

Enhancing economic resilience in North Eastern Brazil by harnessing rain



Short learning note on the experiences with the promotion of rain water harvesting in Brazil, for domestic use and to raise livelihood in the drought-affected North East

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Photographs on cover

Left: Discussion between staff of the IRPAA/ATER Plano Brasilia Sem Miséria project with Dona Preta the development of her rain-watered farm, Caraçá, Bahia State

Right: A team of the University Federal of Campina Grande and University Federal of Minas Gerais discussing water retention and storage options with a farmer.

All Photographs are by Han Heijnen, unless otherwise indicated.

Acknowledgement:

The report presented here is the result of a brief visit to the Petrolina/Juazeiro and Recife to meet with IRPAA, EMBRAPA Semi-árido, Dom Helder Camara Project/IFAD and ASA. The assistance provided by Joao Gnadlinger of IRPAA for making local arrangements for my visit is highly appreciated. The field visit to Caraçá and the interaction with field staff, in particular those of the IRPAA/ATER project was enlightening. Dra. Luiza Teixeira de Lima Brito of EMBRAPA showed the good work done by EMBRAPA over the years in raising resilience. Both are of course active core members of ABCMAC and are to be appreciated for their long term commitment to the cause of harvesting rainwater.

In Recife the discussions with Felipe Jalfrim and Ricardo Blackburn of the Dom Helder Camara Project under IFAD were helpful in further understanding the challenges, while Cicera Gomes of ASA is to be thanked for explaining the origin and roles of ASA in P1MC and P1+2.

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Acronyms

ABCMAC	Associação Brasileira de Captação e Manejo de Água de Chuva/Brazilian Association for Rain Water Harvesting and Management
ASA	Articulação no Semi-Árido Brasileiro/Articulating (needs) for the Semi-arid Areas of Brazil
ATER	Projeto Assistência Técnico e Extensão Rural para Famílias em extrema Pobreza
EMBRAPA	Empresa Brasileira de Pesquisa Agropecuária/ Brazilian Enterprise for Agricultural Research; Ministry of Agriculture, Livestock and Supply
EMBRAPA Semi-árido	specialized institute for the semi-arid zone, located 40 km out of Petrolina
FIDA	Fundo Internacional de Desenvolvimento Agrícola
IFAD	International Fund for Agricultural Development
INSA	Instituto Nacional do Semiárido/National Institute for the Semi-arid Areas
IRPAA	Instituto Regional da Pequena Agropecuária Apropriada/Regional Institute for Appropriate Small Farming and Animal Husbandry
P1+2:	Programa uma Terra e duas Águas/Programme 1 piece of land and 2 sources of water
P1MC	Programa um Milhão de Cisternais rurais/ Program for 1 Million Cisterns in rural areas
PBSM	Plano Brasília Sem Miséria
R\$	Brazil Real
RWH	Rain Water Harvesting
SAB	Semi-arid Areas of Brazil

Abstract

In 2012 RAIN Foundation received funding from the International Fund for Agricultural Development to undertake a project entitled “Rainwater Harvesting (RWH) for Food Security; Setting an enabling institutional and policy environment for RWH”. The project aims to develop the institutional and policy context for mainstreaming RWH, in particular boosting the role of RWH for enhanced food production and food security.

One of the countries that has made important progress in this area is Brazil, where large rainwater harvesting programmes for domestic and small-scale agriculture have been implemented since 2003. ABCMAC – the Brazil rainwater harvesting association - and EMBRAPA – an agricultural research agency - have played important roles in facilitating initial technical development and promulgation of rainwater harvesting technologies and experiences.

P1MC: one million tank programme was initiated to ensure water security for poor households in remote areas in the North East. The P1 + 2 (one piece of land and 2 sources of water) project was initiated later when it became clear that provision of a water store for domestic use is often not enough to help families get out of poverty. Access to sufficient land is further critical to have a reasonable livelihood

Rainwater harvesting was promulgated through a NGO facilitated programme through ASA, an umbrella NGO, bringing together some 3000 civil society organizations. Tanks, flywheel pumps on hand dug wells, rock catchments, subsurface dams, and deep water pits have all been constructed for water storage.

Besides the use of green water conserving technologies such as drip irrigation, planting pits, contour tillage, vegetative soil protection and use of manure, other solutions included water supply for agriculture such as cisterns (52 m³) for supplemental irrigation of vegetable gardens and for poultry raising, deepwater pits for livestock, and catchments of rainwater diverted from roads.

Over 700'000 rainwater tanks have been constructed and people have been trained in survival in these drought conditions. They now appreciate that fighting for more water is not always possible, but that *Convivência com o Semiárido* - Living in harmony with the semi-arid zone, by adopting suitable methods of water storage and use, allows people to manage a decent life even though water is scarce. Continued support through specialized government agencies, through social support programmes, and through the vibrant civil society infrastructure allows for further quality enhancements of the programmes, further research and development, for continued communication and training, and academic evaluation for quality control.

However, the importance of civil society and its ability to construct an intermediary to negotiate with government on behalf of its constituencies, has been critical. Without the voice of CSOs, the democratization of water development in the North East may not have taken place and large scale water users may have gotten the upper hand. Even today these risks are present with the plans for a diversion of the Rio Sao Francisco still on the table.

The Government of Brazil has subsidized the construction of rainwater tanks under the P1MC project and in general has facilitated the implementations of the project through ASA and its member NGOs. To copy such an approach in suitable areas in Africa would be difficult directly through Government programming and would require substantial support by Development Partners. Furthermore technical support from government agencies and practical and advocacy support from NGOs may be more difficult to secure, while local conditions and social differences may make successful replication of the Brazil programme less feasible.

Experiences with individual technical applications in water collection and storage, and in agricultural solutions for retaining green water, and for livestock, may well be transferable. Many of the technologies in use in Brazil are also described in the most recent 3R publication ‘Securing Water and Land in the Tana Basin’ (2012).

Enhancing economic resilience in North Eastern Brazil by harnessing rain



1. Introduction

In 2012 RAIN Foundation received funding from the International Fund for Agricultural Development (IFAD/FIDA Fundo Internacional de Desenvolvimento Agrícola) to undertake a project entitled “Rainwater Harvesting (RWH) for Food Security; Setting an enabling institutional and policy environment for RWH”. The project is co-funded by the Dutch Ministry of Foreign Affairs, and will run until 2015.



The project aims to develop the institutional and policy context for mainstreaming RWH, in particular boosting the role of RWH for enhanced food production and food security. Knowledge management through the development of learning systems, and mobilization and strengthening of existing RWH networks are critical instruments in this respect. Innovative approaches may be needed to raise the profile of RWH techniques and approaches in national development and ensure their mainstreaming in quality enhancing operations.

While the RAIN Foundation project will benefit countries in East Africa, West Africa and Latin America, it will attempt to collect learning from all around the world where it concerns application of rainwater harvesting in development and for enhancing the resilience of the poor.

The North Eastern region of Brazil is an area comprising 9 states and some 23 million inhabitants, that receives less than an average of 800 mm rain in a year, with high rates of evapotranspiration and regular droughts. During the last 15 years the Government of Brazil has worked with civil society to implement a large number of projects to enhance livelihood by raising water security in the area. The 1 million cisterns projects and the programme 1 piece of land and 2 sources of water, have become well reported upon. (Gnadlinger J. , 2007) (ASA, 2011) (Domènech, Gomes, & Heller, 2012).

As part of the IFAD sponsored project, a consultant made an exploratory inventory of the activities and experiences in promoting RWH through ABCMAC (Associação Brasileira de Captação e Manejo de Água de Chuva / Brazilian Association for Rain Water Harvesting and Management), and through the ASA Programmes P1MC and P1+2 in the semi-arid areas in Brazil. The Consultant visited the North East from April 20-26, 2013. The programme of visit and the people met can be viewed in annex 1. The consultant also visited the same area when he was a keynote speaker during the 8th National RWH Conference of ABCMAC held in Campina Grande in August 2012. The bi-annual ABCMAC conference attracted over 300 participants including representatives of universities, governmental and non-governmental institutions and of several other sectors from the different regions of Brazil. The contacts and exchanges that were made during the conference facilitated the current visit to the North East.

This report describes briefly the findings of the 5 day visit. It obviously does not do justice to the efforts that are undertaken by the Government of Brazil, the many NGOs and the people of the North East to reduce poverty through enhancing water security, and develop ways by which people will be able to live with dignity in a tough physical surrounding and climate. The bibliography and the references provided in the text illustrate clearly that the efforts have grown into a multifaceted and diverse set of projects and measures.

1. Initiating rain water harvesting in Brazil

Brazil is a water rich country and so harvesting of rainwater was often not more than an informal activity in areas with plenty of rainfall but no formal water supply. With some exceptions, there did not exist experiences with rainwater utilization methods in Brazil, until 25 years ago. The situation began to change, when EMBRAPA (Brazilian Enterprise for Agricultural Research) started with experiments of constructing rainwater cisterns and subsurface dams in the late 1970s. In the 1990s, IRPAA (The Regional Institute for Appropriate Small Farming and Animal Husbandry), other NGOs, grass-root organizations and communities began to construct cisterns in the Semi-Arid Areas of Brazil (SAB). In the following years, EMBRAPA, through its campus dealing with the semi-arid areas located just outside Petrolina and IRPAA which was based in Juazeiro, its sister city, across the Rio São Francisco started to organized several Rainwater Harvesting Conferences. A first national conference was held in 1997 in Petrolina that raised the interest in rainwater harvesting and allowed an inventory of existing projects and development activities.

The interior of the North-East of Brazil is mostly semi-arid. Survival in the semi-arid zones in the North East of Brazil has always only been possible by managing (rain) water. The Brazilian semi-arid region covers an area of 980,000 km², covering 1,135 municipalities. It includes nine states: Alagoas, Bahia, Ceará, Paraíba, Pernambuco, Piauí, Rio Grande do Norte, Sergipe and (Northern) Minas Gerais. It is an area in which people have been quite poor and often have to survive in marginal farms. Some 22.6 million people are estimated to live in the area, representing approximately 12% of the population. ([www.insa.gov.br / censosab](http://www.insa.gov.br/censosab)). It is one of the more densely populated areas of Brazil.

