

2

ZERO
HUNGER



END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

CASE STUDY: ITAIPU AND SDG 2

Activities by ITAIPU Binacional supporting implementation of the Sustainable Development Goal 2 (SDG 2) of the United Nations 2030 Agenda for Sustainable Development



2



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FOOD SECURITY AND
IMPROVED NUTRITION
AND PROMOTE
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AGRICULTURE**

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WHERE WE ARE



Integration that
generates Renewable
Energy and promotes
Sustainable Development



ITAIPU BINACIONAL AND THE UNITED NATIONS 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT

Itaipu is a binational entity created in 1974 by Brazil and Paraguay in order to utilize the Paraná River, along the border of the two countries, to generate hydropower. Today, the Itaipu Hydropower Plant is the largest generator of renewable power in the world (ITAIPU, 2018 a). As of 2018, Itaipu had generated a total of over 2.6 billion Megawatts-hour (MWh) since the beginning of its operation, in 1984 (ITAIPU, 2019 a).

Since its conception, Itaipu Binacional has followed sustainable development principles as reflected by its 15 strategic objectives and integrated actions and programs, supporting social well-being, economic growth and environmental protection, contributing to regional prosperity in Paraguay and Brazil. Itaipu's activities in the region have been recognized as excellent examples of "Best Practices" in the effective implementation of the United Nations 2030 Agenda for Sustainable Development and the Sustainable Development Goals (SDGs) (ITAIPU, 2019 b).



SDG 2: END HUNGER, ACHIEVE FOOD SECURITY AND IMPROVED NUTRITION AND PROMOTE SUSTAINABLE AGRICULTURE

Target 2.1: By 2030, end hunger and ensure access by all people, in particular the poor and people in vulnerable situations, including infants, to safe, nutritious and sufficient food all year round

Target 2.2: By 2030, end all forms of malnutrition, including achieving, by 2025, the internationally agreed targets on stunting and wasting in children under 5 years of age, and address the nutritional needs of adolescent girls, pregnant and lactating women and older persons

Target 2.3: By 2030, double the agricultural productivity and incomes of small-scale food producers, in particular women, indigenous peoples, family farmers, pastoralists and fishers, including through secure and equal access to land, other productive resources and inputs, knowledge, financial services, markets and opportunities for value addition and non-farm employment

Target 2.4: By 2030, ensure sustainable food production systems and implement resilient agricultural practices that increase productivity and production, that help maintain ecosystems, that strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters and that progressively improve land and soil quality

Target 2.5: By 2020, maintain the genetic diversity of seeds, cultivated plants and farmed and domesticated animals and their related wild species, including through soundly managed and diversified seed and plant banks at the national, regional and international levels, and promote access to and fair and equitable sharing of benefits arising from the utilization of genetic resources and associated traditional knowledge, as internationally agreed

Target 2.a: Increase investment, including through enhanced international cooperation, in rural infrastructure, agricultural research and extension services, technology development and plant and livestock gene banks in order to enhance agricultural productive capacity in developing countries, in particular least developed countries

Target 2.b: Correct and prevent trade restrictions and distortions in world agricultural markets, including through the parallel elimination of all forms of agricultural export subsidies and all export measures with equivalent effect, in accordance with the mandate of the Doha Development Round

Target 2.c: Adopt measures to ensure the proper functioning of food commodity markets and their derivatives and facilitate timely access to market information, including on food reserves, in order to help limit extreme food price volatility.

Source: United Nations.

ITAIPU BINACIONAL AND THE UNITED NATIONS 2030 AGENDA FOR SUSTAINABLE DEVELOPMENT



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SUSTAINABLE DEVELOPMENT STRATEGY OF ITAIPU

Itaipu's vision for 2020 is to be "the generator of clean, renewable energy with the best operating performance and the world's best sustainability practices, promoting sustainable development and regional integration" (ITAIPU, 2018 b).

For Itaipu, social responsibility is a major commitment, intrinsically linked to its management system, constituting one of its most important missions in its different lines of action. Itaipu follows policies and practices that promote prosperity and contribute to improving the well-being of the population in many communities, in both Paraguay and Brazil. The organization represents a powerful force in the advancement of sustainable regional development, helping to build more peaceful, inclusive, equitable and solidary societies. In Brazil, these actions have taken place mainly in the area of influence of the Reservoir and extend to many municipalities in the western region of the state of Paraná. In Paraguay, many of the actions have national coverage and benefit different regions of the country.

Within the social dimension of sustainable development, activities by Itaipu are designed to help to reduce poverty, increase food security and enhance nutrition, improve health, foster better education and promote equality with respect to gender, age, disabilities, race, religion, ethnicity and economic status. They also promote income generation, protection of children and adolescents, respect for human rights, justice for all, accountable institutions, conservation of biodiversity, and sustainable means of production and consumption. These activities are part of the Itaipu's Business Plan, which includes the corresponding programs and actions fully linked to strategic objectives and organizational policies and guidelines (ITAIPU, 2018 c)





UVA RÚSTICA
Niagara Branca





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ITAIPU AND THE SDG 2

ITAIPU conducts important activities related to the objectives of SDG 2 (end hunger, achieve food security, improve nutrition and promote sustainable agriculture). These activities are centered on promoting sustainable rural development and providing technical assistance for the introduction of organic and family farming, development of aquaculture, providing education for more nutritious meals served in schools, and soil and water conservation in agricultural systems.



