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REDE DE DESENVOLVIMENTO HUMANO

Adapta Sertão

An inspiring experience in adaptation to climate change by smallholder farmers in the semi-arid region of Brazil.

Contributors

Cooperatives
COODAPI - Cooperative of Agricultural Development of Ipirá
COOAP - Agroindustrial Cooperative of PIntadas
COMAI - Cooperative of Mairi
COOPES - Production Cooperative of Piemonte da Diamantina
COOPOFITE - Polyvalent Daughters of the Earth Cooperative
COOPAITA - Agroindustrial Cooperative of Itaberaba
FRIGBAHIA - Pintadas
Ser do Sertão - Agroindustrial Cooperative of Pintadas
SICOOB Sertão - Credit Cooperative of Pintadas

Oragnizations of e Jacuipe River Basin
State Normal College of Pintadas
Office of State Representative Neusa Cadore
Pintadas Network
Network of Community Radios and Blogs (Baixia Grande, Quixabeira, Pintadas, Itaberaba)

Oranizations Outside of Pintadas
Adapta Group (Rio de Janeiro, São Paulo, State of Janeiro)
Sinal do Vale Institute (Mata Atlântica - Rio de Janeiro)
REDEH - Human Development Network (Rio de Janeiro)
SER - Environmental Consulting (Brazil)
WRI - World Resources Institute (Brazil)

Unions and Colleagues
CODES - Territorial Development Collegiate of the Jacuípe Basin
Public Consortium for the Sustainable Development of the Jacuípe River Basin Territory
OCEB - Union and Cooperative Organizations of the State of Bahia
SESCOOP/BA - National Cooperative Learning Service in the State of Bahia
Union of Rural Workers of the Municipality of Baixia Grande
Union of Rural Workers of the Municipality of Brumado

Universities and Institutes of Applied Research
Centro Clima, COPPE, Federal University of Rio de Janeiro (UFRJ)
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UNEB - State University of Bahia
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About This Edition

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Content

Forward

The story told in this book was a milestone in the lives of many of us who were the protagonists. Twelve years marked by learning, revelations, discoveries, challenges, but above all by a great human experience. We participated in a rich mosaic of activities ranging from inquiries about complex models of climate simulation, research and technological innovations with climate scientists, to conversations about the extreme difficulties that drought imposes on the lives of families who often do not even have the possibility of participating in a project like Adapta Sertão, which was created to help them.

It was in these bridges of understanding and communication between worlds that live such different realities that we found our greatest area of learning. We had to deal with the limits of our understanding, with our impatience for the lack of response to needs that were obvious to us and possible to respond to immediately. We had to start again several times because some of our strategies did not achieve the expected result or did not include essential aspects for sustainability. We were able to identify new opportunities in the course of the project and in those 12 years also witnessed that Brazil has changed and the sertão as well. More transparency in public policies, more participation, more access to institutional resources for the semi-arid region and, above all, more openness for dialogue on innovations to make public policies more efficient and effective. This makes us think with relief and gratitude: Adapta Sertão was compatible with its time. In another era of slower changes, we would not have made so much progress.

We believe that Adapta Sertao's experience in these 12 years was in many ways aligned with the challenges of our time. Firstly, we chose as the focus of our attention the

family farming that, in a country like Brazil and especially in the semi-arid region, is fundamental for overcoming the regional inequalities that cause migration and gender disparities and aggravate health problems with the consumption of low quality food.

We conducted the process with a systemic approach that re-connected parameters essential for an effective and sustainable development process. Many of these development components, such as water reservoirs, were implanted long before the arrival of Adapta Sertão and for various reasons, became under-utilized, and did not address the needs of the local populations. We understand that in most cases our role was to re-establish a connection to operate in a more practical and effective way. In addition to development components, we connected people from different areas of knowledge, disciplines and sectors. Many of those who accompanied us in this process admire Adapta Sertão's culture of diversity: multidisciplinary, multisectoral, intercultural, interclass social, interracial, intergenerational. It created an ecosystem that stimulated the freedom to experiment in an innovative way. One example is the regeneration model of the Caatinga based on the concept of "food forest" that is useful for people and animals. In this model, men and women work together sharing the landscape: the men with the cattle and the women with the fruit trees.

We always believed we would not find a path together if we did not establish a dialogue that included all the diversity that characterizes us as a society. This was a discipline that we set as a premise. We learned from the Pintadas laboratory, which long before our arrival, already cultivated it and helped us to keep practicing. We worked with a learning method and a curriculum. The systematization of everything that was done in Adapta Sertão at each stage and step was crucial to move forward, but it was also essential to give the project a culture of continuous learning and a shared vision. The continuity of an idea, as appropriate and complete as it is for its time, depends on the possibility of being

updated and this only happens through a mechanism that allows other people to learn from what is happening.

