences and mechanical arts by higher education institutions. The four units which integrate the CCA [the Teaching Faculty, Agricultural Extension Service (SEA), Agricultural Experiment Station, and International Programs] are part of an institution, which has capably served the agricultural sector and society as a whole for the last 90 years. The CCA relies on competent professionals and community resources: (a) a prestigious institution for higher education, research, and development which is not limited to the Mayagüez Campus and includes seven experiment substations and 66 offices of the SEA located around Puerto Rico; (b) a broad spectrum of internationally renowned scientists and teaching personnel; (c) graduate and postgraduate students; and (d) community leaders for the SEA programs involving *Ciencias de la Familia y el Consumidor* (Family and Consumer Sciences); *Juventud y 4-H* (Youth and 4-H); and *Desarrollo de los Recursos de la Comunidad* (Community Resources Development). Currently, the CCA curriculum is being revised with the intention of introducing initiatives, courses, and specialized programs to satisfy the different needs of the agro industrial sector such as those relating to food science, biotechnology, and agricultural engineering.

The CCA wants to continue fostering the benefits of sustainable agriculture among farmers, children, parents, teachers, and society as a whole. This contribution will consist of workshops, intensive counseling, and the development of research and/or demonstration projects within the different experiment substations, farms, and private units of agricultural production.

PROCESS TO CREATE THE STRATEGIC PLAN

The process to create this plan was arduous and required commitment and responsibility from people who recognized the importance not only of its creation but also its implementation and effectiveness. The creation process began with a proposal submitted to the Southern Region of the USDA Sustainable Agriculture Research and Education Program (SARE). When the proposal was approved, the Dean and Director of the CCA organized a committee composed of researchers, extensionists, and professors to create the plan. Also, a student from the Graduate School of Planning of the University of Puerto Rico at Río Piedras was chosen as a planner to assist in its preparation.

Creating a strategic plan requires four broad steps. First, the specific situation which needs to be improved must be precisely determined and defined. Second, after research, interviews, and discussions, the mission must be articulated.

Third, the specific goals, objectives, and strategies which will help to achieve the mission must be defined. The objectives, which are quantifiable in terms of timing and resources, help structure the specific action plan in order to reach each specific goal. The individual strategies represent the course of action needed to achieve each one of the objectives. The specific strategies are also quantifiable.

Finally, the implementation of the action plan begins. Once the implementation has started, specific parameters, previously defined, are used to compare expected with actual results.

CASCCA went through the process of formulating the necessary goals, objectives, and strategies. This process took place through the continuous exchange of information, analyses,

discussions, and synthesis of ideas among the members of CASCCA, professors, farmers, scientists, students, segments of society, employees of private enterprises, and professional personnel from local and Federal agencies. CASCCA members accumulated, distributed, and exchanged information and available literature through workshops, meetings, focal groups, and individual and group interviews.

The formulation of the plan began in January 1998. Several focal group meetings took place involving the CASCCA members, students from the CCA, farmers, and visiting professors (Dr. Aref Abdul-Baki, researcher at the Maryland ARS, and Dr. Charles F. Francis of the University of Nebraska, Lincoln). Also, the steering team of the CASCCA (Dr. Hipólito O’Farrill, Dr. José Huerta, and Emilia Viqueira-Keller) discussed at length the deputation of the plan. As a result of the meetings and professional exchanges of ideas, CASCCA came up with the first draft of the plan in November, 2000. The draft was made available for revision and evaluation on the internet web page <http://sea.upr.clu.edu/> under *Archivos y documentos*. The comments received were incorporated into the plan. The final plan was finished in April 2001. The English version of the plan was finished in August, 2001. Both versions are currently available to the agricultural community at the same web site address. CSA continues being open to receive comments and suggestions about the plan.

The next section defines the internal and external challenges which the CCA confronts, its strengths, and the opportunities which the CCA has for the development of its plan for sustainable agriculture in Puerto Rico. Also, included are the goals, objectives, and strategies for the plan.

CHALLENGES, STRENGTHS, AND OPPORTUNITIES

Internal Challenges

- Encourage and put into practice a more effective communication network at all levels.
- Improve internal relationships and collaboration.
- Improve links and relationships with public agencies, nongovernmental organizations, farmers, and society as a whole.
- Create a leadership position which will help to coordinate the research, development, and disclosure of information concerning sustainable agriculture among the different CCA units and programs.

