



Strategic and Operational Guidelines for Hydroenvironmental Development in Hydrographic Microbasins in Northeastern Brazil Semiarid Region

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Abstract

The objective of this paper is to support rural leaderships, hydroenvironmental technicians and governmental authorities engaged in planning and execution of integrated actions focused on the rational soil and natural resource use to fight environmental degradation through hydroenvironmental development projects.

Strategic and operational guidelines suggested by this paper have been taken from "PRODHAM-1999 Technical-Operational Manual", as properly improved over ten years of experimentation during the implantation of Ceará Hydroenvironmental Development Project. Therefore, for replication of PRODHAM experience in other hydrographic microbasins located in Northeastern Brazil semiarid region, the following strategic elements are suggested: hydrographic microbasin, inter-institutional and benefited communities' involvement, a participative diagnosis and environmental education of target population. Recommended guidelines should be focused on vegetation recovery, soil conservation/reclamation, water resource quality and quantity, environmental education, organizational strengthening, and development of traditional and alternative production systems.

Operational guidelines suggested in this work, on the other hand, refer to: criteria and guidance for the selection of microbasins to be benefited, strategies for mobilization and sensitization, and monitoring of works.

Finally, operational and behavioral recommendations to be considered in new projects include: a) skilled and motivated technical staff; b) existence of a sponsor (governor, secretary, etc.) for the project; c) allocated and available funds; d) agility and feedback (evaluation) of project actions; e) friendly and professional relationship with community leaderships; f) presence, at least weekly, of a technical representative of project in work sites; g) excellence of quality of services and events performed; h) avoidance of political parties, unions and local groups' interferences; i) effective involvement of institutions; and j) equal treatment of project beneficiaries.

Key words: Semiarid, Ceará, hydroenvironmental development; hydrographic basin.

1 INTRODUCTION

The objective of this paper is to provide technical support to professionals and managers engaged in planning and execution of public policies against environmental degradation in Northeast Brazil semiarid region, to support actions focused on rational soil and natural resource uses to increase agricultural productivity, maintain the productive potential of semiarid land and environmental sustainability.

It is in that environment of low profitability where it is necessary to create under scientific and technological basis, natural resource preservation and recovery programs that would lead to the implementation of competitive and ecologically sustainable economic activities.

Therefore, proposals contained in this paper result from the experience of the Secretary of Water Resources of the State of Ceará (SRH-CE) jointly with the Superintendence of Hydraulic Works (SOHIDRA) and Ceará Meteorology Foundation (FUNCEME), which designed, executed and evaluated Ceará Hydroenvironmental Development Project (PRODHAM) over 1999-2009 period. The Project developed, at pilot level, articulated and sustainable environmental resource recovery/preservation and socioeconomic development actions in ecosystems/regions and rural communities in four selected hydrographic microbasins. The Project was financially supported by the World Bank.

PRODHAM actions were developed in hydrographic microbasins of Cangati river in the municipality of Canindé; Pesqueiro River in the municipality of Aratuba; Batoque River in the municipality of Paramoti; and Salgado/Oiticica Rivers in the municipalities of Pacoti and Palmácia.

The innovative posture of SRH that, from the simple execution of water infrastructure works, which is its basic mission, also moved to the development of complementary programs and projects, without which both the longevity of infrastructure works and the quality and quantity of accumulated water resources and other natural resources upstream and downstream to reservoirs and perennialized rivers would be seriously endangered.

This way, strategic and operational guidelines suggested in this paper are based on both PRODHAM works guidance documents (SRH-CE, 2010a), and those containing geoenvironmental and socioeconomic evaluations included in SRH-CE.FUNCEME (2010b) and França (2010), respectively.

2. BRIEF PRODHAM CHARACTERIZATION: PILOT PROJECT

PRODHAM, as a pilot, experimental project designed for hydroenvironmental recovery and preservation of four hydrographic microbasins located in degraded areas of Ceará semiarid region, promoted water and environmental resource sustainability, having man as its focal point.

PRODHAM strategy was operating at physical, economic, social and environmental levels. At physical level, by implanting works that contributed to soil, water and vegetation preservation. At economic level, by implementing actions that fostered the rational use of soil, identification of and qualification in non-agricultural economic activities, to prevent pressures on local natural resources. At social level, by implementing actions to strengthen citizenship, such as capacity building and incentive for organizational process. At environmental level, by educating on the environment

preservation, control of ground clearing by fire, implantation of forest reserves, recovery of ciliary forests, and campaigns for domestic waste recycling control.