Adapta Sertão generated a community that went far beyond Pintadas, where it began, or REDEH, the organization that provided the institutional base for most of the projects developed. Cooperatives, agricultural technicians, family farmers, and public managers in various areas joined together and implemented the new mechanisms. This was the key for a small project to become a sustainable development program, rewarded and recognized by many people. It is up to us to be grateful for the opportunity we had to develop Adapta Sertão, a program that has surprised and improved us as professionals and human beings.

There are endless people to thank and it is difficult to give an order of priority. In every moment and circumstance the help of the many people who participated in the project was crucial. We thank the entire community of the Pintadas Network of organizations and people, starting with Neusa Cadore and Nereide Segala, our godmothers who introduced us to Pintadas and the Jacuípe Basin. We thank the REDEH team, with emphasis on Tiago Costa and Fábio Andrade Moraes, who were directly involved in the projects. We also thank the entire technical team of Adapta Sertão, coordinated by Daniele, who all contributed to making the technical guidelines of the Program a reference throughout the semiarid region, and which are now recognized by several national and international awards.

As the project expanded from Pintadas to the Jacuípe Basin Territory in its second phase, we established new friends and partners in Baixa Grande, Quixabeira, Pé de Serra, Mairi, a list which was joined by many other municipalities, where Adapta Sertão is the meeting point of the sustainability family of the Jacuípe Basin. We would like to thank especially

the youngsters and all the agricultural technicians who have applied the model MAIS, Vandelso Silva Dias, Jocivaldo Ferreira Bastos, Thiago Rios Lima, Demilton Santos dos Reis and Florisvaldo Merces, who were with us from the beginning.

In addition to Pintadas and the Jacuípe Basin, our sponsor since the first phase of the project was Professor Emílio La Rovere, who at various times in the journey helped us, enabling resources and channels to receive them, and legitimizing Adapta Sertão in many forums and spaces in which he participates. Valuable support for Adapta Sertão also was provided by Cergio Tecchio of the OCEB / SESCOOP System, who supported the cooperative strengthening strategy, and Professor Jennifer Burney of the University of California San Diego and Alexandre Maia of the University of Campinas, for their dedication to finding scientific economic responses to the climatic phenomena of the Jacuipe Basin Territory. This list of acknowledgments also includes the IDB team that has engaged itself in this final phase of Adapta Sertão to make it a replicable model.

Finally, our thanks go to Ineke Holtwijk, who conducted the interviews, helping us to tell a story in which we feel deeply grateful to have participated.

Thais Corral

Daniele Cesano

1. A New Urgency

For his work the agronomist Marcelo Bastos flies every month from the metropolis of São Paulo to Bahia, a state in northeastern Brazil. Bastos works for a program that helps smallholder farmers to better withstand persistent drought. At the beginning of last year every time he got out of the plane he held his heart. What disaster would he see this time? Brazilian newspapers reported the worst drought in the region in a hundred years.

The farmers of the program live in a steppe-like area, wwcalled the *sertão* in Brazil. The **sertão** extends over eight different federal states. It is characterized by prolonged droughts and periods with heavy rain that can also lead to flooding. Bastos's project is widely praised because of its effectiveness. Thanks to him, the farmers gain strength, and they can handle two years of drought. But how effective can you be if there has been

decreasing rainfall for six years? That was the case.

In the typically wet season in the sertão (roughly from October to March) it had only drizzled occasionally . Reservoirs that have to fill up during the wet season were therefore dry or almost dry at the beginning of 2017. Throughout the area you had apocalyptic scenes. There were bones and cadavers of cows everywhere along the road. Vultures, in anticipation of more dead meat, circled above the grasslands where emaciated cattle roamed around. Planting on the field had dried up and houses were closed because the residents had left. In the villages people lined up with buckets and jerry cans for free drinking water that was delivered by tank-cars.

Marcelo Bastos visited the farmers of the program for a week every month too measure progress and to give advice. He saw their situation deteriorate in front of him. “The farmers were desperate,” he says. “It was terrifying. Even the cacti had dried up. “
The local prickly pear cactus (*palma forrageira*) plays an important role in the program to make farmers weather-resistant. The leaves contain a lot of water. It is chopped up and - used as a base for cattle feed, but also to protect the soil from the sun. Farmers are encouraged to grow a large supply of cactus to survive the dry months. Nonetheless, according to Bastos: “Even farmers with cactus fields were in bad shape.” If they harvested cactus leaves during this extreme drought, there was a risk that the plant wouldn’t recuperate and would die.