1.

**SUSTAINABLE RURAL
DEVELOPMENT /
SUSTAINABLE
AGRICULTURE**



Itaipu Binacional

Objective and description

The purpose of this action is to promote sustainable rural development, and to reduce the use of contaminants in agriculture in the water runoff areas of the Reservoir and other relevant areas of Itaipu.

The program is implemented in both Brazil and Paraguay, and there are similarities and specific characteristics in each country, according to its regional features.

In Itaipu's area of influence on the Brazilian margin, the program promotes the diffusion of the agroecological production system through a network of Technical Assistance and Rural Extension (ATER), focused on organic production and in the process of conversion to it. Access to the network is free for all family farmers in the region. The network is based on the dissemination of sustainable production practices, with local productive arrangements between the sponsoring organizations (such as Itaipu and the Municipal Prefectures) and the executing

organizations and partners, supporting all farmers' associations and cooperatives of the project.

The program also supports research, development, and teaching of family and organic agriculture, meeting the demands of the region. This line of action is made possible through agreements with universities for specific training of teachers, researchers, and students, and the participation in the Network of Agroecology Research of Paraná. The initiative also supports technological innovation, such as the use of homeopathy in agriculture, the development of an organic no-tillage farming system, courses, seminars, and publications. Another line of action is the strengthening of the certification process and commercialization of organic products and family farming, which is done through the support and advice of associations and cooperatives.

The Sustainable Rural Development program also promotes the dissemination of the benefits of organic production to the population, seeking the creation of social, environmental, and commercial direct links from rural to urban locations. The links are established by supporting lectures in schools, promoting and participating in events with booths and promotional materials about family farming and organic production, and by supporting the sale of organic products from family agriculture in strategic places in order to reach the population in general.

The promotion of sustainable agriculture takes into account technical and economic aspects for the development and continuity of family farming. Therefore, the program encourages the diversification of production and the improvement of land management. This work is carried out periodically by ATER through technical advisory service visits to rural properties in intervals of 15 to 90 days, depending on the type of productive activity (ITAIPU, 2014).

ATER is able to promote the training and guidance of family farmers (including young people and women) on how to value, produce and recognize the use of the family workforce.

Implemented since mid-2002, this action has been improved and expanded so that now it is performed in 36 municipalities within the area of influence of Itaipu.

Related Targets

This action is directly linked to Target 2.3 on increasing agricultural productivity, Target 2.4 on ensuring sustainable food production systems, and Target 2.5 on maintaining genetic diversity. It is also consistent with Target 2.a related to investment in rural infrastructure and agricultural research. ATER is able to promote the training and guidance of family farmers (including young people and women) on how to value, produce and recognize the use of the family workforce.

Challenges

One of the greatest challenges of implementing this action, which includes structuring a complex program with a regional dimension, is the maintenance of a continuous planning of activities and actions with periodic review and monitoring to ensure the participation of stakeholders involved. Regarding the target audience, it used to be disorganized and focused solely on the very local market at the beginning of the project. It took a lot of effort from the partners involved in the program to generate a significant evolution in the quality, quantity, and variety of their products. Nowadays, the products are commercialized not only in the communities they are produced. Different associations from 36 municipalities of Paraná state are constantly in contact with one another, monitoring the demands and contacts with several supermarkets and local markets in a way that their products can reach a much broader area.

Increasing the production and consumption of organic food was another challenge that has been faced by expanding and maintaining the ATER network, developing current production chains, strengthening associations and cooperatives, supporting the research, development and teaching of Agroecology, and measuring socioeconomic results with the indicators. The institutional support of Itaipu has been fundamental in making the project viable during its 17 years of existence, by providing methodological, technical, and financial support.

Lessons learned

One of the main lessons learned in structuring a complex program with regional dimension is that there should be a continuous planning of activities and actions, with periodic review and monitoring, ensuring the participation of the stakeholders involved. What contributed to the success of the practice was the adaptation and creation of participative methodologies for



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the development of ATER, the agro-industrialization and commercialization actions, and their integration. In this process, it was essential to have an active Steering Committee with the participation of the institutions involved in the project.

Results

Since the beginning of the project, there has been a significant evolution in the quality, quantity and variety of products. In addition to effectively placing their products in the market, participating organizations have also sought to invest and expand their agro-industries and retail outlets. Although there were only 188 beneficiaries at the beginning of the program, the initiative currently serves approximately 2,500 families, including indigenous communities. In 2018, 3,539 technical advisory service visits were conducted on rural properties, along with 169 group training activities with the participation of 2,666 farmers. Furthermore, 16 farmer associations with 110 group activities and 1,452 participants were advised.

Another important activity with the seven cooperatives and 135 family agriculture businesses is focused on labeling, brand, nutritional information, and standardization of products, with the aim of expanding the commercialization with greater added value to the

products, thereby providing income improvement and economic development. The program also has an action that encourages the use of medicinal and phytotherapeutic plants in the municipalities, which has demonstration units, production and distribution of seedlings.