- Create a strategic plan which will facilitate the coordination and organization of the diverse projects and research proposals concerning sustainable agriculture that will be taking place within the CCA.
- Encourage CCA professors to include ecological and sustainable agriculture topics in their curricula discussions.
- Encourage the development of a research program aimed at developing sustainable agricultural systems on the island.

Internal Strengths

- CCA is:
 - a prestigious higher education institution.
 - an excellent academic center consisting of researchers, extensionists, professors, and administrators committed to sustainable agriculture.
- CCA has a broad-based infrastructure with organized services, and research facilities spread throughout Puerto Rico: five agricultural extension regions with 66 offices and approximately 50 specialists, 100 agricultural agents, 60 home economists, and seven experiment substations with 75 researchers. It has a computer network which facilitates fast communication among the experiment substations, the SEA offices, the University of Puerto Rico at Mayagüez and with the public in general.
- CCA research, education, and extension phases are integrated into seven departments. Moreover, the work of these departments is interdisciplinary in the development of different initiatives and projects concerning technological transfers, research, and education.
- SEA has an integrated education program carried out by voluntary leaders who reach different community groups. The program areas are *Ciencias de la Familia y el Consumidor* (Family and Consumer Sciences); *Juventud y 4-H* (Youth and 4-H); *Desarrollo de los Recursos de la Comunidad* (Community Resources Development); and *Agricultura, Mercadeo, y Recursos Naturales* (Agriculture, Marketing, and Natural Resources).
- Through the International Programs Office, the CCA has cooperative ties with foreign research and development centers.

External Challenges

- Rapid losses of agricultural land due to horizontal urban development.
- Speculation with agricultural land.
- The allocation by the local (Puerto Rico) government of more resources and attention to other sectors of the economy.
- Crop and animal enterprises that are developed through the use of imported inorganic fertilizers, pesticides, and feed.
- Lack of government incentives to foster sustainable agricultural practices.

External Opportunities

- Increasing concern of society as a whole regarding environmental problems.
- Growing interest in the consumption of fresh foods with the least amount possible of agrochemical residues.

- High potential for the development and marketing of agricultural goods produced locally due to accelerated development of communication networks.
- A vigorous agricultural incentives program sponsored by the Puerto Rican government.
- Interest among diverse political sectors in strengthening the island's agriculture.

TIME SPAN OF THE STRATEGIC PLAN AND EVALUATION

One of the principles of sustainable agriculture is to support long-term efficient production of agricultural commodities. The intention is to perpetuate the use of practices which will make agricultural activities sustainable and profitable. As a tool to assure the continuity of sustainable island agriculture, this plan will be in a constant state of development and evolution; it must adapt itself to the never-ending changes and demands of society as a whole and must be updated with the newest techniques and information available on sustainable agriculture. The plan will be evaluated periodically by CASCCA and an in-depth report prepared to communicate results obtained at the time of evaluation. The report will be submitted to the Dean and Director of the CCA. When approved, its findings will be given to scientists, farmers, students, government officials, and society as a whole.

Once the implementation of the plan has begun, CASCCA will be reorganized. Its members will be volunteers who have demonstrated leadership and serious commitment to Puerto Rico's agriculture. The following should be members of CASCCA: Professional Development Program State Coordinator, at least two members of each unit of the CCA, a planner, an evaluator, three farmers, one representative from the Natural Resources Conservation Service, one representative from Puerto Rico's Department of Agriculture, and two representatives from nongovernmental organizations.

The members of the Committee will be responsible for evaluating the effectiveness and efficiency of the plan. The impact of the results will be measured through evaluation tools that will be utilized specifically for the stated objectives and strategies. Emphasis will be given to the parameters that:

- satisfy human food needs,
- enhance environmental quality and efficiently utilize natural resources,
- make the most efficient use of nonrenewable and on-farm resources,
- integrate, where appropriate, natural biological cycles and controls,

- sustain the economic viability of farm operations,
- enhance the quality of life for farmers and society as a whole, and
- promote the efficient and effective distribution of agricultural products to local and nonlocal markets.

Some of the parameters that will be used to measure the results and effectiveness of the plan are:

Output Indicators

1. Number of knowledge bases created.
2. Number of pamphlets, technical guides, loose information sheets, and other types of publications developed.
3. Number of conferences, seminars, workshops, farm demonstrations, farm visits, and other educational activities offered to children, teachers, university students, agricultural professionals, farmers, and society as a whole.
4. Number of children, teachers, university students, professionals in agricultural fields, farmers, and members of society as a whole who have had orientation on the importance and benefits of sustainable agriculture.
5. Number of new or updated courses which include sustainable agriculture components.
6. Number of sustainable agriculture research and demonstration projects implemented.
7. Number of research and demonstration projects implemented on farms.
8. Number of farmers working together on research and demonstration projects.
9. Number of farmers who have benefited from sustainable agriculture research and demonstration projects.