Only in July, usually a dry month, would it really rain for the first time. At Adapta Sertão, the program for which Marcelo Bastos works, they took stock of the damage. The big surprise? None of the project’s farmers had seen their own cattle die since 2014. It was a milestone, says Valdirene dos Santos, the local coordinator of the program. In case of severe drought, it was normal until then that half of the herd died or ended up prematurely

in the slaughterhouse. Selling the emaciated livestock quickly, if necessarily at predatory prices, is one of the farmers' survival strategies.

The project Adapta Sertão (which means Adapt the Steppe) had passed a stress test gloriously. "We had not counted on such a prolonged drought," says Bastos. How does he explain that the participating farmers did so well in spite of the drought? Part of the step-by-step plan of Adapta Sertão is for farmers to sell the dairy cows that give the least milk. This saves food and water, while not significantly decreasing the milk yield. The farmers of Adapta Sertão therefore experienced the drought with fewer but relatively stronger cows. A second reason: the farmers had planted extra cactus on the advice of the project in the years before. A third reason: the farmers took cacti from the wild. The native cactus variety is the mandacaru, a tree-like cactus with leaves like fingers. The prickly pear cactus has blades in the shape of a tennis racket.

As an agronomist at a program that heralds sustainability, you are not happy when farmers cut down cacti in the wild, Bastos admits. But what to do? "Our farmers do not cut down trees anymore," he argues. "We had a serious talk about this." He explained to the farmers that deforestation is one of the reasons that they are now without water and that the grasslands look like desert. Reforestation is not an option for most, he says. "It is expensive. Most have little to spend and don't feel it is their responsibility."

Adapta Sertão started in 2006, if you count an initial irrigation experiment under a different name. It is actually the name of a coalition of organizations which was until the beginning of 2018 coordinated by an NGO based in Rio de Janeiro, Rede de Desenvolvimento Humano (REDEH). The organizations are working together on this resilience project, but the name Adapta Sertão is also used to refer to the program itself. In 2015, Adapta Sertão was named the most successful innovative program for smallholder farmers in the fight

against climate change in the Americas by the Inter-American Development Bank (IDB).

The program aims to make the farmers weatherproof. The founders had food security as their main purpose. It means that the farmers and their families had enough to eat, even if the drought lasts for a long time. At Adapta Sertão the innovation is not in what they do but how they do it. Existing knowledge and technology related to irrigation and agriculture are grouped together and cleverly combined into a working and reproducible model. The farmers themselves play an important role in providing insights. Everything is tested, measured and constantly updated, and now also put online.

Another remarkable way of operating is that the program is not limited to the farmer and his/her harvest, but that it stirs up the entire production chain. Where there are problems, solutions are presented. If other parties are needed for this, they will be approached. A farmer who produces but cannot sell his goods does not make much progress, they say at Adapta Sertão.

The sertão, a culturally very rich region, is also called the Africa of Brazil. You will find many mud houses, and in the countryside residents usually get the water from a cistern or a well that could be an hour or longer walk. The vegetation is scarce and prickly and the climate hardy. In the dry season the temperature can rise to fifty degrees Celsius in the shade and almost all riverbeds dry up. An important difference from Africa is that there is no desert, but desertification is a real threat, scientists say. It is getting hotter and drier in the sertão.

The sertão is considered a so-called ‘hotspot’ in terms of climate change. Hotspots are regions that are severely affected by the changing climate and at the same time are home to vulnerable, poor communities. Poor people in these hotspots depend on their immediate environment for their food and income. It makes them extra vulnerable to the extreme weather conditions that climate change provokes.

Brazil is one of the countries where scientists study intensively the consequences of climate change. Because of the Amazon and the instability of rainfall in southern Brazil, Brazilian citizens are also very aware of the climate problem. Yet the state of emergency in the sertão does not stir great interest. The sertão is synonymous with prolonged drought for most Brazilians. Famous literary works that everyone has heard about at school have described drought and poverty for as long as anyone can remember.

Adapta Sertão collaborates with climate scientists. This is remarkable because, in general, the interest of Brazilian NGO’s in scientific information is limited. “It is a lot of politics and not very technical,” is the experience of Emilio Lèbre la Rovere, climate expert at the Federal University of Rio de Janeiro and member of the prestigious Intergovernmental Panel on Climate Change (IPCC).

Adapta Sertão tries to make agricultural practices in the sertão resilient. It is an example of *climate smart agriculture*. Extreme weather puts harvest and livestock under pressure, as can clearly be seen in the sertão. Every drought, the overall agricultural production decreases by 12 to 22 percent. Milk production drops an impressive 70 percent. But many policy makers, farmers and businesses are not yet in for climate smart agriculture. For them it is little more than a buzz word from a power point presentation. If they have already heard of it.