It is also connected to actions of the Environmental Education program, which promotes healthy recipe courses for the training of nutritionists and cooks in food safety, healthy eating, food reuse and environmental conservation. These actions assist in the implementation of municipal school feeding programs to increase the quality and quantity of healthy foods from family farms, promoting students health and regional development.

Itaipu monitors the results of these actions by following up on the monthly reports sent by the managers of the current contracts and agreements, and comparing these to the pre-established goals, seeking to execute them and correct possible obstacles to the success of the work. In addition, Itaipu monitors the execution in the field, verifying the quality of the service. The project also has an active Steering Committee, which meets every 60 days. The committee is composed of organizations representing civil society, farmers and governments, and allows active participation of their peers. In the meetings, the guidelines, actions, and assessments of the program are created, guaranteeing the legitimacy of the results achieved.



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2.

INNOVATIVE TECHNOLOGICAL ASSISTANCE AND MODERNIZATION OF FAMILY FARMING



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Objective and description

The initiative in Paraguay embraces two actions: (1) Modernization of Family Farming with focus on conservation agriculture, integration into value chain and financial strengthening, and (2) Innovative Technological Assistance to Family Farming (ATIAF).

The action to modernize family farming contributes to improving the living conditions and income of rural producers, promoting the strengthening of agricultural production ventures aimed at integrating markets to regional value chains through services and inputs in order to consolidate technological modernization, increase productivity, and improve the income of families in situations of poverty and extreme poverty in rural settlements. By strengthening the farming families financially, a goal of sustainability can be reached.

ATIAF aims to support the presence of the State in communities of low-income and family producers, leading to innovation and technological incorporation that will improve and modernize the production systems, increase productivity, and encourage diversification of consumption and income crops with good market demand. Such innovation will become a means of achieving the socioe-

conomic progress of families in the beneficiary communities.

Itaipu finances the initiatives supporting these actions in which professionals are hired to advise producers, oversee activities, and generate reports. With the data provided, Itaipu supervises the activities in order to corroborate the correct management and fulfill the goals. These actions have been implemented since 2014, with the second action beginning in June 2019, in Itaipu's areas of influence. The actions were implemented in seven departments, 32 districts, and more than 130 communities in Paraguay.

Related Targets

These initiatives are most directly linked to Target 2.3, as the works are focused on increasing productivity and working with low-income producers, with broad participation of female heads of household.

These initiatives are also directly linked to Target 2.4. With the increase of the profitability of producers, there is less migration to cities and more diversification of items produced, so that families can settle old accounts and generate new dividends for the sector.

Challenges

For the modernization of family farming, a historical challenge was mainly related to cultural change in several aspects. The first challenge was related to the move from conventional family farming with little to no mechanized productive activity, to modernized family farming that included mechanized activities from soil preparation to planting. The second aspect is that, originally, family farming used to be based on mechanization practices that included moving the soil and incorporating organic matter without agricultural conservation practices. Through the actions implemented, a cultural change was achieved so that conservation practices such as direct planting, crop rotation, and planting green cover-crops could be implemented in 60% of the coverage area.

With regards to topographic and logistical challenges, the actions being implemented in highly dispersed areas, with great distances to travel and very different productive ecosystems. All this translates into

implemented actions that were logistically complex to undertake. As a result, corrective actions were taken by hiring local personnel to use applications for monitoring and supervising the work. Over time it became possible to maintain an inter-institutional executive committee that, through weekly reviews, was able to keep pace with the project.

Lessons Learned

For the modernization of family farming, several lessons learned can be mentioned. One of the main lessons is that any action related to the generation of income and productivity must begin in a timely manner. Normally due to administrative processes, the start date of the project has not always coincided with the ideal sowing date of the selected crops. This lesson learned is mainly related to the agricultural calendar.

Another very important lesson learned is the appropriate selection of beneficiaries by the Ministry of Agriculture and Livestock, so that the actions to be implemented



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by the project can have positive effects mostly focused on farming families that can be served in the future by the Ministry.

Adequate selection of plots to implement the project with quality is crucial. This lesson is related to the selection of beneficiaries and the agricultural calendar.

High participation of women in the action implemented is equally crucial. On average, projects financed by Itaipu have had an average of 43% participation of women farmers, which provides differentiated results when properly investing the income generated by the project. It has been possible to promote and maintain a high participation of women in an agricultural project normally associated culturally only to male producers.

Hiring local businesses for mechanization services was also a lesson learned over the years. It is necessary to develop local suppliers that can provide mechanization services to continue energizing local economies through direct investment of the project by hiring local labor, services and machinery from the communities themselves. This implies greater investment in the control and monitoring of the project. Although the quality of the work may vary, it is certain that the development of micro and small mechanization services companies would achieve the long-desired goal of farmers who have managed to escape poverty. This will provide the opportunity for the Ministry to serve new beneficiaries and to provide differentiated technical assistance.