As such, PROGRAM operates in two fronts: physical-environmental and educational. For that, it implanted hydroenvironmental infrastructure works (successive dams for sediment retention, underground dams, stone barriers, contour terraces, plate cisterns, etc.), and held awareness events focused on HMB degradation (recomposition of ciliary forest, reforestation, dry farming, reclamation of degraded areas, , etc.).

The original design of project included the evaluation of implanted works aimed at a far-reaching diffusion of methodologies and practices tested and adapted for adoption in different areas of the State of Ceará semiarid region.

2. STRATEGIC HYDROENVIRONMENTAL DEVELOPMENT ACTIONS

Strategic actions to support hydroenvironmental development projects should include the hydrographic microbasin as a planning unit, the involvement of local communities in work process, participatory diagnosis, and environmental education to change the target population's mindset.

2.1 Hydrographic Microbasin (HMB)

Focus on HMB is based on the fact that it is a basic planning and operation unit for the sustainable development of agricultural activities in that physical space, thus allowing a better use, management and conservation of soil, natural resources including water, flora and fauna, reflecting on the social organization of population of the hydrographic basin of a region.

According to Fernandes; Souza (1994),

“Approaches to planning and management, which adopt the hydrographic basin as a basic work unit, are more adequate to make production consistent with environmental preservation; as natural geographic units, hydrographic microbasins have integrated geophysical and social characteristics.”

This way, promoting actions for integrated, sustainable rural development where the hydrographic microbasin is the planning unit, and the producer organization is the action strategy, is the best work process to obtain gains of productivity and use of adequate technologies from environmental, economic and social standpoint (OLIVEIRA, 1999).

2.2 Inter-institutional and Selected Area Community Involvement

Execution of rural development works includes and requires the active involvement of the whole population of selected areas, support to association development (organization, transparency, autonomy, operation capacity, etc.), incentive to social inclusion in associative movement (especially women and youngsters), and organized participation of several rural social actors in planning and relevant public policies.

It also assumes the development of a community awareness work focused on their permanent responsibility for the hydroenvironmental recovery/preservation, in partnership with community associations in selected hydrographic microbasins.

2.3 Participatory Socioeconomic and Biophysical Diagnosis

For rural projects where there is a great involvement of local communities, prior understanding of local reality is critical for action planning, failure minimization, and beneficiaries' spontaneous involvement and their long-term commitment.

Two types of diagnoses should be made. One is the fast participatory diagnosis (FPD), which consists of the search of understanding the community's real reality, taking into account their history, social, productive, cultural, economic, environmental and organizational relations, as well as the population's life conditions.

Tillmann and Salas (1994), upon considering FDP, declared that:

“diagnosis requires a dive into reality, by analyzing its recent evolution, endogenous factors (internal) e and exogenous factors (external) that currently exert some influence, and what promotes and restrains the territory development”.

Therefore, FDP objectives include:

- a) understanding how the involved community perceives their most intense problems;
- b) working with people to help them to improve their life conditions;
- c) qualifying people to analyze their problems using different elements; and
- d) supporting the people make them decide to act collectively.

The second type, derived from a sampling, secondary field survey, is characterized by a picture of the initial project stage called *baseline* or zero point. It basically contemplates the socioeconomic aspects in communities and usually provides information for the construction of project evaluation indicator matrix, the results of which are used as the Base Year of indicator matrix. Report of Cangati River microbasin Baseline was published by SRH-CE (2005).

2.4 Benefited Population's Environmental Education

Taking into account that hydroenvironmental development project success in HMB requires a change of paradigms related to the environment, the following actions are suggested for the good performance of proposed project:

- a) making the benefited population aware, informed and knowledgeable of environmental issues that are most related to HMB reality, and developing small community activities in this sense;
- b) incorporating the environmental education topic in school routine through a systematic and interdisciplinary methodology, to allow the student to develop

their environmental awareness, where each topic will be a subsidy and a requirement for the next topic in an permanent process of knowledge production and construction;

- c) capacity building of the project technical staff, multipliers and target population, by encouraging their participation in relevant courses and events, promoting the interchange of experience and investments in learning material, thus creating a new perspective in the educational process;
- d) use of several education environments and a wide range of communication methods (activities, games, reading, experience interchange) that allowed the student to obtain knowledge on the environment, by stressing practical activities and personal experiences; and
- e) valuation and use of knowledge and reality of the target public in the construction of new concepts and perceptions favorable to the environmental education process.