Changes in agriculture always go in waves. The green revolution was a paradigm shift in the 1960s. Fertilizers, irrigation, pesticides, knowledge of the soil: with all kinds of new technologies, production could be increased enormously. Nowadays integrated agriculture is the new credo; it refers to farming systems where the main components (economy, environment and community) are integrated towards a healthy, sustainable production. All resources must be used as efficiently as possible. Producing more with less, going nature‘s way and supporting the collaboration of species - which is also the case with *climate smart agriculture* - is part of that.

Adapta Sertão is leading the way. But the program is also innovative in another sense, since it dedicates itself explicitly to family farmers, thereby connecting two important administrative agendas: climate problems and poverty alleviation.

Thais Corral, one of the founders of the Adapta Sertão program: “The debate about climate change is often so technical . We wanted to make it concrete and add something social to it. Poor people, in fact, more than others suffer from the consequences of climate change whether it is by drought, flooding or hurricanes.”

Tomato plants and food waste at school – preparing a new generation of climate adaptation

It is only a narrow strip of land. And the harvest does not seem exciting: two handfuls of small tomatoes from bare bushes. But the school garden on the patio of the Escola Normal of the municipality of Pintadas represents a cultural revolution. Thanks to the school garden, everyday life has invaded the curriculum. “The garden is about soil, sun and change processes. That

Tomato plants and food waste at school – preparing a new generation of climate adaptation

is biology and chemistry", says school director Nilza Nunes de Almeida (51) triumphantly.

A major problem at all primary schools in Northeast Brazil is that the curriculum is miles away from the students' reality. In Pintadas all of about 600 students have a link with the countryside; most come from a farm, but they do not see the connection between what they learn at school and their daily lives. Ask where the cheese in the supermarket comes from and they gaze at you without any clue. The children do not realize that it is their fathers who produce the raw materials for the cheese.

The winds of change that Adapta Sertão began has also touched the school. Teachers took their pupils to visit a farmer who participated in Adapta Sertão. They got so inspired that the teachers started frequent brainstorming with the people of the project about what else they could do. In 2009 they organized a Feira do Conhecimento, a Knowledge Fair about food production and food safety.

The preparation spread out over months. The school was divided into working groups with teachers. Each group demonstrated a product from the region or explained an issue. Where does our food come from? How do you transform a product? What can generate energy?

On the strip next to the school that until then had been used as a rubbish dump, the students laid out a school garden. Adapta Sertão helped with the irrigation system that the students executed themselves. With bricks the students made beds for lettuce, parsley and tomatoes. The market lasted four days and was a smashing success. Hundreds of people came to watch every day. The school director: "It was not possible, they said.

Technology was too complicated for children. But it was possible. We proved it." Nereide Segala, the former local coordinator of Adapta Sertao: "A teacher said to me: pupils now understand more than we do." Since then, drought, sustainability, food security and food production have been part of the lessons. The students watch videos about these topics. Adapta Sertao employees regularly join the classes if there are questions from students. This year pupils planted trees during a biology class.

For the continuity of Adapta Sertao it is important that young people are also interested in sustainability and how to deal with drought. The seed is planted, Nilza Nunes confirms. Children talk at home about what they have learned in biology, about plants and agronomy. Food waste has become a subject that now provokes reactions with children. Nereide Segala: "They always had the idea that what you buy at the market is valuable but that the fruit that grows at home in the garden is worthless. That is starting to change now."

Recently, a few students told Nilza Nunes that they wanted to study nutrition. The school director: "A few years ago you could not imagine this happening. Doctor or lawyer. It did not go further." Four students of the knowledge market group on food production are now studying at a federal university, which has stringent admission requirements.

2. The Birth of a Project

The success of a project is not coincidence, but coincidence did play a role in the creation of Adapta Sertão. Place, time and people aligned in a miraculous way. There was first of all a meeting of two like-minded souls, Thais Corral and Daniele Cesano, the initiators of Adapta Sertão. Then there was an equally coincidental visit to the dry region of Bahia. There was a cry for help and there was a willingness to pick up on that. And so, the first seed was planted.

In 2003, Thais Corral, a seasoned social entrepreneur from Rio de Janeiro, and Daniele Cesano, a young Italian engineer from the Turin region, met at a gathering of LEAD International in Bath, in the United Kingdom. . Both were fellows of LEAD International,

an organization that strives to promote leadership with an emphasis on sustainability. LEAD had called some of its fellows to help on a strategy and jointly submit projects. The two clicked. Corral had lived in Italy for years and Cesano had just helped a friend in Brazil for a few weeks to set up a sustainable energy project for the semi-arid region. They decided on a joint project about solar energy.