Brazil by Region	Water Availability	Surface Area	Population
North	68,50%	45,30%	6,98%
Centre-West	15,70%	18,80%	6,41%
South	6,50%	6,80%	15,05%
South East	6,00%	10,80%	42,65%
North East	3,30%	18,30%	28,91%

Fonte: Secretaria de Recursos Hídricos do Ministério do Meio Ambiente

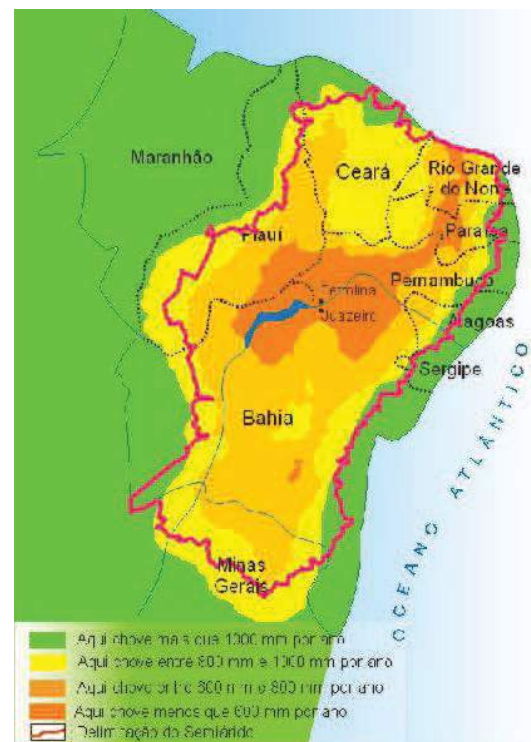


Figure 1 rainfall by area in the semi-arid North East (red line perimeter)

Rainfall in the North East is characterized by poor distribution during the year and between years, as well as by area. At the same time evaporation is high, due to continuous high temperatures (open surface evaporation 3,000 mm a year). Technical solutions to these problems should therefore meet local conditions and management capacity.

The diagram below shows, that while in a drought year there may only be 185 mm of rainfall, in another there could be 974 mm. And all this rainfall might be concentrated in a few weeks. The biggest challenge of water supply is in areas with impermeable crystalline subsoil, without suitable aquifers (very little and mostly saline water only in cracks), which applies to 60 % of SAB. Desalination is a costly solution, with negative environmental impacts when the concentrated salty water by-product is discharged without consideration, thus contaminating the soil.

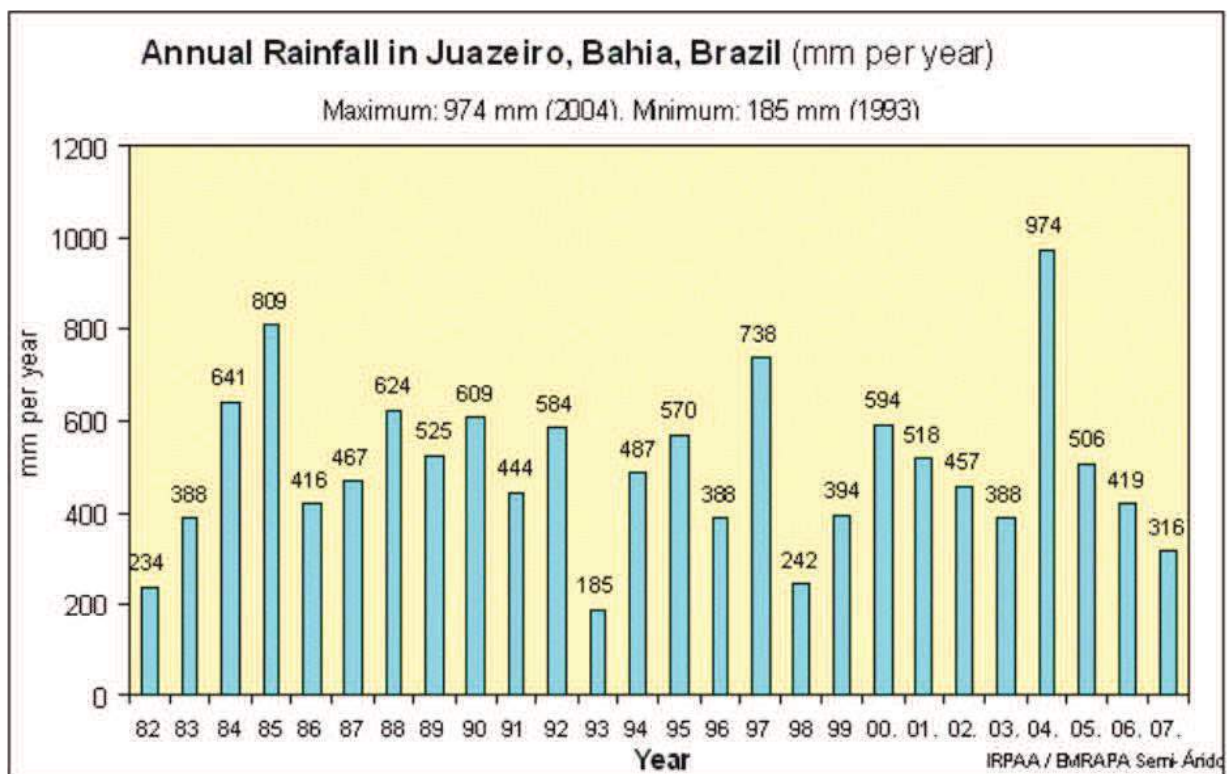


Figure 2 Annual Rainfall in SAB

These facts however should not hinder human life, because the thorn bush vegetation of SAB with its plants and animals is perfectly adapted to these variabilities. 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. However, there are other serious problems like concentrated land tenure systems (leaving the poor on small plots of often-marginal land, which is overused and subject to erosion) and corruption (the economic and political elites benefit during the droughts, misappropriating government drought relief (a phenomenon known as the 'Drought Industry'). Furthermore, a controversial diversion of part of the San Francisco River is a prestige project with advantage to a few large irrigation farmers, but none to the rural people. (Gnadlinger J. , 2007)

Traditionally the problems of the North East have been viewed to be solely associated with lack of water. Early solutions focused on large and costly engineering: a large pond, a large dam, the transposition of the São Francisco River, a large pipeline. These costly solutions did not lead to better protection against droughts.

Initially the efforts of EMBRAPA of the 1970s did not really bear fruit due to limited interest in the semi-arid areas and a different approach by central government. For a long time the focus of government was on support for large-scale productive agricultural areas and it would promote irrigation over localized solutions for securing a livelihood. EMBRAPA played an important role in developing and testing various solutions for raising water security for households through *cisternas* (tanks), wells and small dams, as well as by promoting the application of a variety of larger scale solutions for watering livestock and for growing crops.

An overview of available technologies can be found in the EMBRAPA publication on *Potencialidades da Água de Chuva no Semi-Árido Brasileiro* (Options for using Rainwater in SAB) (Teixeira de L. Brito, Soelma B. de Moura, & Feitosa B. Gama, 2007) and the *Catálogo de Tecnologias: Tecnologias Agrícolas @ Semiárido Show 2009* (EMBRAPA, 2009). A broader review of academic research to promote harmonious and dignified living in the semi-arid areas can be found in a 2011 publication by EMBRAPA: *Semi-arid Brazil: research, development and innovation* (Sá & Gama da Silva, 2010)

In the nineties the collaboration between EMBRAPA and IRPAA led to fresh developments in designing water storage and methods for rainwater harvesting. According to sources the real difference was made when the 2nd national rainwater harvesting conference was held in Petrolina coinciding with the 9th Conference of the International Rainwater Catchment Systems Association (IRCSA) (the 2nd Brazilian Rainwater Catchment Symposium), in July 1999. The participation of important speakers from all around the globe and rainwater harvesting practitioners from other parts of the world demonstrated to Brazil the importance and potential of rainwater harvesting. The Conference led to the creation of ABCMAC.



ABCMAC has since grown in stature through its biannual conferences and its influence through its membership in promoting policy, research, documentation and advocacy (Gnadlinger J. , 2012). (URL: <http://www.abcmac.org.br/>). Whereas initially the conferences addressed the water needs of the inhabitants of the North East, e.g. by themes like "Capture rain water and plant crops suitable to the semiarid areas" with emphasis on the use of rainwater in agriculture, drought resistant varieties and exploitation of native fruit, gradually experiences from other parts of Brazil and of the urban areas are

brought in. Among the members of ABCMAC are researchers, technicians, community leaders, politicians, NGOs and grass-root people, all engaged in rainwater utilization. Especially governmental organizations (MDS – Ministry of Social Development and the Fight against Hunger, EMBRAPA - The Brazilian Agricultural Research Agency, ANA - The Brazilian Water Agency) are nowadays demonstrating the importance of rainwater utilization. During the 8th Conference there were many representatives from various State Universities among the 320 participants.

In the future, ABCMAC will not only concentrate in organizing the biannual symposia, but intends to promote continuous action in research and guidance to organizations, which carry out programs of rainwater utilization in the SAB and support the inclusion of rainwater utilization in curricula of schools and universities. Moreover, it is planned to initiate rainwater utilization to other parts of Brazil (through representatives in different Brazilian States). During the last years, the priorities included research on water quality in cisterns and different rainwater harvesting methods in the Brazilian Semi-Arid Tropics, proposals for rainwater utilization in Brazilian cities and the elaboration - together with the Ministry of the Environment - of the chapter about rainwater of the Brazilian Plan of Water Resources.

2. P1MC and P1+2

At the end of 1999, as a consequence of the awareness building on rainwater harvesting, the Programa um Milhão de Cisternas rurais/Program for 1 Million Cisterns (P1MC) was developed by ASA. ASA - Articulação no Semi-Árido Brasileiro/*Articulating (the needs) for the Semi-arid Areas of Brazil* is a network of almost 3000 NGOs working in the SAB. ASA aims to empower civil society to build participatory processes for sustainable development and cope with the semi-arid areas based on cultural values and social justice. (ASA, 2011)



P1MC was launched in 2003. ASA uses an on-line project management system, and on April 24, 2013, one could read on the website that it had constructed over 458'000 domestic rainwater reservoirs. P1MC is being executed by the civil society in a decentralized manner (at the community, municipal, micro-region, state and regional levels) with initial funding from the Ministry of the Environment , and later from State and international, as well as the private sector.

P1+2: Programa uma Terra e duas Águas/*Programme 1 piece of land and 2 sources of water* runs since 2007. It aims to further enhance the livelihood opportunities in this vast area by focusing on water for production. So far it has completed rainwater collection systems existing of 9000 tanks of 52.000 l capacity, 420 subsurface dams and 302 rock catchments. In addition 208 Volanta-type water pumps have been installed and one trench water storage pit. Altogether P1+2 serves some 12'000 families.

More details are available from the ASA website (URL:

http://www.asabrasil.org.br/Portal/Informacoes.asp?COD_MENU=1150

http://www.asabrasil.org.br/Portal/Informacoes.asp?COD_MENU=1151

or from the bibliography attached (copies of documents provided to RAIN Foundation either in soft or hard copy, by the consultant)

The 2 projects are part of the ASA programme for training and social mobilization for 'living in harmony with the semi-arid zone' : Convivência com o Semi-árido.

ASA is funded by various ministries and entities within the Government of Brazil, including Governo de Minas Gerais – Secretaria de Agricultura Familiar (SAF), Ministério do Desenvolvimento Agrário (MDA), Ministério do Desenvolvimento Social e Combate à fome (MDS), Ministério da Integração Nacional, etc.

ASA hold regular conferences with its constituent partners and stakeholders. In the conferences it reviews the progress and key issues of the Projects as well as reviews political and policy aspects. The last Conference was held in November 2012, in Januária in Minas Gerais.