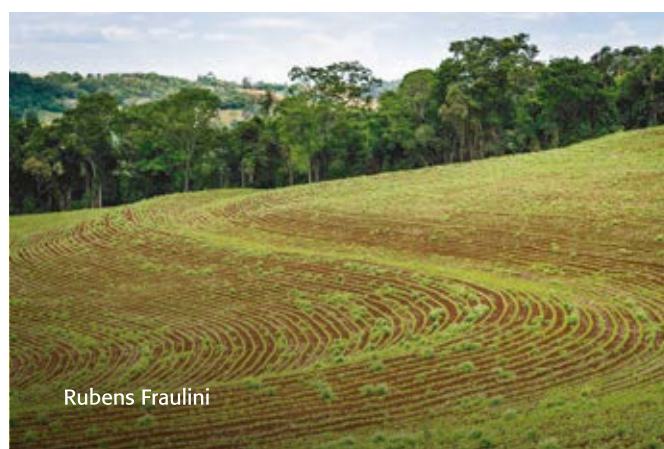
Quality of supplies to be delivered is also an important lesson learned. It is always necessary to maintain high standards for the inputs acquired by the project, so that these inputs can have the desired impact on increasing the yields of the crops that are being produced in order to maintain the income generation as high as possible.

Finally, the introduction of technology for monitoring and project management was an equally important lesson learned. Through the use of the FieldSight application, the use of paper for the registration of field work can be reduced to almost nothing, which increases the quality of the verification of the work, the quality of the data obtained, and the access to accurate information almost in real time.

Results

As a result of these initiatives, over 8,000 families have benefitted (almost 44% headed by women) in six different areas of Paraguay: Concepción, Caaguazú, Alto Paraná, San Pedro, Caazapá, and Canindeyú. The modernization of family agriculture has resulted in over 10,000 hectares of certified plantation of crops such as corn, sesame, soy, cotton, and green fertilizers using both conventional and direct planting methods (See figures below).

A schedule of inspections for plots was created. Surveys were also carried out with producers, technicians, and contributors. Evaluation workshops were also held in conjunction with those involved in the project. The municipality is not involved in all the communities, but it is always a matter of keeping them aware of the activities via the Ministry of Agriculture. Verification was also implemented via UAVs (Unmanned Aerial Vehicles) since the FieldSight system generates GPS points of each of the beneficiary's plots. As a result, the technicians of the Operational Support Division can fly over the same plot in order to access maps and photos of the communities to make comparisons.