3. MAIN ACTIONS TO BE IMPLEMENTED UNDER THE NEW PROJECT

Among actions taken by the Program, the following stand out:

- Construction of hydroenvironmental infrastructures to prevent soil and water losses;
- Active involvement of local communities in the management and productive use of such infrastructures;
- Environmental education of microbasin rural producers and population, by incorporating environmental topics to school routine;
- Technical assistance for economic use of cultivated areas;
- Forest management and reforestation;
- Control of polluting agents;
- Identification and strengthening of agricultural and non-agricultural economic activities, including innovative activities;
- Capacity building of technicians and producers in conservational practices;
- Adoption of adequate technology for natural resource and rural production management; and
- Monitoring of activities and results of the new project with the population's participation.

4. STRATEGIC HYDROENVIRONMENTAL DEVELOPMENT GUIDELINES

Guidelines listed below result from factors that determined the hydrographic microbasin selection as a planning and action unit in hydroenvironmental development projects in Northeastern Brazil semiarid zones.

4.1 Focused on Vegetation Recovery:

- a) increase of vegetative cover in river spring area;
- b) replacement of ciliary vegetation in watercourse margins; and
- c) reclamation of degraded areas in river springs and upstream to reservoirs.

4.2 Focused on Soil Conservation/Recovery:

- a) control of surface runoff in areas upstream to reservoirs and rivers in the hydrographic basin;
- b) soil management and use in cultivated areas to prevent the generation of sediments carried to drainage patterns and reservoirs;
- c) continued evaluation of water-related erosion; and
- d) control of sediments.

4.3 Focused on Water Quality and Quantity Assurance:

- a) actions encouraging the rational water use: surface water and groundwater;
- b) control of water resource polluting agents in river springs through participatory educative actions;
- c) prevention of mining activities in river beds;
- d) strengthening of Basin Committees.

4.4 Focused on Population's Environmental Education:

- a) continued capacity building (theoretical and practical) of producers;
- b) diffusion of technology adapted to semiarid and sub-humid regions;
- c) service and information gateway;
- d) qualification of teachers and teaching coordinators;
- e) incorporation of Environmental Education topic to school routine through a continued and interdisciplinary methodology;
- f) capacity building of the project technical staff, multipliers and benefited population; and

- g) use of several education environments and a wide range of methods to inform and allow the student to obtain knowledge on the environment.

4.5. Organizational Strengthening:

- a) integrated management of hydroenvironmental development actions with local organizations and leaderships;
- b) capacity building of advisors and other leaderships;
- c) institutional development of local entities.

4.6 Development of Production Systems

Development and experimentation of traditional and alternative production systems (agroecological and non-agricultural systems) with the objective of modernizing, expanding and diversifying the local economy.

5. OPERATIONAL GUIDELINES

Based on PRODHAM Operation Manual (SRH-CE, 2010a) and the experience accumulated over the ten years of this Project, guidelines listed below are suggested for the implantation of other hydroenvironmental projects in Brazilian semiarid regions.

5.1. Criteria and Guidance for Selection of Microbasins to Be Benefited:

- a) selection of areas under hydroenvironmental degradation process;
- b) areas with concentration of micro and small rural producers in HMB;
- c) locations should be predominantly in areas with the occurrence of 4th order watercourses;
- d) existence of organized community associations;
- e) no concentration of large properties;
- f) no concentration of leisure sites;
- g) benefit available to the greatest number of families;
- h) occurrence of a greater number of improved areas;
- i) need of support and involvement of municipal governments; and
- j) consent by the Basin Committee.

5.2. Mobilization and Sensitization Strategies:

- a) identification of and contact with local leaderships and groups, inclusive the several communities;
- b) registration of entities – constitution date, president's name, number of members, objectives and projects developed;

- c) mobilization of leaderships for initial presentation of project – this should be made through residential visits to all identified leaderships to explain the meeting objectives;
- d) meeting for initial presentation of project to be held in each community – meeting with leaderships, representatives of entities and municipal institutions;
- e) at microbasin meetings, it suggested that:
 - the involvement of the greatest number of participants in the project is sought;
 - new leaderships are stimulated; and
 - creation of expectations to be met by the Project should be avoided.

5.3. Follow-up of Action Implementation:

- a) population's participation in the construction of hydroenvironmental infrastructure network; and
- b) population's participation in social/productive use of infrastructure network.

6. ACTION MECHANISMS AND INSTRUMENTS

This topic presents the major operational mechanisms and instruments used by PRODHAM, as they are considered the most adequate to be adopted in new similar projects.

6.1. Instruments for Disclosure and Involvement of Target-Population in Project

To carry out a sustainability work in a hydrographic basin, understanding its socioenvironmental characteristics is critical. It is therefore necessary to make a survey of all communities located in the microbasin, by identifying the main landowners, community leaders, population's problems and expectations, existing associations, ongoing projects or actions, level of community's involvement, and other information that will support the analysis, evaluation and promotion of project development process.