Its objective was to assess and strengthen programming for *living with the SAB* from the perspective of the struggle and resistance, reflecting on the current development model and its political, environmental, economic, social and cultural approaches for building project of sustainable development, the eradication of poverty and promotion of citizenship (and identity?). This clearly points to a far broader development approach than just providing water. It explains why during the conference the key thematic areas discussed were:

Water	Earth/Land	Seeds
Sovereignty and Food Security	Education/ training	Popular Communication
Self-organization of Women	Access to markets and Popular Solidarity Economy (EPS)	
ATER Policies on Knowledge: Assistência Técnico e Extensão Rural para Famílias em extrema Pobreza		
Funding/Credits and Solidarity Funds		

Source <http://www.oitavoenconasa.org.br/>

These themes reflect the political context in which the poverty alleviation programming is executed in Brazil. Since June 2011 Brazil is implementing the Plano Brasil Sem Miséria (Plan for Brazil Without Misery) which places social policies at the centre of its economic development strategy (Ministry for

Social Development and Fight against Hunger, 2012). The target beneficiaries of the Plan are the approximately 16.2 million Brazilians identified by the 2010 Census who are still in a situation of extreme poverty, that is, receiving a monthly income below R\$ 70. Extreme poverty manifests itself in many forms besides insufficient income. In order to overcome it, intersectorial action by the State is needed. The Brasil Sem Miséria Plan is coordinated by the Social Development and Fight Against Hunger Ministry and involves a further 10 ministries. Previous initiatives to fight poverty such as the Bolsa Família Program and the Program for the Acquisition of Food (Programa de Aquisição de Alimentos) were expanded and reinvigorated. Brasil Sem Miséria also brought novelties like the Bolsa Verde Program (Green Purse), and the Incentive to Rural Productive Activities (Fomento às Atividades Produtivas Rurais). The national scale and the intersectorial and intergovernmental character of the Plan required the support of tools and networks with similar characteristics –the networks of the Single Register for Social Programs (Cadastro Único para Programas Sociais) and the Social Assistance Single System (Sistema Único de Assistência Social, SUAS).

Busca Ativa (Active Search) is the strategy adopted by Brasil Sem Miséria to find and register all extremely poor families that have not been located yet. Developed at the level of the local authority, it is implemented by social assistance mobile teams and supported by an increase in the transfers of Federal Government resources to local authorities. Thanks to Busca Ativa, 687 thousand families previously “invisible” were included in the Cadastro Único in its first year of existence, and are already receiving the Bolsa Família and other social benefits.

The Brasil Sem Miséria Plan has three main lines of action: the income guarantee, which refers to transfers for the immediate relief of the extreme poverty condition; the productive inclusion promise, which offers job- and income opportunities to the Plan’s target public; and improved access to public services for the provision or expansion of actions of citizenship and social welfare. (text edited from (Ministry for Social Development and Fight against Hunger, 2012).

As the RWH programmes are part of poverty alleviation, subsidized systems can only be obtained by those households that meet project criteria. The program is intended for families with income less than half the minimum wage per family member, that are included in the Unified Register of the Federal Government, and who permanently reside in rural areas and have no access to public water supplies. In addition to these criteria, priority is given to:

- Women-headed households
- Families with children 0 to 6 years
- Children and adolescents attending school
- Adults aged over 65 years
- People with special needs

Next to the P1MC and P1+2 projects there are several other larger programmes that subsidize rain water harvesting programmes, such as Projeto Cisternas and Aguadas (see also annex 4). Local NGOs further support local initiatives in construction and training. All projects are employing similar technologies (see next section). Most likely there are already well over 500.000 families that have benefited from a rainwater harvesting system in the North-East.

Women derived significant material benefits from the program, such as access to water, more time, and better health for their families. However, they also acquired economic and political opportunities as cistern builders and as members of municipal water commissions. Local feminist NGOs and social movements and networks supported women's organization and their participation in non-traditional roles. This participation contributed towards extending women's rights as partners participating in society as agents of their own development (Moraes, 2012).

In 2011 the Agua para Todos programme was initiated under Brasil Sem Miséria. It proposed to install PVC tanks instead of constructing cement-plate tanks. During 2011 and 2012 it installed some 290'000 systems. However this part of the Brasil Sem Miséria programme has been controversial and has led to widespread protests, coordinated by ASA. Annex 5 has the original version of the complaint sheet against the government's approach under the title: **Cisternas de Plastico PVC: Somos Contra: SOLUÇÃO OU ARMADILHA? Plastic Tanks of PVC: we are against it: Solution or Pitfall.** The CSOs objected because the decision making on this type of programme and the funding would move to Brasilia and not be sufficiently in the hands of the people and the CSO in the North East. In their manifest of protest they argued as below:

Indicators	Cement-plate Tanks	PVC Tanks
Citizenship	Water is a right, not a benefit Water for food security	Beneficiaries control only part of the process
Construction	Built by farmers & masons, along with the families.	Delivered ready to households by firms
Control of technology of construction/ autonomy	Families control the whole process; they build, extend and multiply to other families.	Controlled by the companies
Strengthening the local market	The thousands of cisterns built have injected more than US \$ 20 million dollars in the local market that generate more social and economic dynamism.	All the profits will be passed to a few business men and are not being invested in the Region.
Costs	Final cost of the cement plate tank: US\$2,080 (including materials, construction, training and technical support).	As the tanks are constructed above ground, the ultimate cost could be double
Impact on the health of families	Research indicates that the cisterns decrease the incidence of water-related diseases; USP / FEBRABAN (2007), Fiocruz (2010).	There is no research done yet
Political access	Through the municipal committees and the pre-established criteria for the program, families can engage actively in the process.	Process is not explained
Income generation	Masons, technicians, facilitators, trainers, local teams, building houses, hotels, restaurants, small shops, etc. all earn.	Incomes concentrated in the hands of a few businesses
Training for water management	All families are trained in Water Resources Management and in coexistence within the semiarid region.	Process is not explained
Autonomy of the people	People own the technology	Dependence on the suppliers

3. Water Technologies in use in the Semi-arid Zone of Brazil

The early attempts to improve the situation in the SAB emphasized the problem of drought. The focus was on providing water for people to survive. Only later, when it was also seen that people would use the water they had for other aspects of survival, it was understood that a comprehensive package of measures would be needed to enhance the *convivência com o semi-árido*; living in harmony with the semi-arid areas. That led to different ways of collection and storing water, using the strength and diversity of the SAB.

In the discussions with IRPAA it became clear that they see their work in the SAB as three periods of some 10 years: initially developing drinking water solutions, then focusing on water for small scale agricultural production and livestock and now increasingly to make sure that more water is retained in the landscape.

Note: in this section a quick overview of some technologies and approaches is given. Given the scope of the assignment, it was not possible to go into detail. For this the reader needs to refer to the bibliography and the websites listed at the end of the document.

1. Domestic reservoirs/cisternas

The standard tanksize is 16m³, enough for a family of 5 people drinking and cooking, for a period of 6 to 8 months - the dry season in the region (Teixeira de L. Brito, Soelma B. de Moura, & Feitosa B. Gama, 2007). Construction of the cistern is using a simple technology, low cost and adaptable to any region. Pre-cast plates are made by the householders and construction is done by masons from the locality. ASA, under P1MC, claims to have trained more than 20'000 masons over the years.



Figure 3 Plate tank at IRPAA Training Centre

Families may be larger than 5 members or may have different requirements and so, many households have in the meantime constructed additional storage, either because they needed it, or because they could afford to.

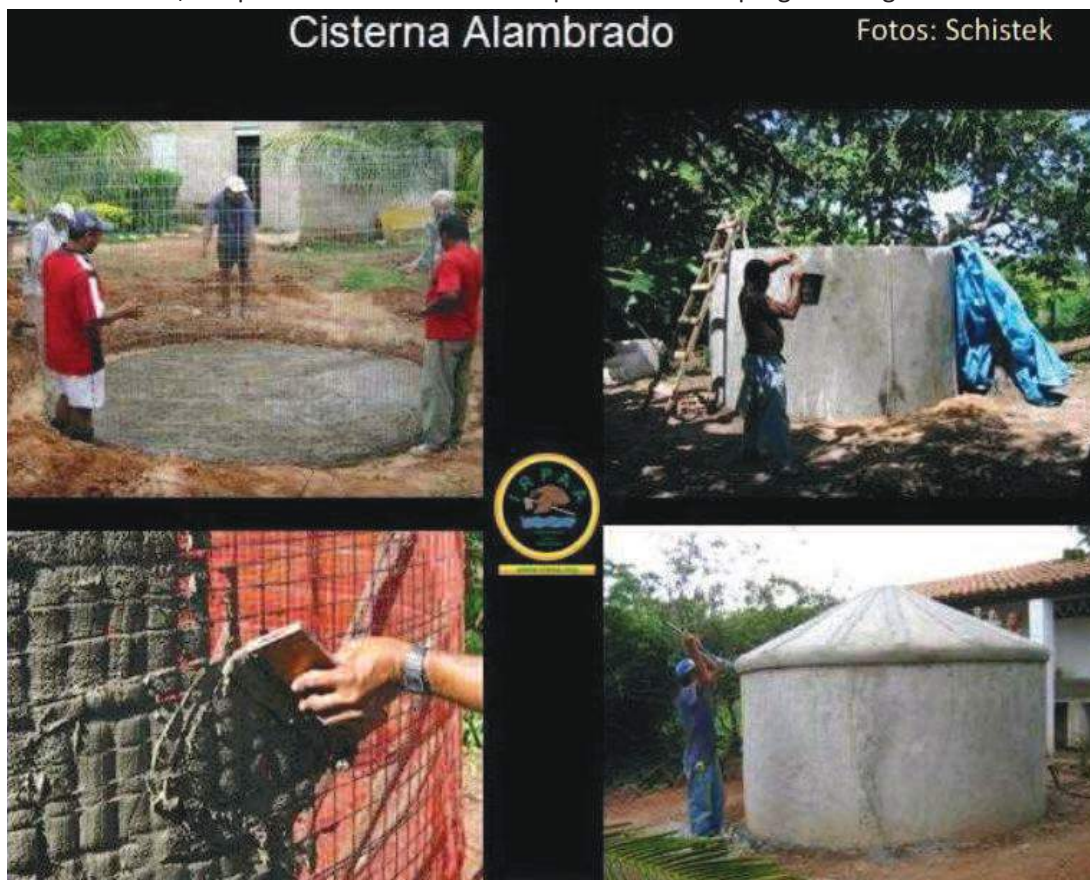
Rainfall is collected from rooftops using normal rainwater harvesting techniques with gutters, a first flush, and piped into the tank. Sometimes people have installed a simple sand filter.



Figure 4 Advisory poster on Good Practices in RWH, projeto Cisternas

The poster on the previous page published by the Projeto Cisternas advocates good practice in keeping the water safe and the RWH system functioning. It also advises on household water treatment options.

IRPAA had developed a different reservoir model, that was set up with a freestanding wire-mesh and based on the ferro-cement technology. Its design was led by combining three characteristics: simplicity of construction, high strength and low cost. The main advantage is that it is not necessary to use a mould during the construction process. To facilitate application of mortar, the wiremesh is wrapped on the outside by agricultural shade cloth. The size of tanks can easily be adjusted by varying the diameter of the wire-mesh circle (Schistek & Gnadlinger, 2011). The quality of this type of tank is better, but for ease of construction, the plate-cement tank was adopted in the ASA programming.