Effectiveness Indicators

1. Percentage of trained farmers who have implemented integrated pest management and sustainable agriculture.
2. Percentage of farmers who have improved their product-marketing capabilities.
3. Percentage of children, teachers, agricultural professionals, farmers, and society as a whole who have adopted sustainable agriculture practices and are utilizing them in gardens, on farms, and in hydroponics, nurseries, and other units of agricultural production.
4. Percentage of children, teachers, and society as a whole who have had orientation on the importance of consumption of locally produced food.

GOALS, OBJECTIVES, AND STRATEGIES

GOAL 1

To increase the understanding, knowledge, and acceptance of the sustainable agriculture concept among agricultural professionals, farmers, university and lower level students, and society as a whole.

Objective 1.1

To create a knowledge base of feasible sustainable agricultural practices to be implemented in Puerto Rico.

Strategies

- 1.1.1 Create a database with names and addresses of the members of the sustainable agriculture community in Puerto Rico.
- 1.1.2 Gather and disperse information concerning sustainable agriculture practices available from:
 - literature (essays, project reports, articles, and publications of students, researchers, extensionists, professors, professional and nonprofessional farmers, among others).
 - knowledge developed through the experience and traditions of farmers and agricultural professionals in universities, industries, and government (by means of workshops, focal groups, and individual and group interviews).

Objective 1.2

To disseminate and exchange available information about sustainable agriculture and make it accessible to farmers, agricultural professionals, researchers, extensionists, professors, students, and the public in general.

Strategies

- 1.2.1 Disseminate pertinent information through bulletins, press articles, radio and television programs, e-mail, and web pages.
- 1.2.2 Organize available information and integrate it into computerized programs, pamphlets, and technical guides.

Objective 1.3

To support a broad-based systematic training program on sustainable agricultural practices which would include segments of interest and benefit to farmers, agricultural professionals, researchers, extensionists, professors, students, and society as a whole.

Strategies

- 1.3.1 Design a periodic newsletter to be published at least quarterly and distributed among the members of the agricultural community.

- 1.3.2 Offer workshops and visit demonstration farms and other units of agricultural production.
- 1.3.3 Periodically provide news and findings to the general public through newsletters, e-mail, and the web pages.
- 1.3.4 Design new university courses about agro ecology and sustainable agriculture. (These courses will be composed of visits to laboratories and/or workshops on demonstration farms and other units of agricultural production.)
- 1.3.5 Update existing university courses so that they include sustainable agriculture principles.

GOAL 2

To support a permanent educational program in order to spread knowledge among Puerto Rico's population about the importance and benefits of sustainable agriculture to them.

Objective 2.1

To orient children, elementary and high school teachers, university professors and students, government officials, farmers, and society as a whole about the importance of the conservation of land with high agricultural use or potential and the consumption of locally produced food.

Strategies

- 2.1.1 Develop educational units for children and parents concerning the importance of the conservation of cropland and the environment.
- 2.1.2 Inform and educate volunteers, teachers, and society as a whole about the importance of the conservation of agriculture and the environment through publications, radio and television programs, cultural festivities, and visits to forests, farms, plant nurseries, hydroponics, individual fruit and vegetable gardens, and urban land used for agricultural production.
- 2.1.3 Motivate society as a whole to participate actively in agricultural public policy debates and issues.
- 2.1.4 Encourage government agencies to offer incentives such as insurance and other types of subsidies for sustainable agricultural systems.

GOAL 3

To strengthen the research and extension programs focused on the generation and dissemination of information and technology needed for the sustainable development and utilization of farmland, hydroponics, home fruit and vegetable gardens, urban land for agricultural production, plant nurseries, and forests in Puerto Rico.

Objective 3.1

To carry out multidisciplinary, cooperative and participatory research and/or extension projects on sustainable agriculture.

Strategies

- 3.1.1 Develop research and extension projects involving the members of the different departments of the CCA and other faculties and institutions.
- 3.1.2 Foster the research and extension activities of agro entrepreneurs, government agencies, nongovernmental organizations, and private entities.
- 3.1.3 Develop research and extension projects on farms, nurseries, and other units of private agricultural production.
- 3.1.4 Foster university and high school students' participation in research and extension projects involving sustainable agriculture practices.

Objective 3.2

To develop and validate the economic viability of production and marketing strategies which are environmentally and/or socially equitable.

