HANDOUT

"Sustainable Use of Water in Agriculture"

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Brazil

KNOW-HOW 3000
The knowledge network of HORIZONT3000 and its partners

Contents

1. Introduction to Semi-Arid Brazil (SAB)

The SAB - Semi-Arid region of Brazil in the Northeastern part of the country, extending over 969,599 km^2 and 1,133 municipalities, is inhabited by 21 million people, 9 million of them in the rural area. The SAB has a yearly rainfall below 800 mm. It is not little, but irregular rainfall, which characterizes SAB. While in a drought year you could receive only 185 mm of rainfall, in another year one could receive 974 mm. And all this rainfall could be concentrated in a few weeks. The evaporation rate is high, due to continuous high temperatures (open surface evaporation of about 3,000 mm a year). Until recent years, the region was called the "drought stricken polygon" in governmental documents. When the irregularity of rain is presented as the sole cause of underdevelopment, the role of excluding social structures mainly the concentration of fertile land and water in the hands of big landowners goes unchecked and therefore remains invisible. The artificial water reservoirs as the 70,000 smaller and bigger dams and deep wells are mostly in the hands of an elite group.

2. The new / old paradigm of rainwater harvesting

The historic top-down rural development approach is still prevailing in many governmental projects and fortified by the agro-business sector (irrigation for export crops, bio-energy production, partly diversion of the São Francisco River). On the other hand, during the past years, a progressive adoption of community based participatory approaches have favored the development of water harvesting techniques, present today in many small-scale farming systems. A number of popular movements of the civilian society (NGOs, small-scale farmers unions, associations, cooperatives) have proposed and carried out successful alternatives. The situation of the SAB is changing especially through awareness building: What are the real reasons of suffering from drought? How may one be prepared for the next drought? Droughts are longer than normal dry periods without or less than average rainfall, but many consequences of droughts are man-made: poor or no water management, deforestation, agriculture not appropriate to the climate, overgrazing, no access to land, social and political exploitation. What can we learn from the plants in the caatinga? They resolve their water needs with one large rainfall and store the water in roots, trunks and leaves. They avoid unnecessary evaporation. The caatinga with its plants and animals is perfectly adapted to these irregularities. So the people in SAB discover that, in spite of the unevenly distributed rainfall, it is possible to catch the rain when it falls, store it and have a reliable water source during the dry season, not only for drinking purposes, but also for agriculture and livestock. Rainwater harvesting is an efficient, effective and democratic use of water resources. Given the infra-structure and a good management, it will be possible to have sufficient water for

different uses in the local communities under semi-arid conditions and also in so called dry periods, especially if considered the following steps.

3. Participative and integrated water management:
The communities in SAB manage the water problem in different ways, using all the available kinds of water supply (ground, surface, soil and rainwater):

a. 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 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 and removing water from the tank through a handpump guarantee safe drinking quality.

b. 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.

c. Assuring **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 to use its water for animals or irrigation.

d. 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 **a, b** and **c** 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 also the place for drought relief / mitigation programs. The challenge is to make these programs on day unnecessary.

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

Integrated management of small watersheds, common pasture grounds and properties could follow a comprehensive watershed management model beginning at the top of the properties or watersheds where the rainwater begins to run off:

- on the hill top of a property through ecoforestation and reforestation, planting drought-tolerant plants for soil cover, vegetative barriers for soil protection with natural pasture;

- for the hill side through terracing or contour planting, "in situ" water catchment, planting of fruit trees and vegetables, small dams for infiltration and recharge of groundwater, recovering soil and vegetation from the beginning of the water flow;
- at the foot of the hill: wear a boot, using rainwater catchment technologies as subsoil dams, shallow wells with manual pumps, gabion dams or successive dams as silt arrestors at the foot of the hill.

In 2010 we began an interesting community based initiative, called **"recaatingamento"**, trying to integrate technologies of rainwater catchment in a program of environmental recovering of the caatinga vegetation and sustainable development.

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. It was necessary to create the institutional base to make of the different isolated experiences political programs for the whole SAB. In 1999, organizations working in SAB gathered and founded the ASA Network, today made up of over 1000 grass-root organizations among them NGO's, farmers' unions, associations and cooperatives. First ASA elaborated and launched **P1MC – 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 (mostly from the Ministry of Social Development) and to a smaller extent from 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). Until now, almost 400,000 cisterns of 16,000 l have been constructed. Besides P1MC, other NGOs and State Governments are constructing cisterns for drinking water. In some municipalities of SAB all rural households have already constructed their cisterns. Two independent evaluations mentioned improved health of the population through better drinking water quality and time saving for women, who no longer need to fetch water long distances from their homes. In some cases cultural problems identified were that water was used for purposes other than drinking and that water quality was not taken into account. In general, as a consequence of the cistern construction process the people develop a positive awareness about the life in the semiarid region and its requirements as the maintenance of the cisterns and the care about water quality. In some municipalities, local health agents, trained by ASA, attend the families periodically. The program could go on faster, if there would not be a delay in the availability of funds from time to time. P1MC was the kick-off for sustainable development of SAB.

Since 2007, 6000 rainwater catchment systems, mostly underground cisterns for protective irrigation, rock cisterns and subsurface dams, have been constructed by another program called **P1+2 - Program 1 Piece of Land and 2 Types of Water**, financed mostly by the Brazilian Ministry of Social Development. A new added technology is the Volanta hand-pump, used in not very productive wells with salty, but for animals drinkable water, which facilitate the raising of small animals. 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. 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.

5. Key messages and challenges

The mentioned projects of the civil society show that they are:

- elaborated by the civil society,
- "born out of the semiarid region",
- aiming at a life in harmony with the semiarid climate,
- concerned with the fundamental question of land distribution through an appropriate land reform,
- using land and water in a sustainable way
- they are social technologies and
- involve the rural population in their construction and implementation process.

The decisions are made by an interaction process of the civil society, political and economic actors. There exist also some challenges to bridge divides for water especially between government and people: e. g.

- Different objectives
- Bureaucratic processes
- Compartments
- Discontinuity (elections)
- Different languages
- Money = power = manipulation

Especially in the SAB, many on-going development programs like biodiesel, irrigation of sugar cane, diversion of the São Francisco River must be questioned under the aspect of Integrated Land and Water Management and of "living in harmony with the semi-arid climate', proposed by the civil society.

The rural communities in SAB must continue working hard to make their vision of a sustainable SAB true. The Brazilian government must accelerate financing of P1MC to construct the one million cisterns until 2015 and definitely include the use of other water harvesting technologies into its development projects. It is hoped that rainwater catchment and management will be more integrated also in the Programs of Combat against Desertification and Mitigation and Adaptation to Climate Change. It would be possible and interesting to exchange participative and integrated water management experiences between SAB and other semi-arid parts of the world.