Rubens Fraulini

Concepción
2,024 beneficiaries

San Pedro
3,676 beneficiaries

Caaguazú
1,002 beneficiaries

Caazapá
131 beneficiaries

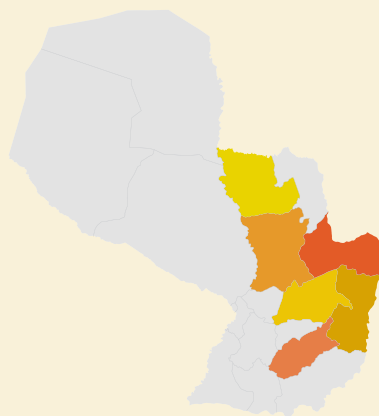
Alto Paraná
308 beneficiaries

Canindeyú
1,037 beneficiaries



8,184 families benefited

*Results until June of 2019



MEN
4,594 beneficiaries



WOMEN
3,588 beneficiaries



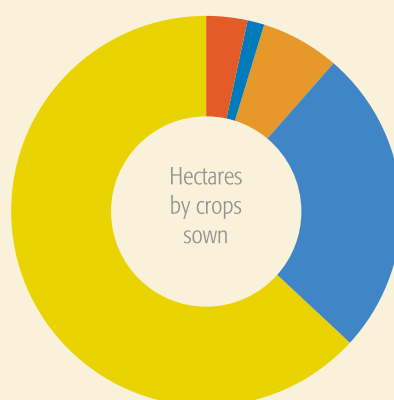
CORN
6,642 ha

SESAME
2,654 ha

SOY
674 ha

COTTON
169 ha

**GREEN
MANURE**
346 HS



**Conventional
Planting**

3,840 ha

**Direct
Planting**

6,545 ha

10,385 verified hectares planted

*Results until June of 2019

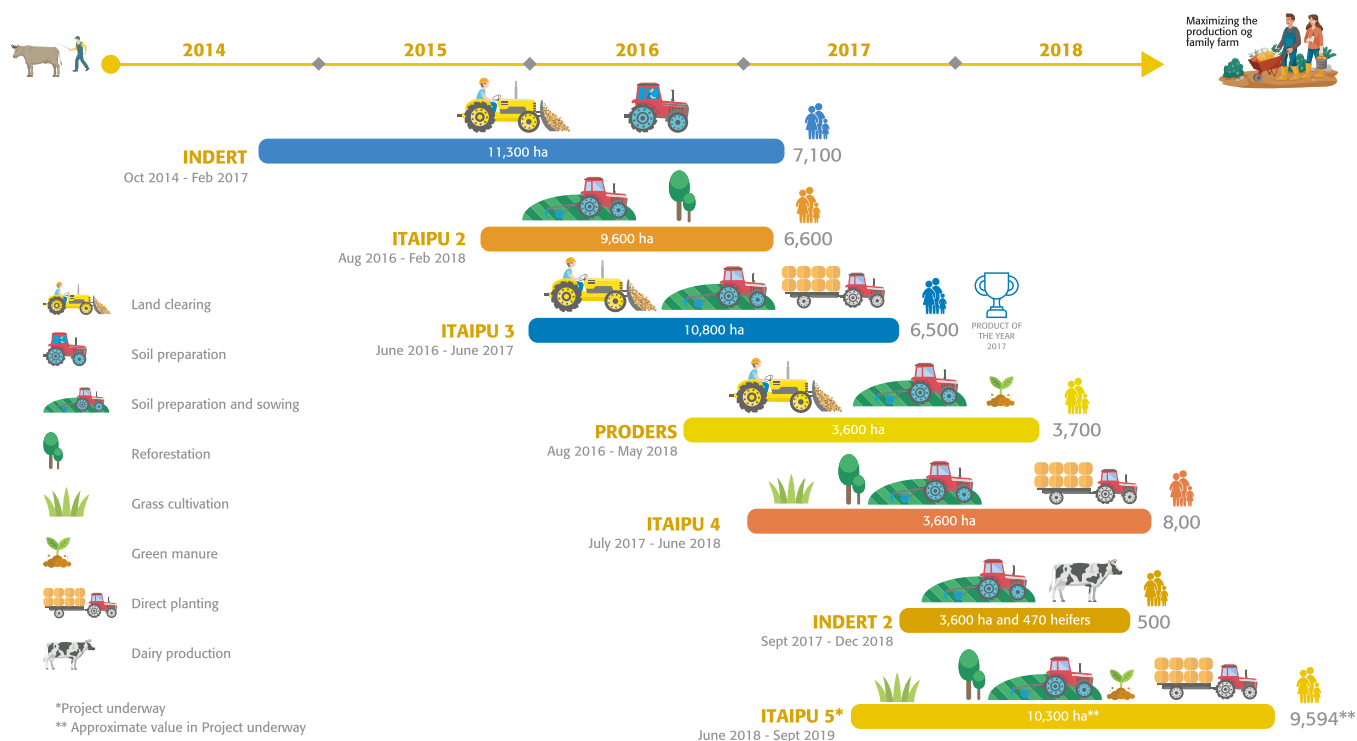


Project investment in soil preparation and consumables

4,850,000 \$US

Total estimated Project Income

5,965,500 \$US





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3.

**FISH
PRODUCTION**



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Objective and description

The most important objectives of this program are water security, the conservation of natural resources used by aquaculture systems and the social and economic development of Itaipu's area of influence.

To reach aquaculture sustainability, Itaipu supports the development and diffusion of new technologies and technical assistance to benefit all communities that use the Reservoir and land areas to produce fish as a means of economic income, such as professional fishermen, indigenous people and riverside communities.

The improvement of fish aquaculture in the Reservoir is made by using a technical protocol developed by Itaipu and partners. The protocol involves native fish breeding, aquaculture trainings and donating fingerlings and equipments to small scale producers for the first production cycle. The fish culture system used in this program involves the production on net cages with higher densities of fish per cubic meter. This protocol has promoted significant improvement in the potential of fish culture in the hydroelectric power plant reservoirs (Beveridge, 2004).

At the same time, team works on the improvement of sustainable aquaculture technology, such as the Biofloc system, which allows significant increase of water efficiency and quality if compared to the traditional models commonly used in the west of Paraná state. Biofloc is a technique that promotes microorganisms' enhancement in a closed aquaculture system with water recirculation. In such closed system, the same water is used through the production cycle. The bacteria,

protozoans and other microscopic organisms promote the water quality, avoiding contamination of local waters. Besides water efficiency, the closed model provides biological and water security through the areas that influence Itaipu's Reservoir.

Related Targets

The action is most directly linked to Target 2.3 of increasing agricultural productivity of small-scale food producers including artisanal fishermen. Despite the substantial increase in fishing production upstream of large dams, over the years the fisheries in these environments have shown a decreasing trend or stagnation. In the other hand, fish farming can substitute fisheries and promote sustainable living to riverside communities and small scale fishermen. Net cage aquaculture presents an immense potential to be explored, as freshwater net cage aquaculture has been increasing in all Brazilian regions in recent years and already represents 8% of national aquaculture production system (Brabo et al., 2014; Ministério da Pesca e Aquicultura, 2013). The cultivation of fish in Brazilian Reservoirs can promote a great increase in aquaculture production, creating conditions to attract new investors and to generate employment and income (Ayroza et al., 2006).

Another related target for this action is Target 2.4 of ensuring sustainable food production. In fish farming, only 25% of the nutrient used (approximately) in the fish food pellets is retained in fish biomass production (Crab, 2010). The remainder is carried away by the effluent and can reach and generate problems of several

kinds in the rivers where they drain. In western Paraná, which is the largest producer of tilapia (*Tilapia rendalli*) in Brazil, there is a great risk to the conservation of water resources, which are very important to the area of influence surrounding the Itaipu Reservoir. Therefore, the adoption of models or technologies that allow greater water efficiency and food production is fundamental.

Closed systems, such as Biofloc (BFT), based on biochemical processes, allows the recycling and reusing of nutrients (especially nitrogenous and phosphates), by means of bacterial action, allowing for greater efficiency in the utilization of the feed offered to the aquatic animals. Itaipu has invested in research and development with BFT, mainly in the production of fingerlings and native species.