Corral, originally an administrator and journalist, had been active in social projects for decades, usually as a social innovator, manager and fundraiser. Her long advocacy career focused on women and environment, including as the co-founder of WEDO (Women, Environment and Development Organization), a major global advocacy organization. In international forums she had noticed how water and climate as subjects were rising on the agenda. Both were affecting women and their communities, especially poor women of semi-arid regions. Scarce water for domestic and agricultural use had to be collected with a bucket in many cases.

Everywhere in the countryside the government had constructed water reservoirs, but there was no technology to pump the water further. The question had always been: why can´t we use solar energy to pump ground water? Brazil, rich in hydropower, had been slow to tap into that movement. But after the turn of the century solar energy was finally coming into vogue in Brazil.

Cesano and Corral believed that solar panels could be a godsend for the countryside and a precious resource to allow access to water for poor communities. Solar panels could also be used as a key element for irrigation. Cesano had specialized in sustainability and water management and, after his stay in Brazil, he felt like something adventurous, something big. The engineer: “I came from the business world and had never worked on the theme of poverty. It was a new field for me, a new area of learning and big challenge.”

Their project had to focus on education, Corral believed. How do you motivate rural residents to get started with solar energy? The hardware - the solar panel - was not the problem. According to her, the adaptation to the use of the new technology was the obstacle; it was too much change for people at once. Based on training and on communication strategies such as radio they believed they could develop a methodology for the introduction of solar panels in the semi-arid region.

LEAD supported them in finding a project where they could gain practical experience. Their first joint action would be in a project co-financed by REEEP in Bahia. REEEP stands for Renewable Energy and Energy Efficiency Partnership. It is an international organization sponsored by, among others, Western European governments. It aims to put sustainable energy on the market in developing countries. In Bahia REEEP sponsored a local organization that would install solar panels throughout the region.

So it was that about a year after their meeting in the United Kingdom, Corral and Cesano collaborated on the development of a community training to disseminate solar energy for pumping water for irrigation. In Valente, a small city in the sertão of Bahia, they trained social workers and teachers for several days on how to instruct poor people on solar panels, using radio and cartoons.

Corral, however, still had an agenda item to complete in the region. One of her NGO's from Rio de Janeiro had for years trained women in radio at over 400 radio stations throughout Brazil. One of the radio stations in Bahia with which her organization cooperated was expanded with a telecenter, a public space

equipped with computers where locals could get computer lessons and access the internet. The telecenters had to bring the digital revolution to the poorer strata of the population and were stipulated at the time of the privatization of telecommunications in Brazil. The two NGO's that Corral led – REDEH and CEMINA - were dedicated to implementing these telecenters.

The opening was festive for the telecenter in the municipality of Pintadas, a municipality with about 11,000 inhabitants on a three-hour drive inland from Salvador. Pintadas is unique for its history of popular uprisings. It also had a female mayor, which in the conservative sertão was exceptional. These were all good reasons for Thais Corral to go there for the first time.

The festivities were in the afternoon at the town hall of Pintadas, located in a low building along the access road. There were many women who belonged to the Association of Women of Pintadas. The association had not only initiated a radio program but also operated a restaurant. And now it would be managing a telecenter. In her speech the mayor celebrated the arrival of 25 computers for the telecentre. "We too are now entering the digital age in Pintadas."

One of the women, a social activist working in the municipal department of agriculture, stood up and took the floor. "Yes. The digital age, but we, the women farmers, are still in the age of the bucket." As if to reinforce her words, she held a bucket up in the air. Other women, too, stood up and waved buckets. The woman turned to Corral. "And Thais, will there be a day when we no longer have to water our fields with buckets?"

"I did not think of that request myself. It was a cry for help that I picked up from one of the women in our network," reveals Nereide Segala, the bucket activist, thinking back

to that moment more than a decade ago. The village was thrilled about the arrival of the computers and the internet. Segala: “It was a big thing. Imagine, at that point we were only using radios to communicate. The internet would open a window to the world.”

The farmers, with whom Segala worked in a municipal program for family agriculture, concluded that the computers would not bring them anything. They lived outside the village and worked on their own plots. Their reality was fetching water with a bucket and spraying the field with a garden hose and watering can. That was a time-consuming job. In addition, much of the water evaporated. It was high time for technology that helped poor farmers, Segala thought, so she had called on the peasant women to all come to the opening of the telecenter and make themselves heard.

Corral remembers as though it were yesterday the moment that the women stood there with their buckets. She felt called to action. In her circle of friends Corral was known as socially committed but also as someone with a sharp sense for opportunities. She linked this to another remarkable talent: she knew how to bring people together to get a project up and running. “This is the place where we need to do something with water pumps and solar panels,” she told Cesano when they were back in Rio de Janeiro. “We already have the knowledge and the network. These people are really motivated.”