Mostly homesteads will have roof catchment areas that will allow the tanks to be filled up at the end of the rainy period. For survival and livelihood, water is also needed for small livestock (chicken and goats) and to grow vegetables and crops like sorghum and pigeon peas that are more suited to the climatic conditions.

2. Reservoirs of 52 m³

For agriculture and livestock more water needs to be stored. Using the plate-technology as in use for the 16 m³ tanks, tanks are being constructed of 52 m³. The standard catchment area for these tanks is 210 m² (Diaconia, 2008)



Figure 5 Constructing a 52m³ tank with concave cement plates (ASA 2011), catchment area for such a tank is shown at right

The catchment area and the partly dug in tank need to be sited properly, such that the catchment area drains easily into the tank. A small sand trap is also made between the catchment area and the tank. The catchment area is made of cement plates (of 1 x 1 m) or otherwise plastered, with a low brick perimeter wall. These systems are constructed as part of the P1+2 project.



3. Hand-dug wells with a wide diameter

A shallow well is dug with an opening of up to 2m of diameter with a cement cover and a manual pump. Sometimes the wells are built with pre-fabricated cement rings. The wells are fitted with a hand pump according to the Volanta pump originally from the Netherlands (Jansen Venneboer, Wijhe). The pump is low-maintenance and can be easily operated by everyone once you get the large flywheel going. It is locally known as the Bomba d'Água Popular (BAP), and is supposed to last up to 30 years. It is reliable and can serve some 1000 l for a well depth of 40 m. (ASA, 2011)

When the borehole is well located, the BAP will yield sufficient water for both domestic use as well as livestock watering.



Figure 6 The Bomba d'Água Popular, based on the Volanta design (ASA)

4. Subsurface Dams

Where appropriate sub surface dams are also constructed. The EMBRAPA publication *Potencialidades da Água de Chuva no Semi-Árido Brasileiro* describes several technical solutions, including subsurface dams with a stone masonry or concrete dam, to subterranean dams with a plastic liner up to the rock face. The dams are constructed to make use of the green water available to plants shortly after the rains, while a well towards the downstream end of the bunded area can be used for pumping drinking water during the dry season (ASA, 2011), (Teixeira de L. Brito, Soelma B. de Moura, & Feitosa B. Gama, 2007), (Sá & Gama da Silva, 2010), (PRODHAM, 2010).

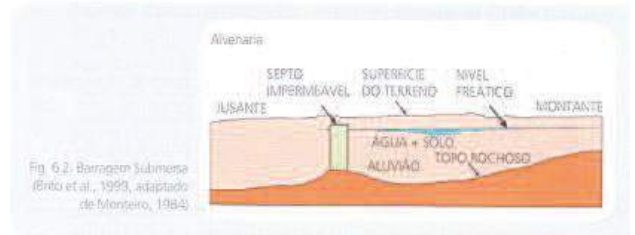


Figure 7 subsurface dam up and subterranean dam below; Illustration from *Potencialidades da Água de Chuva/EMBRAPA*



Fig. 8.3. Barragem subterrânea ou submersa (Brito et al., 1999)

Figure 8 A rock catchment constructed under P1+2 (ASA website)

5. Rock catchments

As the crystalline rock is shallow in some 80% of the semi-arid zone, it happens regularly that suitable rock faces can be found that would allow a rock catchment to be made with a little bit of investment. (ASA, 2011).

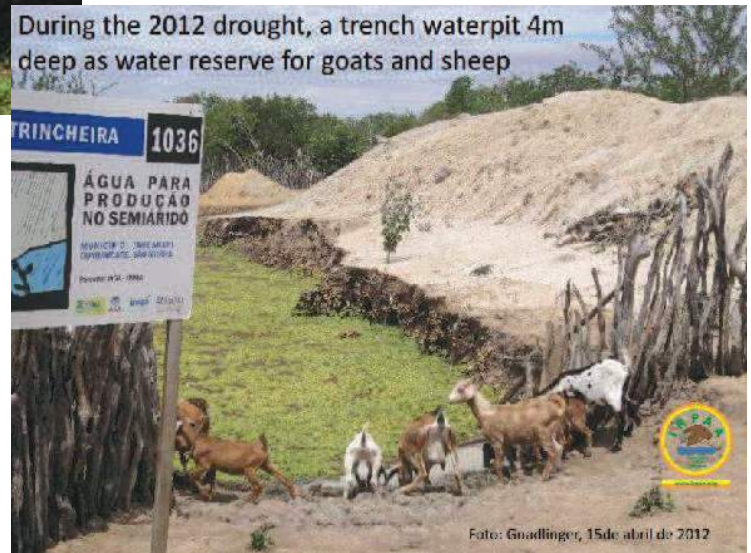


Figure 9 Barreiro Trincheira (Gnadlinger 2012)

6. Water Storage Pits

A Trincheira Barreiro - deep trenches locally known as *caixos* – are traditional water storage pits that can be dug in some 80% of SAB where the bedrock is crystalline. The reservoirs are dug with vertical walls, narrow and deep. The greater the depth and the lesser the surface of the reservoir the longer will the water water last. Often it took years of hard work to increase the depth. The advent of bulldozers meant the end of good quality *caixos*. Excavations by bulldozer result in a larger surface area of the pit but little depth. These reservoirs dry up faster due to large evaporation.

4. Agriculture and Livestock

The P1+2 concept has provided more space for agricultural production. Still it is often difficult due to limited availability of water. For that reason also the keeping of cattle has its limitations. The Caatinga area that I visited did not allow keeping of cattle, and we could see that farms had been abandoned for that reason. Goats and sheep can be managed better as these require less water, and can also access water pits like the caixos mentioned above. They also find good fodder in the ubiquitous *Prosopis juliflora* tree and *leuceana*.

Government agencies like Embrapa and NGOs such as IRPAA and Utopia are all active in designing solutions that make optimal use of water. Drip irrigation, planting pits, organic mulching, and a variety of techniques to capture water on-site such as through plowing furrows or contour trenches, supplemental irrigation on rainfed lands, and road catchments for irrigation of fruit trees. Usually vegetable plots are small, adequate to provide greens for the family but leaving little for barter or sale. In most sites a longish vegetable bed is made with a plastic liner that is kept in place by a low brick wall. Water is added through below ground irrigation. The site is covered with agriculture shade cloth.



Figure 10 Demonstration site at EMBRAPA



Figure 11 family farm in Caraçá

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 (see figure 7 on the previous page). 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 for watering animals or for irrigation (Gnadlinger J. , 2007). Even in the first months after the rainy season, it is possible to plant a second time. During an earlier visit North of Campina Grande I

also visited sites near the University of Campina Grande research center where stone bunds and gully plugging were applied.

For management of goats and sheep, adequate fodder should be available. In addition to the Prosopis tree, farmers plant the Mandacaru cactus. While the original Mandacaru has spines, a spineless variety makes feeding easier.



The "Cabeça de frade" cactus: 'friar's head' needs 3 m² to grow and provide fodder and moisture. Its roots are shallow.



Figure 12 Growing spineless 'Mandacaru' cactus as fodder

By using the resources of the semi-arid zone, better living is possible. Changing from "drought in the Northeast" to exploiting the opportunities in the semi-arid zone offers possibilities of coexistence.



Figure 13 Don Antonio and his son, on holiday from school 40 km further on. His mother was making caramelized milk sweets for sale, and shows the pigeon peas and sorghum they have grown for a first time to try out. Planting annual crops such as green gram and sesame adapted to the dry climate is critical for survival.



The Umbu tree offers a further example of recognizing opportunities. The Umbu tree has a store of water in its tubers underground and so manages to survive even in drought times. It produces plum-like fruits that can be made into jams and 'doce', a fruit preserve. In the Caatinga area women groups have been encouraged to collect and process the fruits and it has now become an export product, even on sale in the airport shop in Petrolina. The sustainable use and processing of native fruits, such as umbu (*Spatidia tuberosa*) and cashew improves livelihood prospects.



The mandala, a circular kitchen farm, with a chicken pen in the centre, and rows of vegetables around it. The idea seems that the chicken manure is used to fertilise the farm around it (but is the chicken manure not too sharp?). This picture is from an area North of Campina Grande. The reservoir at left provides for drip irrigation.



Figure 14 A hydroponic system on display at the ABCMAC Conference in August 2012 in Campina Grande

In the discussion with the Dom Helder Camara Project it became clear that further development and promotion of suitable agricultural techniques would be beneficial. Resource recovery through utilization of biogas digesters or utilization of grey water are areas where further development and promotion is possible (Mattos & Farias Júnior, 2012), (Projeto Dom Helder Camara, 2012).

The ATER project: Projeto Assistência Técnica e Extensão Rural para Famílias em extrema Pobreza, technical extension and extension to families in extreme poverty, executed under the Brazil without Misery project, may be a response to this concern. IRPAA executes an ATER project from its Juazeiro base. ATER intends to provide more income for those who produce and more food for those who need it. Through financial incentive, technical assistance, and guarantee of sale for a fair price for produce, it contributes to make life. The project provides assistance to the poorest families and also undertakes active search for households in need (see annex 3 for a write-up in English).

In conclusion, rain water harvesting and water management are key to the households ability to live in harmony with the semi-arid zone. Many agencies are providing support to raise agricultural efficiency in water application and by selecting better suite crops and livestock solutions.

During the past 20 years, a number of popular movements of the civilian society (NGO's, small-scale farmers' unions, associations, cooperatives) have proposed and carried out successful alternatives. Rural people, who learned how to "live in harmony with the semiarid climate" and know appropriate production methods, are ready to fight for rainwater catchment systems as well as for all the other aspects facilitating and enriching life in SAB. They are discovering how to resolve the water problem in SAB: it has to be managed in different ways, according to the available kinds of water supply (ground, surface, soil and rainwater)(Gnadlinger,2003).

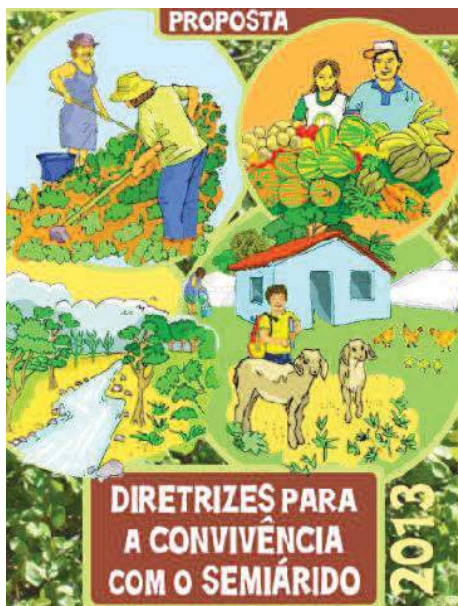
However, the interests of the large agri-industry are also present in the area with AgroVale, a massive agricultural enterprise in the Sao Francisco Valley. Large scale irrigation already takes place and a controversial plan has been proposed to divert even more water from the Sao Francisco.