Challenges

The greatest challenges in implementing this action are the following: developing a technological package for the production of native fish in net cages adapted to the reality of the target public, standardization and regularization of the aquaculture areas (in the Itaipu Reservoir) for aquaculture purposes, environmental licensing, difficulties in accessing credit, and organizing and coordinating groups in the execution of the harvesting. The difficulty of the transition from fishing to productive activity is also of note.

The potential that aquaculture presents is made difficult in large part by the lack of studies about carrying capacity of reservoirs, the impacts of introduced fish species, by legal aspects related to the environmental licensing process for the practice of this activity in Brazil and by the disruption of its productive chain (Brabo et al., 2014). In addition, in Brazil, the first initiatives for net cage fish farming ran into problems mainly caused by the lack of knowledge on the part of producers and technicians, and by the lack of commercially available feed that was nutritionally adequate to meet fish requirements (Ostrensky et al., 2008).

Lessons Learned

Before implementing this action, it is necessary to evaluate the environmental regulations and laws for the implementation and installation of net cages in large reservoirs. Studies should be carried out to assess the production capacity of the environment in question in order to avoid future pollution and other ecological problems in the aquatic environment. A partnership between technical assistance and rural extension entities should be established in order to guarantee parameters for the production quality and encourage the consumption of fish in the region in order to strengthen the production chain. In relation to the expansion of the use of more

Results

The main results of this action were the following: there was no fish farming by the community at the beginning of the program, and now, 202 tons per year are cultivated, which are used exclusively in local commerce and thus provide substantial income generation and improved nutrition. Currently, there are families that live exclusively from the commercialization of fish from the Itaipu Reservoir. In the production of fry for fattening in net cages, the significant increase in water efficiency stands out. Currently, about 100 to 500 liters of water are used per kg of fish, which is much less compared to the more than 15,000 to 25,000 liters in more conventional systems in excavated nurseries.

The results of this action are monitored by recording fish production by aquaculture. Production information is collected through visits to production sites. In addition, technicians responsible for technical assistance prepare bi-monthly reports with relevant information, such as the quantity of fish stocked, net cages in production, the amount of fish stocked in the period, the average price of the sale, venues of sale, the cost of the feed, etc. Furthermore, the development of research projects in conjunction with universities enables the production of zootechnical and environmental indicators related to sustainable farming, such as BFT.



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4.

**EDUCATION FOR
SUSTAINABILITY IN
AGRICULTURE AND FOOD
SECURITY**



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Objective and Description

The objective of this initiative is to promote environmental and economic sustainability within the scope of securing agricultural food sources and nutritional security in the operational territory of Itaipu in Brazil (all 55 municipalities), thus encouraging the development of healthy living practices. This initiative has been in action since 2007.

Itaipu carries out this action in compliance with the principles of government programs such as the National School Feeding Program (PNAE) and the National Sustainable Rural Development Plan (PNDRSS). It is a continuous training process for nutritionists and cooks who work in the municipalities involved. It prioritizes locally produced foods, minimizing environmental impacts of production and boosting the local economy.

In partnership with municipalities, Itaipu offers training courses and organizes healthy recipe contests developed by the cooks who prepare school meals. The selected recipes make up a "healthy recipe book" distributed to all schools and municipal secretariats of education that can use it as a pedagogical tool to improve nutrition in their communities.

In this context, the rural extension promoted by Itaipu and partners plays an important complementary role in the research and generation of agricultural knowledge and its diffusion to the rural environment, mainly by working with more sustainable practices and producing organic food.

Related Targets

The targets related to this initiative are Targets 2.1 and 2.4. By working directly with local cooks who prepare school meals, this initiative helps to ensure access by all people, in particular the poor and people in vulnerable situations who attend these schools, to safe, nutritious and sufficient food all year round, and thus is related to Target 2.1.

By prioritizing locally produced foods that are specifically known to have minimal environmental impact, this program encourages sustainable food production systems that help maintain ecosystems, strengthen capacity for adaptation to climate change, and progressively improve land and soil quality, thus relating the initiative to Target 2.4.

Challenges

One challenge was the acceptance of change by the cooks. The cooks who were used to receiving canned food from suppliers started receiving food to be processed instead, which caused changes in thought and routine in the school kitchens. Another challenge was the resistance from municipal education secretariats to organize a new purchasing system that would give value to local production. At this stage of re-education and reorganization, the continuing education courses and healthy recipe contests were fundamental for the acceptance and change in the behavior of the population involved.

Lessons learned

There was greater integration among the segments involved in school meals, such as nutritionists, cooks, technical assistance and families of the farmers, bringing the relationship between production and consumption closer. The use of locally sourced food has resulted in both quality increases and financial empowerment of the small farmer and the retailer, who sells products to the small farmer. This cycle of short chains in the commercialization of family agriculture and public policies contributed to the guarantee of sales and to the safety of planting, keeping small farmers in the field and improving the quality of life of the farmers and the population.

Results

- Training of 480 nutritionists and cooks
- Over 1,000 school lunch women participate in competitions
169 recipes published in healthy recipe books
- Approximately US\$ 60,000 distributed in prizes
Promoting local family farming
- Integrating school feeding management, the ATER network (Brazilian Entity for Technical Assistance and Rural Extension), farmers and cooks
- Contributing to the drafting of the National Law that determines hiring a nutritionist for the PNAE
- Contributing to the implementation of municipal public policies and fields of action complementary to the PNAE





5.