In 2006, the application arrived at several Italian charitable organizations for a pilot for irrigation system in Pintadas. The duo had opted for Italy because Cesano had a network there. He had since then returned to Italy, where he worked for Ambiente Italia, a consultancy and research institute in the field of sustainability and urban planning from Milan. This consultancy introduced him to Fondazione Cariplo, one of the largest private equity funds for charity in the world and also based in Milan. Fondazione Cariplo awarded 30,000 euro to Pintadas Solar, the name they gave to their project.

At LEAD, Corral and Cesano would eventually remain the only pair that entered into a successful and long-term practical partnership, which had been the main purpose of the initiative of LEAD International.

3. Pintadas, A Social Laboratory

In Brazil the northeastern region is less developed in comparison to the south and southwest parts of the country. At the beginning of colonial times however, it was a rich and powerful region because of the sugar plantations. When the Portuguese colonial powers decided to upgrade Rio de Janeiro as the capital and plantations in the Northeast failed to modernize, the region fell behind. However, the feudalistic power structure of that time remains to this day.

There exists there an oligarchy of a few traditional families and agro-industrial groups. Its members own large chunks of land and many businesses, including local media. You

will also find them and their partners in important political positions. The drought has been used for decades by this oligarchy to strengthen their position. Most commonly a politician makes sure locals get water but in return they have to vote for him. Subsidies from the federal government to combat the drought ended up with sugar magnates, agribusiness and construction companies. Supermarkets and farm shops created artificial scarcity in order to increase consumer prices and they made money with tank-cars that sold drinking water. These abuses and many more have become known in Brazil as a industria da seca (the industry of the drought).

Another characteristic of the Northeast and especially the sertão is migration. For more than a century, men and sometimes whole families have been moving to wherever there is work. They have worked on rubber plantations in the Amazon, in mines, and in the construction of dams and roads. Since the industrialization of South Brazil and Southeast Brazil, cities such as São Paulo and Rio de Janeiro are magnets for poor migrants from the Northeast. There they usually work in factories, shops and construction. It is not a coincidence that Brazilian porters and cleaners are often migrants from northeastern Brazil.

Although agriculture in northeastern Brazil is the main source of income for residents, the government invested in the development of agro-industry in the South and Southeast from the 1940s onwards. The Northeast, including the sertão, was like a leftover. It has been ignored and has not been seen as useful for decades. Agriculture in this region consisted initially of sugar and cotton plantations. Today, extensive livestock farming dominates.

There are hardly any permanent jobs in the sertão. Most residents are, out of necessity, smallholder farmers; they have a few hectares of land they use to grow beans, corn and

manioc; they keep chickens and a few cows. Often women are head of the family, because their men have left for work to Rio or São Paulo. Not uncommonly, the sons and daughters also migrate when still young. “In the sertão parents forbid their children to stay. Life here is unjust and without dignity, they argue. In the South of Brazil it is exactly the opposite. Children have to stay, “says Marcelo Bastos, who visited farms throughout Brazil as an irrigation specialist.

Pintadas fits in the picture and at the same time it does not. In Pintadas, at least 3000 inhabitants worked in sugar-cane factories in São Paulo during the eighties. “That was one third of the population then,” says Neusa Cadore. Cadore, who arrived in Pintadas in 1984, was twice mayor of Pintadas for the leftist Labor Party (PT). In the eighties she was a young missionary and came with two colleagues from Santa Catarina in southernmost Brazil to work for two years in Bahia. The bishops of the region had asked for help.

The poverty the families faced overwhelmed these women. Cadore: “We felt as if we had ended up on another planet. In Southern Brazil we were used to running water, electricity and paved roads. Here there was nothing. And six out of seven harvests failed due to the drought. It was totally shocking.” Neusa wrote a friend in Italy to ask if he could raise money. They made a list of the hundred poorest families and bought food for them.

The missionaries themselves had no money. They were given four bags of beans on arrival and that was it. They had to grow their own food. Cadore: “That’s how we learned a lot about agriculture.” They witnessed a long drought with thousands of hungry people. Children died from dehydration. It was suffering too great for words. The former mayor: “The image I will never forget in my life is how babies were buried in cardboard boxes.”

Because of the misery, but also because of the enthusiasm of the inhabitants, the missionaries decided to stay when their two years expired. By then they had experienced the beginning of a fierce battle for land. It was conducted by twenty families and hundreds of volunteers. It was this conflict that swept the remote municipality of Pintadas into the

national newspapers.

