P1MC And P1+2
Two Community-based Rainwater Harvesting
Programs in Semi-arid Brazil

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1. Introduction

P1MC, the Program One Million Cisterns for Drinking Water, and P1+2, the Program One Piece of Land and Two Types of Water, are examples of "Mainstreaming Rainwater Harvesting" in the context of integrated water and land management in Semi-Arid Brazil (SAB) in both policy and practice.

Brazil, with an extensive 8.5 million square kilometers and 180 million inhabitants has 15 % of the world's freshwater. But this water is unevenly distributed. About 12 % of Brazil's surface is located in a tropical semiarid climate zone with less than 3% of Brazil's freshwater. Semi-Arid Brazil, or the so-called "drought stricken polygon," in the Northeastern part of the country is a region extending over almost one million square kilometers and inhabited by about 18 million people, half of them in the rural area.

Until recent years, when faced with a drought, the rural population was not able to cope with it. Each year the people tilled the soil and planted corn hoping for sufficient rainfall. But regular rainfall from year to year and season to season is the exception rather than the rule in a semiarid climate. Thus, a bad harvest seemed to be programmed in advance.

2. Rural development as "living in harmony with the semi-arid climate"

This situation is changing now through awareness building: What are the real reasons of suffering from drought? How to be prepared for the next drought? Droughts are longer as normal dry periods without or less than average rainfall, but the consequences of droughts are man-made: poor or no water management, deforestation, agriculture not appropriate to the climate, no access to land, social and political exploitation.

Rural people organized in grass-root communities and peasants associations, who learned how to "live in harmony with the semiarid climate" and know appropriate production methods, are ready to diminish their vulnerability, fighting for rainwater catchment systems as well as for all the other aspects, which facilitate and enrich life in SAB.

3. Participative and integrated water management:

The communities are discovering how to resolve the water problem in SAB: it has to be managed in different ways, using all the available kinds of water supply (ground, surface, soil and rainwater) (Gnadlinger, 2003):

a. Managing water for the environment: based on the watershed, protection of springs, and riparian vegetation, pollution prevention, wastewater treatment, reuse and recycling of water.

Watershed Management is the integration of technologies within the boundaries of a drainage area for optimum development of land, water and plant resources to meet the basic needs of people and animals in a sustainable manner. In SAB, we speak also of agro-eco-hydrological management (with 172 geo-environmental units), where water is treated in the context of climate, rainfall, groundwater, watershed, soil, land tenure, etc. People especially learn from the environment how to use water in a water-stressed semi-arid area.

b. Providing **drinking water for every household** (supplied by cisterns, shallow wells, etc.): No Family without Safe Drinking Water.

Several tank designs are available, well known and used in the SAB. The two designs most efficiently regarding low cost are the semi-surface cistern made of pre-cast segments (user preference) and the wire-mesh concrete cistern (sustainability). Diversion of the first rain, removing water from the tank through a handpump and filtering the water before consumption guarantee safe drinking quality.

c. Taking care of community water for washing, bathing and for animals, supplied by ponds, ground catchment rock-cisterns, riverbed-cisterns, shallow wells, etc.; necessity of community organization for planning, construction and maintenance.

More than 4-meter-deep hand-dug rock cisterns with a small surface to prevent evaporation losses are a traditional way to harvest water for the dry season. Even in the dry years these reservoirs have enough water for humans, animals and a small vegetable garden (Fig. 5).

d. Assuring blue and green water for agriculture, supplied by sub-surface impoundments, supplemental irrigation, road catchments for irrigation of fruit trees, contour plowing: minimum tillage, use of furrows for storing rainwater in situ = inter-row water harvesting; using manure and mulching to store water for plants; planting crops adapted to dry climate conditions (sorghum, pigeon pea, green gram, sesame, etc.).

Sub-surface impoundments, appropriate in crystalline subsoil, store rainwater runoff for a later application: a transversal barrier is dug below the ground surface in a shallow soil (normally 1 to 3 meter deep) of an intermittent streamlet toward the impervious subsoil. Then earth or rock filled sub-surface dams are built with a PVC sheet on the downstream face avoiding seepage. When finished, it is possible to plant all types of vegetables, corn, rice, beans or fruit trees, on the runoff watered upstream soil. In addition there is almost always dug a shallow well into the impoundment to use its water for animals or irrigation. Even in the first months after the rainy season, it is possible to plant a second time (Porto et al., 1999).

e. Supplying emergency water for drought years, guaranteed by deep wells and smaller dams strategically distributed. This point is a transitory solution as long as points b, c and d are not completely achieved. The common water truck must be replaced, since it is not only the most expensive type of water supply, but also water of bad quality and has been misused to get communities dependent on politicians. Here is the place for drought relief / mitigation programs. The challenge is to make these programs on day unnecessary.