**SOIL AND WATER
CONSERVATION IN
AGRICULTURAL
ECOSYSTEMS**



Rubens Fraulini

Objective and Description

The adoption of sustainable systems of agricultural production is fundamental to supply the growing food demand of the world population. Soil and water management practices are important in this matter, for they increase productivity and production, which helps maintain ecosystems.

Since 1988, Itaipu has implemented soil and water conservation activities in its area of influence to reduce the introduction of sediments, nutrients and pesticides into the tributaries, rivers and Reservoir, with some of the actions also contributing to improve agricultural ecosystems. The activity was initially limited to the territory of the 16 municipalities bordering the Reservoir on the Brazilian margin. It has gradually been expanded, reaching a territory of 55 municipalities, 54 in the western region of the state of Paraná and one in the state of Mato Grosso do Sul. In addition, the set of actions has been improved in accordance with both physical and socioeconomic changes in the region.

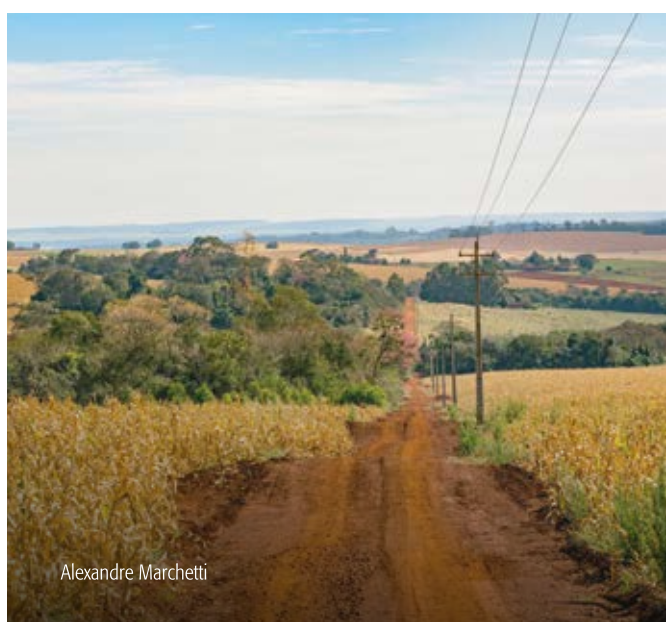
In order to enable the implementation of corrective actions to environmental problems in the region, a previous diagnose of the agricultural area is done and some management practices are recommended. The use of good soil management practices, such as the Direct Planting System (Sistema de Plantio Direto – SPD) may be recommended. The system adopts technical-scientific fundamentals, such as: i) no-till farming; ii) permanent land cover; (iii) rotation and diversification of crops; and (iv) maximization of the presence of live roots in the soil.

The rotation and diversification of crops is an agricultural conservation technique that aims at reducing soil exhaustion. One of the most important benefits associated to it involves the nutrient recycling; thus, the proper planning of crop rotation allows the use of plant species characterized by root systems capable of reaching different depths, which allows the utilization of nutrients stored in different layers in the soil profile. Crop rotation also allows the combination and/or alternation of plants with different nutritional requirements and ability to

absorb nutrients. Hence, nutrients that are not absorbed by a given plant can be harnessed by other plant species and, upon decomposition of the haystack, become available.

Crop rotation also influences the efficiency of extraction and utilization of nutrients applied as fertilizers, which brings economic and environmental benefits. The major responsible for the higher rotation efficiency was the inclusion of corn crop, which, in the state of Paraná, Brazil, is commonly used to rotate with soy and wheat crops. Such practice helps to ensure sustainable food production systems as it can be considered an agricultural practice that increases productivity and production.

Practices of water and soil conservation bring a number of benefits, such as reduction of soil erosion, improved maintenance of organic matter and increase of its stock in the soil, improved soil water infiltration and retention capacity, reduction of water losses by evaporation, regularization of the flow regime of the water courses, and the reduction of the maximum flows and increase of the minimum flows, which reduces the risk of flooding; reduction of agricultural risk caused by drought; and the physical, chemical and biological non-degradation of the soil or its gradual recovery.



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Related Targets

This action is directly related to Target 2.4, as it ensures sustainable food production systems and implements resilient agricultural practices that increase productivity and production, help maintain the current agricultural ecosystems and strengthen capacity for adaptation to climate change, extreme weather, drought, flooding and other disasters through its improvement of land and soil quality.

Challenges

The belief held by a large part of the rural producers that the Direct Planting System (Sistema de Plantio Direto – SPD) is a self-sufficient method for erosion control has led to a lack of commitment to the implantation, remodeling and maintenance of terraces, which is also a very important element of best practices.

The SPD method itself has some challenges in this region:

- Clay to very clayey soils required the adaptation of machinery to suit the socioeconomic reality of family producers, who have limited capital and small tractors
- The region lacked a defined dry season and had hot and humid summers, creating the need for technologies to overcome the climatic conditions that led to the rapid decomposition of the straw used at the soil surface as protective cover
- Rural producers resisted the rotation and diversification of cover crops in the SPD, one of the technical-scientific pillars of the system, even with the availability of rotation and diversification models with species of economical return

In the case of municipalities, there is a shortage of human resources with technical qualification for the development of projects and execution of environmental actions, as well as the shortage of machinery and financial resources.