Strategies

- 3.2.1 Evaluate the economic viability of sustainable practices developed by farmers and/or demonstration and research projects.
- 3.2.2 Select suitable clones, lines, races, and varieties for sustainable practices.
- 3.2.3 Identify and develop soil and crop management practices that can reduce erosion and maintain or enhance soil fertility and agricultural production.
- 3.2.4 Develop alternate methods to the use of pesticides and inorganic fertilizers through the use of beneficial organisms, agricultural residues, green manure, cover crops, intercrops, and other acceptable practices for the management of agricultural enterprises.
- 3.2.5 When necessary, develop practices for the judicious use of pesticides.
- 3.2.6 Develop sustainable practices for hydroponics, home fruit and vegetable gardens, urban land for agricultural production, forests, and plant nurseries.

Objective 3.3

To develop marketing strategies for local and overseas markets.

Strategies

- 3.3.1 Direct marketing efforts on farms.
- 3.3.2 Identify strategic areas with true market potential that could be served by direct delivery such as homes, businesses (food stores, produce markets, restaurants, and business offices), and institutions (hospitals, schools, churches, etc.).
- 3.3.3 Create markets for farmers in these strategic areas.
- 3.3.4 Develop an information network for the availability of locally grown agricultural products and their prices.
- 3.3.5 Promote local products through publications, radio and television programs, cultural festivities, and e-mail.

SCHEDULE AND BUDGET

SCHEDULE

The implementation of the plan will begin on or before October 2001. Since the plan is continuous and, consequently, does not have an end, CASCCA will update and revalidate it through an annual evaluation.

The following table describes the implementation and revision dates of the plan.

| ACTIVITY | Implementation date | Revision date |
|---------------|---------------------|---------------|
| Goal 1 | October 2001 | October 2002 |
| Objective 1.1 | October 2001 | October 2002 |
| Objective 1.2 | October 2001 | October 2002 |
| Objective 1.3 | October 2001 | October 2002 |
| Goal 2 | October 2001 | October 2002 |
| Objective 2.1 | October 2001 | October 2002 |
| Goal 3 | October 2001 | October 2002 |
| Objective 3.1 | October 2001 | October 2002 |
| Objective 3.2 | October 2001 | October 2002 |
| Objective 3.3 | October 2001 | October 2002 |

BUDGET

Costs related to the implementation of the plan will be partially covered by the CCA budget since the research, extension, and education programs will be focused on sustainable agriculture. However, the majority of the budget items will be mainly covered by external funds obtained through proposals submitted to local or Federal agencies and nongovernmental organizations.

The following table shows the activities that will be financed by the CCA and those in need of external funding as well.

| ACTIVITY | FUNDS |
|------------------------------|---------------------------|
| Goal 1; Objective 1.1 | |
| Strategy 1.1.1 | CCA Budget |
| Strategy 1.1.2 | CCA Budget |
| Goal 1; Objective 1.2 | |
| Strategy 1.2.1 | External Funds/CCA Budget |
| Strategy 1.2.2 | External Funds/CCA Budget |
| Goal 1; Objective 1.3 | |
| Strategy 1.3.1 | External Funds/CCA Budget |
| Strategy 1.3.2 | CCA Budget |
| Strategy 1.3.3 | External Funds/CCA Budget |
| Strategy 1.3.4 | CCA Budget |
| Strategy 1.3.5 | CCA Budget |
| Goal 2; Objective 2.1 | |
| Strategy 2.1.1 | CCA Budget |
| Strategy 2.1.2 | External Funds/CCA Budget |
| Strategy 2.1.3 | External Funds/CCA Budget |
| Strategy 2.1.4 | External Funds/CCA Budget |
| Goal 3; Objective 3.1 | |
| Strategy 3.1.1 | CCA Budget |
| Strategy 3.1.2 | External Funds/CCA Budget |
| Strategy 3.1.3 | External Funds/CCA Budget |
| Strategy 3.1.4 | External Funds/CCA Budget |
| Goal 3; Objective 3.2 | |
| Strategy 3.2.1 | External Funds/CCA Budget |
| Strategy 3.2.2 | External Funds/CCA Budget |
| Strategy 3.2.3 | CCA Budget |
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| Goal 3; Objective 3.3 | |
| Strategy 3.3.1 | External Funds/CCA Budget |
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| Strategy 3.3.3 | External Funds/CCA Budget |
| Strategy 3.3.4 | External Funds/CCA Budget |
| Strategy 3.3.5 | External Funds/CCA Budget |

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