The germ of the conflict was a battle over water. Initially there were no fences in the countryside of Pintadas. Cows grazed where water and grass were. When fencing became compulsory in the 1980s, local warmongers forced families off the good plots of land they had been using for years.

The resistance included an encampment, collective labor in the field, arrests and intimidation. It all stretched out over two years, but the families won the battle. The families who were allocated land from the government decided that they would share the plots and the financial support for the land reform with all those involved. They wanted a collective agricultural project. That would eventually fail, but the experience would educate many for leadership later.

The Catholic Church actively supported the protest. The residents were deeply religious. The church was their moral authority and educator at the same time. In Christianity-based communities – it was the heyday of the Liberation Theology – life was discussed every week. Drought was the scourge of God, the residents said. And if you suffered, you would go to heaven. “Suffering is not a punishment but the consequence of silliness, and it creates exploitation,” the missionaries objected. And what about miracles? “We replied that we create miracles with our hands and feet,” says Velzi Stolf, one of the missionaries.

Pintadas had distinguished itself once and for all with the successful fight against the land grab of the warmongers. At its peak the encampment had been home to four thousand people. The volunteers had built kilometers of fence; they had celebrated religious rituals on the field and even created their own saint, Nossa Senhora dos

Mutirões (Our Lady of Collective Work). They chose as a deity a pregnant woman: pregnant with hope. Political awareness had grown.

Mutirão

Mutirão is a well-known term in Brazil, especially in the countryside. It is work that people do for free and as a collective, usually to achieve a certain goal that would be difficult or impossible working on your own. Farmers working together on each other's land, during harvest season, for example. You also see it with the building of a house or with developing a new field: I help you; you help me, we help each other.

In the sertão, the mutirão is commonplace. In Pintadas the saint to protect the volunteers was even invented: Our Lady of Mutirões. Adapta Sertão cleverly integrated the mutirão into the program. Participants work together in groups on each other's fields at least six times a year; for example, to plant cactus. Planting a hectare of cactus takes at least eight days if you do it on your own. "The work seems lighter in mutirão," says coordinator Daniele Cesano.

But working together also has an educational goal: farmers accept new concepts better with companionship and camaraderie. They speak the same language and learn from each other. The agricultural consultants of the project are always there. Both before and after the concepts are introduced, all sorts of technical issues are discussed in the group. This helps the new knowledge to be absorbed, and it fosters friendships. Each mutirão becomes a small party with beer, rum and lots of homemade food. There are those that say that this companionship is the driving force of the mutirões.

Brazil had an authoritarian military government for two decades that had forced many dissidents into exile in the sixties and seventies. To be called the Cuba of Brazil was really something in those days. That was how opponents of the protesting families branded Pintadas in the press. The residents of Pintadas themselves experienced their communal events as a social laboratory with progress as the goal. “You never saw anyone from the government or the state. That’s why we started,” says Julita de Almeida, then a young social activist. Four out of five residents lived in the countryside around Pintadas. De Almeida: “They had nothing. No power, no doctor, no telephone and no radio. We went out there and it felt as if we were development workers in our own municipality.”

Via the missionaries there was contact with church communities in South Brazil who supported them. And there came foreign priests who assisted them with advice and action. One of the foreign priests started a seed bank because the farmers had lost their seeds due to the drought. The first water reservoirs and dams were built with money from abroad. The activists also organized a fund to help farmers and distribute food parcels. Over the years, Pintadas received support from half a dozen Western European countries. “We did not count on the government at all,” explains Velzi Stolf.

When democracy gradually returned in the late 1980s, there was a lot of public money for dams and water reservoirs. Pintadas would be the first municipality in Northeast Brazil where everyone got a well or water tank behind or on the house thanks to the government. In the early nineties, there was a national fund for smallholder farmers. Again Pintadas was the first municipality where credits were granted. Thanks to the organizational capacity of the residents, the municipality had become a reference in the region and first in line.

The amazing organizing power of the residents of Pintadas once more was proved

when Neusa Cadore was elected mayor. The governor, a conservative landlord, closed the office of the regional bank as a reprisal. “No more money to Pintadas,” he said. The nearest bank was located more than two hours away by bus. Together with the municipality, within a year the residents organized their own credit cooperative, SICOOB Sertão.

It was one of the foreign priests who suggested the residents should interact more with the municipality. Why not having a weekly village meeting where everyone wanting to help the community move forward could air his or her ideas and projects? Rede Pintadas (Network Pintadas) was created in the 1990s. The collective radio station emerged as a way to reach farmers, and expanded to include a shelter for young people, an agricultural school, a large population survey, weekly debates about common diseases, and a restaurant by women of the village; the network devised and organized everything together with the municipality. Rede Pintadas worked from the *bottom up* long before it came into fashion.