Clearly the understanding and action by civil society to learn how to live within the drought affected North East is critical. It is a struggle between big water interests (and initially the State led 'drought industry' with its large-scale solutions) and localized solutions and management for living in harmony in the North East. The development of a multifaceted network of over 3000 NGOs and the increasing support from social – and subsidized – Government and State programmes for the poor and hard-core poor, demonstrates that other solutions are possible when water and land, agricultural and livelihood options are combined in ways that are technically and socially sustainable even given the uncertainties . The fact that ever more households are coming out of poverty shows that the approach works.

In the context of this very brief visit to the area it is not possible to analyse the politics of land and water, but these most certainly play a role in the development of the North East of Brazil.

5. Knowledge Management and Training

Capacity building for approaches in which one can achieve a dignified and decent living in the semi-arid areas is further promoted through a course programme under the RedeSAN Project. The Project is a partnership between the Ministry of Social Development and Fight against Hunger (MDS) and the Foundation for Support to UFRGS (Federal University of Rio Grande do Sul) engaged in training of managers of public food safety and nutrition. It offers free distant learning courses on learning to 'live in harmony within SAB' / *Convivência com o Semiárido Brasileira* aimed at people who work in the area and are working with or organizations working to combat food insecurity, poverty and social exclusion.



Course modules deal with

- Living in harmony with the semi-arid areas
- Sovereignty and food security and nutrition; human right to water and sufficient food
- Access to water
- Management and social control of public policies

It has recently also published a guidance document on developing public policies. The document was the outcome of consultations between social movements and trade unions, non-governmental organizations and the Catholic Church, along with rural households proposing guidelines for the construction of public policies for sustainable coexistence with this Brazilian region (Redesan, 2013).

It appears there are a large number of training opportunities and course programmes, at all levels, for ordinary people and practitioners, and also for students.

For instance, the National Institute for the Semi-Arid (INSA), Campina Grande/PB, in partnership with ASA, has recently announced the selection for the scholarship project "family farming systems resilient to extreme environmental events in the context of the Brazilian semiarid region (SAB): alternatives to coping processes for desertification and climate change." Candidates are invited from the field of agricultural sciences with a minimum experience of 5 years in issues of coexistence with the semiarid areas, with farmer experimentation and strengthening community networks (May 2013).

6. Documentation

ASA and other agencies working in or for the semi-arid zones invest a lot in documentation of their experiences as a tool for knowledge exchange. Systematic documentation plays an important role in recovery and reorganization of knowledge generated and accumulated locally.

In turn the process of collective process of recovery and recording of local knowledge and practices of coexistence within the semiarid zone will encourage others to also document their experiences. It is also an important educational tool of collective construction of knowledge and dissemination of successful initiatives in the field of family farming. Several tools are used to communicate, promote and document such as newsletters, brochures, radio programs, banners. In P1 +2, a tool that has been adopted is the print newsletter called O Candeeiro: The Lamp.



In addition to documentation and communication by ASA and its various partners, there have also been a good number of institutes and universities that publish on research and field experiences, appropriate technologies and approaches, and a variety of other promotional and political notes, evaluations and studies. The wealth of information will undoubtedly raise the capacity of the people and civil society to further enhance the capability to live decently in the semi-arid areas.

7. Evaluations and reflection

As the P1MC and P1+2 are expanding in the region, there are more opportunities for measuring impact and evaluating of outcomes. Increasingly local universities are coming in to undertake studies, often as part of undergraduate studies. One such studies collected data in Pernambuco in 2007 and looked at prevalence of diarrhoea among individuals whose household had a rainwater cistern compared to individuals whose household did not have a cistern. A lower prevalence among individuals with cisterns was found which illustrates the importance of improving water access through initiatives such as the P1MC in northeast Brazil (Marcynuk & et al, 2013). Further studies are needed to investigate this association while accounting for additional risk and preventative factors that may be associated with diarrhoea among the study population.

Two evaluations of the program were carried out one by the Audit Division of the Brazilian Government (2006) and the other by EMBRAPA (2006). Under the positive aspects are mentioned the health improvement of the population through better drinking water quality and time saving of women. Cultural problems are that the people use water for other purposes than drinking and that they don't consider water quality adequately. More time and money should be invested in awareness building (Gnadlinger J. , 2007)

The Department of Sanitary and Environmental Engineering of the Escola de Engenharia, Universidade Federal de Minas Gerais, during one of its studies around Berilo, undertook a participative SWOT matrix to describe the politico-institutional aspects of P1MC. The matrix shows the tensions between opportunity for action and the lack of political organization and acumen to manage the opportunity.

Strengths	Weaknesses	Opportunities	Threats
Participative and transparent management of public resources ●●●●●●●●	Small team, large area to be served and short period to achieve the goals ●●●●●●●●●●	Partnership with universities and researchers ●●●●●	Programs using different methodologies ●●●●
P1MC arrives where the public power has not arrived yet ●●	Lack of collaboration between the stakeholders involved (public power and civil society) ●	More leaderships working for community strengthening ●●●	Fragmented policies in the field ●●●●
The commitment that local management units have with the benefited families ●	The poorest families are left out of the program	Auditing to reinforce the management commitment and the quality of the projects ●	<i>Cisternism</i> ●●●
The network ASA has almost 2,000 entities / institutions		Implement rainwater harvesting services in rural schools ●	Large families: 24% of the families have more than five members ●
The municipal committees a key piece of the program (P1MC) ●			Auditing methodology which gives more relevance to the technical aspects of the program
Community strengthening through the actions of the program			

The circles indicate the importance that participants gave to every issue identified. One circle = one vote

One of the threats to the program identified during the workshop would be the so-called “cisternism”, by which more attention is paid to the hardware than to the software aspects of the program. There is scope for improving universal access of the programs to reach the most vulnerable sector of society. So, designing more flexible programs that can be adjusted to different local contexts may become essential.

In the long term, local government bodies are the main entity with the capacity to monitor that rainwater is collected in a safe and reliable manner and, if needed, conduct awareness campaigns to improve operation and maintenance practices and provide technical and logistical support to assure water quality. The collaboration between health workers and P1MC that is starting to take place in Brazil will certainly bring fruitful results in terms of improved water quality. (Domènech, Gomes, & Heller, 2012)

The water quantity provided by a 16m³ reservoir is likely not sufficient for an extended drought (dos Santos & Barbosa da Silva, 2009). But it is a good start to make the household more resilient.

Further evaluations must consider the technical aspect of construction and of water quality. For instance it would be of interest to study the integrity of tanks constructed in the field, and in particular try to assess water tightness. The latter is not easy as reservoirs are partially constructed below ground. An evaluation of the functionality of the cisternas seems to have been done by EMBRAPA, but data are not available.

Considering that female-headed households make up 30 percent of households in the Brazilian semi-arid region, and that in times of drought a big proportion of poor men out-migrate, the need for gender equity policies in development is paramount, especially in water stressed regions. Within the P1MC and P1+2 programmes, women not only derived significant material benefits from the program, such as access to water, more time, and better health for their families, but they also acquired economic and political opportunities (as cistern builders and as members of municipal water commissions), roles traditionally reserved for men. The cistern builders, for instance, initially numbered only three, while by 2008 there were approximately 300. They have their own regional meetings, funded by the P1MC. Central to this transformational process was the role played by local feminist NGOs and by social movements and networks supporting women's organization and their participation in non-traditional roles. This extended participation contributed towards extending women's rights not only to access clean water for survival, but to participate in society as agents of their own development (Moraes, 2012).

A recommendation of an ABCMAC Workshop is that water normally should not be treated in the cistern, but in a separate container before consumption through for instance a charcoal filter, boiling, moringa seeds, SODIS, chlorination (Gnadlinger J., 2007)

8. Conclusions

In the last twenty years, the North East of Brazil has seen important changes in the way people have learned to live with in the tough and water scarce conditions. Large scale solutions are still attempted, but on the whole the advent of rainwater harvesting technology and a variety of agricultural adaptations to growing food while conserving water, has made life better. Still, poverty is present and continued efforts by government such as through the Bolsa Familia and a range of support programmes are required to lift families out of extreme poverty.

The role of civil society, directly through support to implementation of RWH projects, but also indirectly through its organization, its ability to respond to government authority during project planning, advocacy and communication, and training at all levels, has been exemplary. Most certainly this has provided the oil of implementation and empowerment to the machinery that the government brought to bear in resolving the issues in the North East.

It seems that the 9th Conference of the International Rainwater Catchment Systems Association (IRCSA) (the 2nd Brazilian Rainwater Catchment Symposium), held in Petrolina in July 1999 was a watershed in how Brazil viewed rainwater harvesting. The participation of important speakers from all around the globe and rainwater harvesting practitioners from other parts of the world demonstrated to Brazil the importance and potential of rainwater harvesting. The Conference also led to the creation of ABCMAC,

Associação Brasileira de Captação e Manejo de Água de Chuva/Brazilian Association for Rain Water Harvesting and Management. ABCMAC and EMBRAPA subsequently played important roles in facilitating initial technical development of aspects of the P1MC project and the promulgation of rainwater harvesting technologies and experiences.

Initially through the P1MC project from 2003 and later through the P1+2 project in 2007 more families are gradually able to learn to live within the semi-arid area. Rain water harvesting and water management are key to the households ability to live in harmony with the semi-arid zone. Many agencies are providing support to raise agricultural efficiency in water application and by selecting better suite crops and livestock solutions. The emigration out of the area also seems to have reduced, and more families see life in the North-East as a reasonable prospect.

The situation of the SAB 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.

Clearly the understanding and action by civil society to learn how to live within the drought affected North East is critical. It is a struggle between big water interests (and initially the State led 'drought industry' with its large-scale solutions) and localized solutions and management for living in harmony in the North East. The development of a multifaceted network of over 3000 NGOs and the increasing support from social – and subsidized – Government and State programmes for the poor and hard-core poor, demonstrates that other solutions are possible when water and land, agricultural and livelihood options are combined in ways that are technically and socially sustainable even given the uncertainties. The fact that ever more households are coming out of poverty shows that the approach works.

When limited to interventions in rainwater harvesting and agricultural techniques, one can conclude that the combination of innovation, applied research, persistence and commitment to improve the fate of the poor people of the North East, in combination with ample government funding has produced, and continues to produce impressive results, in poverty alleviation, citizenship rights and engagement in society, and in prospects of life.

However, the importance of civil society and its ability to construct an intermediary to negotiate with government on behalf of its constituencies, has been critical. Without the voice of CSOs, the democratization of water development in the North East may not have taken place and large scale water users may have gotten the upper hand. Even today these risks are present with the plans for a diversion of the Rio Sao Francisco still on the table.

Over 600'000 rainwater tanks have been constructed and people have been trained in survival in these drought conditions. The now appreciate that fighting for more water is not always possible, but that *Convivência com o Semiárido* by adopting suitable methods of water storage and use allows people to live even though water is scarce. Continued support through specialized government agencies, through social support programmes, and through the vibrant civil society infrastructure allows for further quality

enhancements of the programmes, further research and development, for continued communication and training, and academic evaluation for quality control.