Lessons Learned

It was necessary to carry out projects to raise awareness and capacity of the communities in relation to the theme of soil and water, having the systemic vision from the local to the global as a guiding principle.

Partnerships with farmers, municipalities and institutions linked to education, research and technical assistance for the implementation of solutions to environmental problems, whether through innovation arising from research and development, or through the diffusion and execution of already proven technologies, have proved to be an adequate corporate action strategy to seek the commitment of the partners with the continuity of the projects. However, the main limiting factor for these actions is the lack of financial and human resources in the partner institutions.

The success of this action strategy depends on the effective participation of the partners in all stages of the action, which includes environmental diagnosis, planning, projects and execution.

In relation to SPD, there is a need to develop and validate a methodology for evaluating the quality of the direct planting system within a set of parameters, with the elaboration of a system improvement plan for each farm, identifying its strengths and weaknesses. Awards and recognition to the best-ranked producers regarding the quality of the SPD adopted in their rural properties are measures that are also part of the strategy to promote the full adoption of the practices and technologies that make up the SPD's technical-scientific foundations.

Results

Results are measured through the mapping of the actions performed in the areas by using geoprocessing tools. Research, development and innovation projects are aimed at establishing new methodologies for monitoring the effectiveness of environmental actions

implemented in terms of soil and water conservation.

Currently, there are 421 areas with planned and ongoing soil and water conservation actions, as shown on the table below:

Quantitative of activities performed in agricultural areas

Activities	Amount
Community suppliers	202 units
Road Improvements	1,284 km
Roadway covered with gravel	1,932 km
Roadway covered with polyhedral paving	149 km
Fence construction in APP	1,344 km
Soil conservation	39,514 ha
Manure spreaders	299 units
Protection of springs	166 units
Terracing plough	18 units

Training (both theory and field practice) has also been conducted for thousands of rural producers and technicians linked to public and private technical assistance, regarding themes such as:

- Seed production of hedging plants
- Management of soil cover plants as a straw formation strategy
- Rotation and diversification of crops
- Agricultural mechanization to minimize soil mobilization at sowing
- Control of invasive plants
- Fertility management of the production system
- Pest and disease management in the SPD
- Application of the IQP for the monitoring and management of the quality of the SPD
- Application of DRES for soil quality monitoring
- Adoption of DRES as a standard method, by the COAMO and COCAMAR cooperatives and the EMATER Institute
- Elaboration of sizing projects of integrated agricultural terracing systems and adaptation of road systems



CONCLUSIONS



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The sustainable development strategy of Itaipu and its comprehensive program of activities related to ending hunger, achieving food security, improving nutrition and supporting sustainable agriculture can be seen through its sustainable agriculture and rural development programs, including its nutritional training initiative, its fish production, its water and soil conservation activities, and its innovative technological assistance and modernization of family farming. These all represent excellent examples of the implementation in the field of SDG2 and the UN 2030 Agenda for Sustainable Development.

The strong connection between ending hunger and sustainable modern farming and agricultural practices is evident for Itaipu, and the current activities and policies related to reducing hunger and improving nutrition in its area of influence are key to supporting global efforts on ending poverty and increasing nutrition in a sustainable manner.

Aware of the positive impacts that a healthy, well-fed community can have on society, Itaipu has been implementing a comprehensive and extensive program for the well-being of the local community. These initiatives have resulted in a net increase in food security in family households, as a result of healthier and more sustainable food in schools and from local family farms and fish farms, more modern and resilient agricultural practices, and more secure and sustainable food sources.



INTERLINKAGES WITH OTHER SDGs

Our actions in the SDGs

Our approach - Integrated actions in the territory

Activities related to sustainable agriculture and food security (SDG 2) can be interlinked with many of the other SDGs. There is a clear link to SDG 3 (Good Health and Well-Being), as nutritious food will lead to good health and better well-being. The educational training on agricultural practices is linked to SDG 4 (Education).

SDG 6 on clean water and sanitation is also interrelated to Itaipu given the efforts in soil and water conservation and fish production. The sustainable agriculture and modern family farming practices are also linked to SDG 15 (Terrestrial ecosystems).

Rural Development and Sustainable Agriculture

 **2,500** benefited families including indigenous families

 In 2018, **3,539** technical advisory service visits

 169 group training activities with the participation of **2,666 farmers**.

 16 farmer associations with **110 group activities** and **1,452 participants** were advised

Fish Farming

 Over **200 tons** of fish produced annually in the area due to fish farming.

Sustainable Agriculture Education

 Training **480** nutritionists and cooks

 Over **1,000** school lunch ladies participate in competitions.

Family Farming

 Over **8,000 families** were beneficiaries (almost **44%** headed by women) in Paraguay.


 **10,000** hectares of certified plantation of crops.

EDUCATION AND GOOD HEALTH

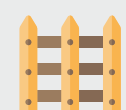


 **69 recipes** published in healthy recipe books.

CONSERVATION ACTIVITIES

 Soil conservation area **39,500 ha**

 Road improvements **1,284 Km**

 Fence construction **1,344 Km**



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