4. Scaling-up through institutional and political arrangements

The NGO IRPAA, Regional Institute for Appropriate Small-Scale Agriculture is focusing on the above-mentioned topics since 1990, in the same way as EMBRAPA, the Brazilian Governmental Agricultural Research Agency, and later ABCMAC, The Brazilian Rainwater Catchment and Management Association. Following integrated water management,

decentralized and participative plans of water supply are elaborated by communities, districts and municipalities of SAB. But it was necessary to create a broader institutional base to make of the different isolated experiences in the SAB a political program. In 1999, organizations working in SAB gathered and founded the ASA Network, today made up of over 1000 grass-root organizations among them NGOs, farmers' unions, associations, and cooperatives. First ASA elaborated and launched the **Program of 1 Million Cisterns** to be executed by the civilian society in a decentralized manner (at the community, municipal, micro-region, state and regional levels). The program receives funding from governmental organizations and the private sector. The goal of the program is to supply safe and drought proof drinking water for 1 million rural households (five million people). In February 2007, more than 180,000 cisterns have been constructed. In some municipalities of SAB already all the rural households have their cisterns.

P1MC was the kick-off for sustainable development of SAB, but other aspects such as food production, health, education, infra-structure, political organization, environmental protection, etc. are equally important to be considered. In the agricultural sector, therefore, P1MC is complemented now by the **Program One Piece of Land and Two Types of Water (P1+2)**. This preogram signifies that every rural family should own one piece of land (1), large enough to produce food and live in a sustainable way and two (2) types of water, one for human consumption and the other one for food production. After guaranteeing drought-proof drinking water for households through P1MC, there remains to ensure water security for livestock raising and agriculture. Besides the use of green water conserving technologies such as contour tillage, vegetative soil protection and use of manure, other experiences are carried out that provide water supply for agriculture such as cisterns for supplemental irrigation of vegetable gardens, for poultry raising and beekeeping, shallow wells, rock cisterns for water for livestock, subsurface dams, catchments of rainwater diverted from roads (Gnadlinger, 2006). Now at the first step of the implementation, 30 pilot experiences are carried out by ASA in different parts of SAB. The Bank of Brazil Foundation and Petrobras, the Brazilian Petrol Company, are financing the initial phase of P1+2. After that, it is hoped that the Brazilian Government will include P1+2 in different development programs as it made with P1MC.

P1MC and P1+2 are "formation and social mobilization programs for living in harmony with the Brazilian Semi-Arid Climate", elaborated and implemented by ASA Network. These programs go hand in hand with a big effort in community formation, education programs of children in the schools of SAB, advocacy in front of decision makers, etc. In this way the communities make the water issue "their business" and not the business of the politicians or the big landowner and influence different governmental programs to get closer to the people, involving directly the population of SAB, using governmental funds for the well-being of the communities and not for the interests of small groups. These programs elaborated by the civil society should join the "Program Combating Desertification" of the Ministry of the Environment, give an orientation for the elaboration of an "Appropriate Land Reform Plan for SAB" of the Ministry of Agrarian Development and give sustainability to the "Program Zero Hunger and Zero Thirst" of the Ministry of Social Development.

4. Outlook

Community water actions leading to programs like P1MC and P1+2 were not possible without a new vision of SAB, based on "living in harmony with the semi-arid climate", similar to the Vision of Water for Food and Rural Development of the 2nd WWF (2000), which describes the life of rural communities in the year 2025: a world of healthy people with adequate nutrition and secure livelihoods, where reign three principles:

a. Access to land and water (all the people have fundamental rights to land, drinking water, hygiene and food production),

b. Sustainability of the production system (in the use of land and water), the technologies and the market,

c. Democracy in the process of implementation and production (the people – men and women – should have a voice in making decisions that affect them, including those related to soil and water management).

The rural communities in SAB are working hard to make their vision true and hope that the Brazilian government will continue financing P1MC and definitely include P1+2 into its development projects. Also for other semi-arid regions of the world these experiences of community based rainwater harvesting in Semi-Arid Brazil could be an example, responding the challenge of integrated water and land management in both policy and practice.

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