With all the difficulties that the programming has faced socially and politically, very important achievements can be noted, and all stakeholders are to be commended for these achievements. That recognition is obviously there, as ASA on behalf of the promoters and implementers of P1MC and P1+2 has received several international awards.

According to Gnadlinger community water actions leading to programs like P1MC and P1+2 would not have been possible without a new vision of SAB, based on “living in harmony with the semi-arid climate” and assurance of three principles:

- Access to land and water (all the people have fundamental rights to land, drinking water, hygiene and food production),
- Sustainability of the production system (in the use of land and water), the technologies and the market,
- 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).

In their origin, the two Brazilian programs were influenced by the Project 1-2-1 in the Gansu Province of China. It may well be that the experiences in the North East will be useful in turn to China, or to semi-arid areas in the Indian sub-continent or Africa .

The bi-annual conferences of ABCMAC and the growing influence of its membership, with representation from government, university, CSOs, practitioners and the private sector, will continue to raise the profile of rainwater harvesting for development, water resources management and risk reduction. It further inspires and encourages better practice through regular documentation of experiences in rainwater harvesting and water conservation.

9. Some take home lessons

1. The Government of Brazil has subsidized the construction of rainwater tanks under the P1MC project and in general has facilitated the implementation of the project through ASA and its member NGOs. To copy such an approach in suitable areas in Africa would be difficult directly through Government programming and would require substantial support by Development Partners.
2. Furthermore technical support from government agencies and practical and advocacy support from NGOs may be more difficult to secure in many African countries, while local conditions and social differences may make successful replication of the Brazil programme less feasible.

3. Experiences with individual technical applications in water collection and storage, and in agricultural solutions for retaining green water, and for livestock, may well be transferable. Many of the technologies in use in Brazil are also described in the most recent 3R publication 'Securing Water and Land in the Tana Basin' (2012).
4. The initiatives by some Government Agencies and NGOs started a process of searching for local, decentralized solutions in water supply, rather than going for disruptive large engineering options, as had been the tradition. It took time and making good use of opportunity, such as the IRCSA meeting in Petrolina, that brought international capacity and experience on RWH to Brazil. It led to the establishment of ABCMAC, the Brazil RWH association, that has been able to further raise interest in RWH through its bi-annual Conferences.
5. Alliance building with Civil Society and NGOs keen on improving the situation in the drought affected North East, from some 700 partners at the beginning of P1MC to 3000 now being part of ASA: Articulação no Semi-Árido Brasileiro/Articulating (needs) for the Semi-arid Areas of Brazil. ASA enables communication and exchange of experiences, which in turn allows all partners to inform local processes and advocate for action within local authority areas.
6. The focus of recent Federal Governments to develop pro-poor policies and action programmes (e.g. Plano Brasília Sem Miséria) aimed at lifting households out of poverty, giving attention to the health and livelihood prospects of and engaging them as citizens in their own development, has benefited the RWH movement. It has provided a spade and trowel to the appropriate technology and advocacy provided by civil society.
7. While the seeds for the opening of the North East were sown long ago, (e.g. Paulo Freire's philosophy, political action in the 1980's) it took time and persistence to make progress. Initially the thinking was based on helping vulnerable and remote households in the North East to water. The gradually in the last 10 years, the concept became more holistic, thinking from the household and community needs upward. What are the needs, how does an intervention fit in the large support picture? That changed the focus from water only for the household, to water for agriculture and livestock. Now for further sustainability and restoration of the landscape, further public and community measures are needed to implement technical and social measures to retain some water wherever there is scope, water for our living environment. Persistence and patience is the key. May be not the best attribute of Development Aid.
8. The interaction within ASA - in 2012 it held its 8th ENCONASA conference with its constituent partners and stakeholders - is a great opportunity for reflection and renewal. Other conferences and exchanges take place within the Region allows for discussion and communication of political and policy aspects affecting the ability to live in harmony in the semi-arid zone of Brazil. Creating regular opportunities for exchange, communication and public debate are critical for effective progress.

9. Recommendations

1. To effect a greater exchange of knowledge and experiences between RWH practitioners between Africa and Latin America, it would be good to invite selected members from the SEARNET network to the ABCMAC conference of August 2014. The reverse can then take place by inviting a team from Brazil to the IRCSA 2015 Conference which is informally suggested for Kenya or South Africa. Interaction should focus on knowledge and information exchange for promotion RWH, but also on creative and structural solutions for managing and improving national RWH associations in low-resource settings.
2. The importance of national/local alliance building between Government, NGOs, Universities and representatives of other stakeholder segments is critical. Many of the RWH associations in East and Southern Africa would benefit from a pro-active membership drive to engage other potential RWH interests. It would be profitable to develop a methodology and guide for national RWH associations to undertake profile raising and increase the membership. A larger and more diverse membership would raise the respectability of the organization and its ability to interact with Government and Development Partners on promoting RWH for water and food security. Thus, national associations would also be able to support national/local RWH communication and advocacy activities.
3. For communication and promoting RWH, countries in Africa may initially not be 'large' enough to yield a lot of interesting information to fill a monthly or bi-monthly newsletter. Borrowing Africa and world-based information from for instance the IRHA website may be a cost-effective approach for maintaining a national newsletter, for instance for Malawi. RAIN could consider to engage IRHA, or a similarly well-informed and competent agency, for servicing public communication needs for national associations in RWH active countries in Africa.
4. In the context of the IFAD supported project it would be helpful to create a link with EMBRAPA by making contact with the EMBRAPA offices in Africa, in particular in Mozambique and Senegal.
5. This short visit to the North East of Brazil has confirmed that interesting developments and technologies are happening. Time was not available to collect more information on detailed application and experiences. The IFAD team in Recife indicated that there is a need for further development and communication of appropriate technology in water collection and storage for domestic and agricultural/livestock use, for resource conservation methods in agriculture and application of drought and salinity resistant crop varieties, for efficient reuse of agricultural waste and waste water, and for developing further opportunities for food preservation methods for local vegetables and fruits. ATER, the extension instrument recently put in place in the Plano Brasília Sem Miséria , would provide a channel for training and communication of good practice.

RAIN Foundation may want to consider to further explore the potential for exchange by identifying a Brazilian expert, or an expert who has studied in Brazil, to further create a link with the context of the RAIN/IFAD project, and in particular the technical aspects described in the recent publication about the Tana river.

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- Teixeira de L. Brito, L., Soelma B. de Moura, M., & Feitosa B. Gama, G. (2007). *Potencialidades da Água de Chuva no Semi-Árido Brasileiro*. Petrolina: Embrapa Semiárido.
- Urbano, I. (2012). *Unidade Técnica Objetivando Práticas Inovadoras e Adaptadas*. Campina Grande: Utopia.

Further useful sites on technology, training, education, on water, livelihood, agriculture etc.

<http://www.diaconia.org.br/novosite/biblioteca/>

http://plataforma.redesan.ufrgs.br/biblioteca/procura.php?cod_tipo_bib=10

<http://www.ufrgs.br/redesan/cursos-2/aguas-cisterna-2013>

<http://www.centrosabia.org.br/>

Proposal for a review of the experiences in rainwater harvesting in Brasil, in particular in the drought-affected North East

Introduction

In 2012 RAIN Foundation received a grant from IFAD, the International Fund for Agricultural Development, to execute a global program on '*Rainwater Harvesting for Food Security; Setting an enabling institutional and policy environment for rainwater harvesting*'.

With growing pressure on water resources, the need to combat climate change effects and provide water supply to households and communities so far unreached, interest has been growing in the last two decades to harness rainwater. While rainwater harvesting promotion focused on ensuring access to safe water for the households that can otherwise not be served, there is now growing interest in exploiting extra benefits in generating (climate change) resilience and livelihood opportunities through enhancing water security. Retaining water where it falls and slowing its flow through the landscape will allow households and communities to eke out a livelihood even when annual rainfall is limited and erratic, and evaporation is high.

RAIN Foundation has in the last decade worked with a wide range of national and international organizations to explore options and opportunities in rainwater harvesting. In that way it has supported demonstrations and documentation of domestic roofwater harvesting, multiple use systems (MUS) and 3R (Recharge-Retain and Re-use). These approaches all contribute to reducing erosion due to heavy rain events. Most recently, RAIN has been part of a consortium of partners that applied such techniques in a document entitled "Securing water and land in the Tana Basin".

While RAIN has been promoting rainwater harvesting around the globe, it has become clear that there are many initiatives, national and international associations, and technical agencies that in one way or another promote and apply rainwater harvesting for survival and improvement of livelihood. Linkages between the various initiatives have been limited and while experiences may have been documented, too many good practices have remained hidden because of remoteness, language, or lack of appreciation of the ecological and social importance of the work done.

The funding from IFAD will enable RAIN to facilitate several objectives:

- mobilise and strengthen a range of existing rainwater harvesting (RWH) networks to undertake collective action
- develop global, regional and national inter-institutional learning systems on RWH
- reinforce innovative RWH approaches and mainstream these into quality enhancing operations

Rainwater harvesting in Brazil

Brazil is a water rich country which has a large area that is semi-arid. Survival in the semi-arid zones in the North East of Brazil has always only been possible by managing (rain)water. The Brazilian semi-arid region covers an area of 975,000 km², covering 1,133 municipalities of northeastern Brazil and northern Minas Gerais. It is an area in which people have been quite

poor and survived in marginal farms. Since 2003 ASA (Articulação no Semi-Árido Brasileiro – [speaking up for the semi-arid areas in Brazil] a local NGO network that brings together some 1000 civil society organizations associated with the semi-arid areas) has supported the constructed of some 419'000 rainwater catchment reservoirs for domestic water supply under the one million cistern programme (P1MC). Subsequently to further enhance the livelihood opportunities in this vast area, the P1+2 –One Piece of Land and Two Types of Water-Programme was initiated in 2007. So far it has completed rainwater collection systems existing of 9000 cement-plate tanks, 420 subsurface dams and 302 rock catchments. In addition 208 Volanta-type water pumps have been installed. Altogether P1+2 serves some 12'000 families.

As part of the IFAD supported programme, RAIN would like to gather information on the effectiveness and scope for replication of the P1MC and P1+2 Programmes to other areas of the world.

Short consultancy on RWH experiences in Brazil

The Terms of Reference consider the consultancy to be an initial venture to link up with the experience and expertise that is available in Brazil in rainwater harvesting in general through ABCMAC (Associação Brasileira de Captação e Manejo de Água de Chuva), and through the ASA Programmes P1MC and P1+2 in the semi-arid areas in Brazil.

Methodology:

1. Literature review of documentation and information materials, mostly in the Portuguese language (3 days)
2. Preparation of field visits and travel, contacting by e-mail, etc. (1 day)
3. Travel in Brazil

It is assumed that the consultant is already in Brazil as he has been invited to present a paper on Collection and Storage of Rainwater in the Vth Conference on Use of Water in Agriculture at the University of Passo Fundo (RS). This Conference will take place from April 15-18, 2013.

From April 20-26, the consultant proposes to travel to Recife (ASA, IFAD), Juazeiro/Petrolina (IRPAA, ABCMAC, possibly EMBRAPA semi-arido and field visits to the semi-arid area) and Belo Horizonte (Universidade Federal de Minas Gerais – UFMG).