Upon starting activities in a microbasin, the most diversified support to be sought, avoiding the exclusion or overestimation of people or ideas. Actions should be developed jointly with residents and representatives of several entities and organized groups operating in the area, in particular the community's members most identified with local problems and sometimes with diverse political matters.

At approaching the communities for execution of work under a participatory management, it is necessary to consider the leaderships' action, as they play an outstanding role in the political and social formation of such communities. Their capacity of effort and mobilization, and their access to community contribute to support the project development.

6.2. Agreement with Community – Constitution of a Management Board

It is necessary to establish an institutional framework in the community to allow project actions to be implemented in partnership with the governmental sponsor, constituted of a local management board.

The management board is a permanent and deliberative collegiate body, whose main objective it to ensure the social control of project in the selected area. It is constituted of representatives of community associations (formally appointed), and governmental and non-governmental bodies operating in microbasin area.

The management board's functions include:

- a) participating in the development of the strategic planning of project;
- b) supporting the public body responsible for the project in decision on Project actions in related areas;
- c) assisting in disclosure of actions developed by the project in communities;
- d) supervising the adequate application of funds allocated by the Managing Association to the microbasin.

6.3. Selection of Managing Association

The main objective of the Managing Association is to agree with the community members to the basic rules for participation in project works, as well as producers, workers and oversees' roles.

The basic principle of methodology to be adopted for the selection of the managing association is active participation of representatives of all community associations existing in the region/HMB in an event specific for that purpose, to formulate a consensual proposal supported by technical criteria qualifying the community association to judiciously manage the work plan and the project funds supported by the other community associations.

Legal criteria to be met by the managing association include:

- a) inexistence of outstanding debts with the Federal, State, or Municipal Government;
- b) its fiscal documentation should be regularized and include certificate of good standing issued by the Federal Revenue Service (income tax return), Caixa Econômica Federal (FGTS), Ministry of Labor (RAIS) and INSS (Debt Clearance Certificate - CND).

6.4. Implantation of Project Base in the Area

Structured physical space (house-office) to support the implementation of actions in the hydrographic basin, and serve as a project reference for local communities, should be located in the respective hydrographic basin, in an easily accessible place equidistant from benefited communities, and provided with the minimum infrastructure of equipment and consumables, adequate to operate as project office.

The professional in charge of project house-office should have at least middle-level technical education, and proven minimum one-year experience in activities related

to technical field assistance, production monitoring, community organization, and coordination of field work teams. That professional should have his own vehicle to travel along the project area.

7. FINAL RECOMMENDATIONS

Taking into account that in Brazil public policies generally fail, not because of their innocuous aspect, adequacy and conception, but because of project management and discontinuity problems, some operational and behavioral factors related to the institutional nature of this paper are listed below, which should be ensured for hydroenvironmental development project effectiveness. They include:

- a) skilled motivated technical staff with the adequate size;
- b) existence of a sponsor (governor, secretary, etc.) for the project;
- c) guaranteed and available funds;
- d) agility and feedback (evaluation) of project actions;
- e) friendly and professional relationship with community leaderships;
- f) presence, at least weekly, of a project technical representative in work areas;
- g) excellence of quality of services and events performed;
- h) avoidance of political-party, union and local groups' interference;
- i) effective involvement of institutions with a mission related to the project, such as Emater, municipal governments, secretariat of agriculture, NGOs, environmental body, etc.; and
- j) equal treatment of all project beneficiaries.

REFERENCES

FERNANDES, M. R.; SOUSA, E. R. **State Hydrographic Sub-Basin Management program: principles and strategies.** Belo Horizonte: Ematermg, 1994. 24 p.

FRANÇA, F. Mavignier. C. (Coord.). **Socioeconomic evaluation PRODHAM results and impact and suggested policies.** Fortaleza: SRH-CE/FUNCEME, 2010.

OLIVEIRA de J. B. **Action Plan for PRODHAM / PROGERIRH Implementation.** Fortaleza: SRH-CE, 1999. 55p.

SRH-CE.FUNCEME. **Geoenvironmental evaluation of conservational practices implanted in Cangati River, Canindé-CE.** Fortaleza: SRH-CE/FUNCEME, 2010b.

SRH-CE. **Global socioeconomic analysis of Cangati River hydrographic microbasin in the municipality of Canindé-CE: baseline report.** Fortaleza: SOHIDRA/FUNCEME, 2005.

SRH-CE. **Technical-Operational Manual of Ceará Hydroenvironmental Development Project (PRODHAM)**. Fortaleza: 2010a.

TILLMANN, H.; SALAS, M. **Manual of fast participatory diagnosis**. San José: PRODA/GTZ, 1994.