Interviews will be held with officers from Government, and other agencies supporting the rainwater harvesting activities specific to the semi-arid regions of Brazil (5days)

4. Draft final reporting (2 days)

Deliverables

1. **Learning note** providing a description of the conditions in the semi-arid region in Brazil, how over the last 15 years promoting the application of rainwater collection has improved livelihood, health and agronomy.
2. The study will include an assessment of the extent to which the P1MC and P1+2 programmes have been effective, what has made the programme successful, and in how far would aspects of this type of programme would be replicable elsewhere, e.g in Africa, from a social or agronomic perspective.
3. The learning note will further include a list of people met or contacted, and a list of sources (both publications and websites).

Travel schedule Han Heijnen to North East of Brazil			
17-04-2013	Uganda –Netherlands	KL535	
20-04-2013	Netherlands- Brazil	KL791	Hotel Matiz Guarulhos
21-04-2013	Sao Paulo – Petrolina	Avianca 6314	Grande Hotel de Juazeiro
24-04-2013	Petrolina-Recife	Avianca 6313	Hotel Praia Recife
26-04-2013	Recife-Sao Paulo	Avianca 6304	
26-04-2013	Brazil-Netherlands	KL792	Arrival 27-4-2013

Persons met	Agency/function	e-mail address	Observations
22-04-2013	IRPAA/Juazeiro		
Johann (Joao) Gnadlinger		joao@irpaa.org	Also ABCMAC (+55)74-8808-6714
Harald Schistek		haraldo@irpaa.org	
Raimundo Fabio	Chief Communication	fabio@irpaa.org	
23-04-2013	Field visit to Caraçá		
Joao, Augustinho			
24-04-2013	EMBRAPA - semi-árido		
Natoniel Franklin de Melo	Director General		
Maria Auxiliadora Coelho Lima	Director Research and Development		
Luiza Teixeira de Lima Brito	Agriculture scientist Researcher	luiza.brito@embrapa.br	Also ABCMAC
Lucio Alberto Pereira	Ecologist/ researcher	lucio.pereira@embrapa.br	(87)3866.3600
Ghislene Feitosa Brito Gama	Librarian	ghislene.gama@embrapa.br	
25-04-2013	Projeto Dom Helder Camara/FIDA		
Felipe Jalfim	Coordinator Planning and Management	fjalfim@dom.gov.br felipejalfim@yahoo.com.br	(81)9949.0799
Ricardo Menezes Blackburn	Expert in Agric. Production Systems	ricardo@dom.gov.br	(81)9711.8205
Eleny Lins		eleny@dom.gov.br	
25-04-2013	ASA		
Cicera Gomes	Assessora da Coordenação P1MC/ASA Brasil	cicera.gomes@asabrasil.org.br	(81) 2121.7666
Caleiee Vogueira		gleieeani@asabrasil.org.br	



Now Airton and Maria Auseir can plan the future of their children

More income for those who produce, more food for those who need it

Incentive, technical assistance, and guarantee of sale for a fair price make life in the country better

As one of the largest food producers in the world, Brazil presents a perverse paradox in rural areas: according to the 2010 Census, 7.5 million persons live in a situation of extreme poverty. Out of the total, 6.5 million live in the North and Northeast regions. They are family farmers, people who make a living extracting natural resources, fishermen, *quilombolas*, Indians, traditional peoples and communities. In order to reach these families, Brasil Sem Miséria operates in three fronts: the Program to Stimulate Rural Productive Activities (Programa de Fomento às Atividades Produtivas Rurais), the Technical Assistance and Rural Extension Program (Assistência Técnica e Extensão Rural, Ater), and the Program for the Acquisition of Food (Programa de Aquisição de Alimentos, PAA).

Implemented by the Social Development and Fight Against Hunger Ministry (MDS) in partnership with the Agrarian Development Ministry (Ministério do Desenvolvimento Agrário, MDA), the Incentive Program (Programa de Fomento) promotes food security and stimulates

sustainable agriculture. The projection is to invest about R\$ 348 million until 2014. Each family that participates in the program receives R\$ 2.4 thousand, not reimbursable. The resources, paid in three installments (the first of R\$ 1 thousand and two of R\$ 700) is oriented to the acquisition of inputs and equipment.

The program also guarantees technical assistance, rural extension, and the distribution of seeds. New opportunities of income generation are opened for the families benefited by the program, once equipped with adequate tools, making the wheels of the local economy turn better.

To produce more and better

Before starting to receive the Fomento, the families are included in the actions of Ater developed by the MDA. Making use of public summons, the Government selects technicians and civilian organizations to draw the profile of the beneficiaries, indicating the agricultural activities that are more adequate to each family nucleus and transmitting

know how about production and management techniques, so that the families can produce more and better.

After making a diagnosis, the technicians of Ater provide guidance to the families in the development of a Project for Structuring a Family Productive Unit (Projeto de Estruturação da Unidade Produtiva Familiar), indicating the activities selected and defining deadlines and stages. The resources of the incentive are transferred to the beneficiaries through Bolsa Família's payment structure.

The Ater agents follow up each family's activities for two years, maximum time of permanence in the program, which can be extended for six more months. During this period, the families have to provide evidence that they are achieving the targets of the project in order to guarantee the receipt of all installments.

In Minas Gerais and in the states of the Northeast, 129 thousand families of extremely poor farmers have guaranteed technical assistance. The target is

Sale for a fair price

With the help of Brasil Sem Miséria, many Brazilians are leaving extreme poverty and entering the map of opportunities. Opportunities that are enhanced by the Food Acquisition Program (Programa de Aquisição de Alimentos, PAA), created to promote the access to adequate nourishment and to economic and social inclusion, and to stimulate sustainable production, commerce and consumption, through family farming.

The PAA makes the acquisition of food possible for poor and extremely poor farmers, people who make their living exploring natural resources, fishermen, Indians and *quilombolas*, without the requirement of an auction. The food bought from these producers is used to provide meals in schools and the

to provide assistance to 253 thousand families until 2014.

With specific actions of productive inclusion and incentives for sustainable agriculture, Brasil Sem Miséria is beginning to change the landscape in rural areas. It has changed the life of people like farmers Maria Ausenir Lopes da Silva and her husband, Airton de Souza Santos. Living in Exu, in the State of Pernambuco semiarid area, they have decided to raise chicken after receiving guidance from the agents of Ater.

With the first installment of the incentive, R\$ 1 thousand, the couple bought the material needed to build a chicken pen where 30 chicken are being raised. The project has worked so well that Maria and Airton are already planning to improve the installations and to buy more matrixes with the money of the next installment.

"I am thinking of engaging in commerce sometime in the future", said Airton, one eye on the future of their children.

provision of the entities that form the social assistance network.

Since the launch of Brasil Sem Miséria, 82 thousand extremely poor farming families have already sold their products to the PAA, and new rules are being implemented to expand further rural productive inclusion. The model of agreements is being gradually replaced by terms of adhesion, which are easier and require less red tape. With the change, the farmers will receive the payments using a magnetic card of an official banking institution. The budget for the expansion of the program in 2012 is of R\$ 1.3 billion. An investment that will allow extremely poor farmers to reinvest in the improvement of the quality of life of their families. 🇧🇷

129
thousand
families with
guaranteed
technical
assistance

82
thousand
families of
extremely poor
farmers included
in the **Food
Acquisition
Program**

Drinking water, produce, include

Water-tank construction program brings citizenship to the Semiárido region, quenching thirst and generating income

Today Mrs. Amélia Júlia de Jesus, who lives in the rural area of Exu, in the State of Pernambuco, has clean water at her doorstep. But it was different in the past. “We suffered a lot, we used to have to go out at night, carrying old cans on our heads, looking for water”, she tells, after being benefited by one of the 490 thousand water-tanks installed in the Semiárido since 2003.

The target of the Programa Água para Todos (Water for All Program) is to provide 750 thousand families with water for human consumption, particularly those families who live in a situation of extreme poverty in the Semiárido region. The families benefited are those registered in the Single Register (Cadastro Único) who informed, in the last Census, that they lived in rural areas and did not have any access – or had precarious access– to water.

The inclusion of Água para Todos in the Brasil Sem Miséria Program has sped up the pace of construction of water tanks, which grew from an annual average of 47 thousand from 2003 to 2010 to 111,206 built from 2011 to April 2012.

The program is coordinated by the National Integration Ministry (Ministério da Integração Nacional), with the support of the Social Development and Fight Against Hunger Ministry, the Environment Ministry, the Cities Ministry, and the Health Ministry, of the Banco do Brasil Foundation, of Banco do Nordeste do Brasil (BNB), and of the National Water Agency (Agência Nacional de Águas).



Dona Amélia exchanged the long journey carrying old cans on her head for the clean water at her doorstep

Also living in Exu, Noêmia Pereira da Silva had to make a 10-kilometer journey to wash clothes. She used to leave home at 4 am with her daughters, carrying the bundle of clothes, by wagon or by bicycle. The water-tank, in addition to shortening the distance, saved the family from diseases that threatened particularly the children, due to the bad quality of the water they consumed in the past. "Life is golden today", says Mrs. Noêmia with a smile.

Water, that quenches thirst and brings comfort, also contributes to increase income. Now, the couple Espedito and Eliethe Leite, for example, can grow vegetables in Ipubi, in the semiarid region of the State of Pernambuco. Since they received the so-called "second water" – that is, water for production – Espedito and Eliethe began planting

lettuce, coriander, green onions, cucumber, carrots, beets and squash. All without agrochemicals, to sell at the street market. Before, they grew only manioc and depended on the help of others to harvest, dry, grind, and toast.

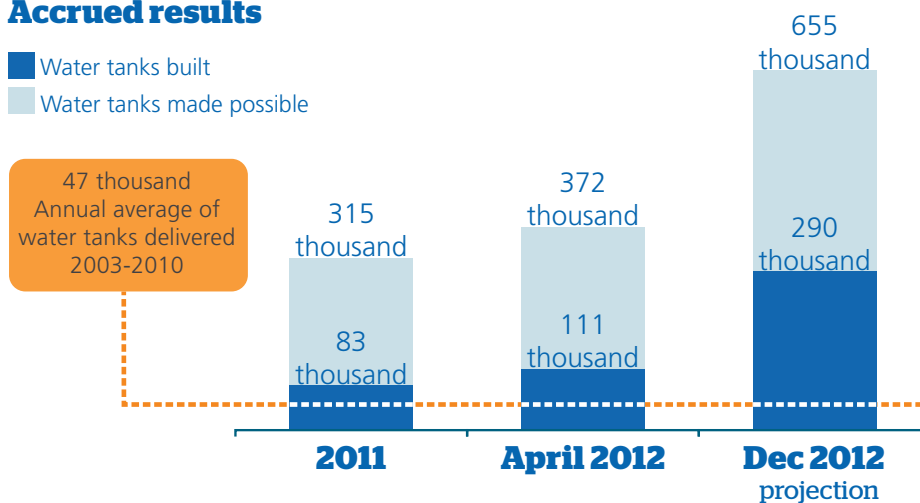
"It was very difficult. With the plantation of vegetables, I and my husband can do everything without help", says Eliethe.

The couple receives about R\$ 80 per week. "The situation is much better, both from the financial and from the family point of view", says Espedito. His wife, who loves to work with plants, watches TV shows on agriculture in order to learn about new crops. "We will try planting strawberries", she said, showing with love the green seedlings that are just beginning to grow.

111
thousand
water-tanks built
in the Semiárido
from 2011 to
April 2012

Accrued results

- Water tanks built
- Water tanks made possible



Thanks to Água para Todos, Espedito and Eliethe plant vegetables and are experimenting with strawberries

Some of the agencies that play an important role in promoting improvement of livelihood through agriculture, conservation of water and soil, and social mobilization in the semi-arid zone of North Eastern Brazil.

Instituto Nacional do Semiárido (INSA)

Av, Francisco Lopes de Almeida, s/n
Serratao, Campina Grande - PB
Phone: (83) 2101 6400, E-mail: insa@insa.gov.br
Contact: Salomao de Sousa Medeiros - salomao@insa.br

Promoting good agricultural practice through documentation, publications, etc. e.g. Sistemas agroflorestais no semiárido brasileiro; Glicirídia, Árvore alternative para o semiárido brasileiro
INSA is part of the Ministry of Science, Technology and Innovation

Embrapa Semiárido: Empresa Brasileira de Pesquisa Agropecuária

BR 428, Km 152, Zona Rural
Caixa Postal 23
Petrolina, PE - Brasil - CEP 56302-970
Phone: (87) 3866-3600
Contact: Luiza Teixeira de Lima Brito – luiza.brito@embrapa.br

EMBRAPA has a training and demonstration area a few miles away from their campus.

IRPAA: Instituto Regional da Pequena Agropecuária Apropriada/Regional Institute for Appropriate Small Farming and Animal Husbandry

Avenida das Nações,04
CEP 48907-218 Juazeiro - Bahia, Brazil
Phone: (74) 3611.6481
www.irpaa.org.br
Contact: João Gnadlinger, - joao@irpaa.org

IRPAA gives residential training courses at their Centro de Treinamento Vargem da Cruz, some 12 km outside of Juazeiro. Courses range from one day to 2 weeks on a diverse spectrum of subjects relevant to the SAB. The 30 hectare plot can accommodate 60 persons at a time.

Articulação no Semi-Árido Brasileiro (ASA)

Rua Nicaragua 111, Espinheiro- 52020-190
Recife PE
Phone: (81) 21217666
Asacom@asabrasil.org.br
www.asabrasil.org.br
Contact: Cicera Gomes, Assessora da Coordenação P1MC
cicera.gomes@asabrasil.org.br

ASA is the umbrella organization coordinating some 3000 NGOs and CSOs in the implementation of the P1MC and P1+2 projects. The projects are part of the programme for development of policies for living in harmony with the semi-arid zone. ASA is funded by the various ministries and entities within the Government of Brazil, including Governo de Minas Gerais – Secretaria de Agricultura Familiar (SAF), Ministério do Desenvolvimento Agrário (MDA), Ministério do Desenvolvimento Social (MDS), etc.

ABCMAC

Associação Brasileira de Captação e Manejo de Água de Chuva
Rua Presidente Dutra, 160, Sala 7A, Centro, Prédio da Codevasf 3° SR
CEP: 56304-230 - Petrolina, PE
E-mail: johanng@abcmac.org.br/joao@irpaa.org

President: Salomão de Souza Medeiros, (INSA): salomao@insa.br
1st Secretary: Luiza Teixeira de Lima Brito, (EMBRAPA-Semiárido)
luiza.brito@embrapa.br

Projeto Dom Helder Camara/FIDA

Rua Dr. Silva Ferreira, 122 – Santo Amaro
Recife/PE – CEP: 50040-130
Phone: (81) 3301.1355
www.projetodomhelder.gov.br
Contacts: Felipe Jalfim Coordinator Planning and Management
fjalfim@dom.gov.br/felipejalfim@yahoo.com.br
Ricardo Menezes Blackburn - ricardo@dom.gov.br

Projeto Aguadas

Instituto de Gestão das Águas e Clima (INGÁ)
Secretario de Meio Ambiente
Governo de Bahia

Department of Sanitary and Environmental Engineering

Escola de Engenharia, Universidade Federal de Minas Gerais,
Av. Antônio Carlos, 6627, Campus Pampulha, 31270-010 - Belo Horizonte, Brazil
Contact: Prof. Leo Heller - heller@desa.ufmg.br. Phone: 031 3238.1958
Prof. Luiz Rafael Palmier (President of ABCMAC from 2007-2011),
palmier@ehr.ufmg.br

Utopia

Unidade Tecnica Objetivande Praticas Inovadores e Adaptadas Av. Dr.Francisco Pinto
323, Bodocongo 58.429-350, Campina Grande -PB - Brazil
Utopiapb@gmail.com
Contact: Ir. Irmao Urbano E-mail: irmaourbano@gmail.com

UTOPIA: mission: create and promote technical solutions that will help the people in the rural areas to survive with the drought.

Post-graduate programme on irrigated agriculture and water resources
Universidade Federal do Reconcave da Bahia, Centro de Ciencias Agrarias Ambientais e Biologicas
Rua Ruy Barbosa, 710, CEP 44380-000
Cruz das Almas - Bahia
(75) 3621 2798
Wrim@wrim.com.br

www.ufrb.edu.br/pgea
Contact: Hans Raj Gheyi (UFRB/CCAAB) E-MAIL: hans@pg.cnpq.br

ASAMIL (Associação de Semi-árido de Microregião de Livramento)

Avenida Presidente Vargas, Nº 140 - Sala 104 - Centro - Livramento de Nossa Senhora - Bahia.
CEP: 46140-000, Telefone: (77) 3444-5314, Email:contato@asamil.org
<http://asamil.org/>

Cisternas de Plástico PVC SOMOS CONTRA!



SOLUÇÃO OU ARMADILHA?

Durante muitos anos, o Semiárido foi apresentado e tratado como inviável e um entrave ao crescimento econômico e social do País. Uma região onde as pessoas não sobreviveriam sem ajuda externa e eram consideradas incapazes de assumir seus destinos.

Essa ideia, construção simbólica, não foi despreziosa, nem pode ser associada à natureza ou às pessoas que vivem no Semiárido. O que se sedimentou é uma construção política, atribuindo todas as dificuldades a Deus ou à natureza. Esse pensamento sempre teve um objetivo claro: beneficiar poucos e manter o poder de dominação da elite, gerando subalternidade.

Associada à falta de água, a solução apontada pela política de combate à seca foi sempre de cunho milagroso: um grande açude, uma grande barragem, a transposição do rio São Francisco, uma grande adutora. Na história recente, no plano dos governos federais, tivemos:

- 1972** PLANOS DE AÇÃO PARA EMERGÊNCIA CONTRA AS CALAMIDADES PÚBLICAS DE SECAS E DE ENCHENTES (Ministério do Interior/Sudene)
- 1979** PLANOS DE AÇÃO PARA EMERGÊNCIA CONTRA AS CALAMIDADES PÚBLICAS (Ministério do Interior/Sudene)
- 1979-83** AÇÃO DO GOVERNO FEDERAL NO COMBATE AS SECAS DO NORDETE (Ministério do Interior/Sudene)

Essas ações ficaram nacionalmente conhecidas como as responsáveis pela famigerada Indústria da Seca.

Numa outra perspectiva, nessa mesma região, a partir do envolvimento das famílias em torno de tecnologias simples, baratas e de grande impacto, **gestadas a partir dos conhecimentos e das práticas das comunidades**, foram sendo construídas cisternas de placas. De algumas dezenas, passaram para centenas e hoje são cerca de 500 mil reservatórios. Uma revolução silenciosa, resultado de uma ação conjunta da sociedade civil organizada, dos governos federal, estaduais e municipais e de vários outros parceiros, inclusive bancos e empresas.

Assim, gradativamente foi crescendo a perspectiva da política de convivência com o Semiárido.

Hoje, o Brasil, a partir da efetivação do Programa Água para Todos, no contexto do Plano Brasil Sem Miséria, pode finalmente comemorar a decisão governamental de universalizar as cisternas, pôr fim à Indústria da Seca e garantir água de qualidade a todas as famílias rurais do Semiárido. Decisão que veio para valer e **demonstra o compromisso do governo da presidenta Dilma Rousseff**.

Parece-nos, no entanto, estranho e inaceitável que, neste contexto, as cisternas de plástico/PVC surjam como alternativa para o semiárido, uma vez que excluem a população local,

não permitindo a sua participação no processo de reaplicação da técnica, criando dependência das empresas.

Efetivamente, o sucesso da ação da ASA através do Programa Um Milhão de Cisternas está na participação das famílias como protagonistas de sua história. No fazer e ser parte do processo.

Nesse contexto, nós, famílias agricultoras e organizações que fazemos a ASA, não nos consideramos as donas da tecnologia, e nem as únicas envolvidas neste processo. No entanto, nos sentimos no dever e no direito de alertar o governo e a sociedade brasileira sobre os efeitos negativos das cisternas de plástico/PVC.

Por fim, queremos ser ouvidas, participarmos e sermos corresponsáveis pela construção e gestão da política de convivência com o Semiárido.

Indicadores	Cisternas de placas	Cisternas de PVC
Cidadania	Água como direito e não benefício. Água como segurança alimentar.	Pessoas beneficiadas que dominam apenas parte do processo.
Construção	Construídas pelos agricultores/as pedreiros/as junto com as famílias.	Entregues prontas às famílias pelas empresas.
Domínio da técnica de construção/Autonomia	Famílias dominam todo processo, participam, constroem e multiplicam para outras famílias.	Domínio das empresas.
Fortalecimento do mercado local	A cada dez mil cisternas construídas, são injetados mais de R\$ 20 milhões de reais no mercado local (materiais de construção, serviços e impostos) que geram mais dinamismo social e econômico.	Todo recurso será repassado às mãos de poucos empresários de fora, não sendo investidos na região.
Custo	Custo final da cisterna de placa: R\$ 2.080,00 (incluindo material, construção, formação e acompanhamento técnico).	Superior às cisternas de placa, podendo o custo final chegar a mais que o dobro.
Impacto na saúde das famílias	Pesquisas indicam que as cisternas de placas diminuem a incidência de doenças relacionadas à água - USP/FEBRABAN (2007), Fiocruz (2010).	Não existem pesquisas.
Acesso à política	Através das comissões municipais presentes em todos os municípios e a partir de critérios pré-estabelecidos pelo programa. As famílias participam ativamente de todo o processo.	Processo ainda não explicitado.
Geração de renda	Pedreiros, técnicos, facilitadores, capacitadores, equipes locais, casas de construção, hotéis, restaurantes, pequenos comércios, etc.	Renda concentrada nas mãos de poucos empresários.
Formação para gestão da água	Todas as famílias são capacitadas em Cursos de Gerenciamento de Recursos Hídricos e convivência com o Semiárido.	Processo ainda não explicitado.
Autonomia da população	As pessoas são donas da tecnologia.	Dependência das empresas.