Rede Pintadas had sponsors at home and abroad. In 2002, the network and the municipality were recognized as best practice for public administration by the prestigious Fundação Getúlio Vargas University in São Paulo. In 2003 Rede Pintadas became an officially and legally recognized partnership of trade unions, cooperatives, associations and women’s groups.

From the very beginning of the Pintadas Solar irrigation project, Rede Pintadas would become an important partner. For Pintadas Solar it was a happy, soft landing thanks to the local partnerships and the peculiar history of the village. Pintadas was used to outsiders who brought in new knowledge and helped the inhabitants to accomplish things. People had been accustomed to discussing everything in groups since the 1980s, and they

were strong social leaders. In addition, REDEH and CEMINA, the NGO's of Corral, already enjoyed prestige due to the collaboration with the collective radio station. Altogether it made Corral and Cesano realize that Pintadas was fertile social ground. Their project would stand a much better chance of success here than in other municipalities.

4. Pintadas Solar: Learning by Doing

The Pintadas Solar project actually started in 2006. In the run-up, the collective radio station had broadcast programs about solar energy. Rede Pintadas had organized several rounds of discussion. The subject really started to come to life in the town. “We dreamed aloud about what would change,” says social activist Nereide Segala about the meetings. But it was dreaming mixed with common sense, she notes. “And you also know that there can be four or five years between an intention and the first step.”

Meanwhile Cesano and Corral struggled with their budget. Solar panels were expensive and difficult to install and maintain, and the intended irrigation systems also cost a lot. Cesano had calculated that they could afford five irrigation systems plus pumps. They

were not sure where to buy them. The closest shops were in Feira de Santana, the second largest city of Bahia. The equipment was not just expensive, but incomplete too, and the instructions were hard to understand and confusing. They did not want to rely on that package and decided to approach the manufacturer directly. They had a good story and a good cause; perhaps they could get a discount, Corral and Cesano said to each other.

They were right. They bought three irrigation systems with a pump that ran on diesel and two with a pump powered by solar energy. Thanks to the discount they had extra money left over to also try other irrigation systems that were more water efficient .

At a trade fair in Germany Cesano discovered a hydroponic system. He got in touch with the inventor and in the end they bought two of these systems to be tested in their pilot as well. The best news was these systems used organic fertilizers, a system known as organoponics. So altogether they would test five conventional irrigation systems and two organoponic systems.

In 2005 Corral was hired to join the board of directors of an innovative international partnership known as South-South-North. This platform was meant to initiate leapfrog projects on mitigation and adaptation to climate change in combination with poverty reduction in six countries. Mitigation means reducing CO2 emissions and adaption is diminishing the vulnerability of people to climate change.

Corral became the Director of Capacity Building for this platform and she proposed Pintadas Solar as a laboratory to see how a community-based adaptation project on climate change could be done. The board of South-South-North supported her idea. Climate scientist Emilio Lèbre la Rovere was one of its members: “We chose the project

because we calculated that the success rate was high. Social cohesion in Pintadas was great; you had strong leaders and institutions, you had people advocating the project and there was political support from the mayor."

The idea was to monitor in Pintadas every phase of the project and extract lessons. The research and systematizing of the experience was to be done in collaboration with the Interdisciplinary Center for Climate Change of the Federal University of Rio de Janeiro (UFRJ), known also as Centro Clima. Centro Clima focused specifically on climate research and policy.

A group of young scientists would come often to Pintadas to do the research. South-South-North awarded the project 20,000 euro to enable training, travelling and team meetings. Two years later Pintadas Solar was presented as a best practice of community-based adaptation in the Global Adaptation to Climate Change Conference in Bangladesh. The experiment in Bahia was at that moment one of the few community-based climate adaptation projects in the world.

For Cesano and Corral the project being also a South-South-North experiment had an important implication. If they wanted to deliver a model that could be fully copied, it meant that all the issues they came across - social, economic, technical and ecological – had to be addressed. And all significant events in the project had to be registered and systematized in some way. The strategic choices they made, however small, had to be based on previously defined criteria and by practicing they would try to find answers to questions that surround climate adaptation projects. Like: when is a practice sustainable? How do you measure life improvement? Is production increase in the case of an agricultural project enough to be considered "life improvement"? Or do you have to demand that the production increase is made using improved (more sustainable)

technology? What do you use as a baseline to measure progress?

The first challenge was choosing participants. They formulated selection criteria and then composed a questionnaire for “job interviews” which they followed strictly. In that way they could trace the outcome and they were able to adjust the questionnaire if something did not work out as wanted.

They preferred as candidates families where both husband and wife worked on the farm. Four of the participants were women; their husbands worked as masons. The women stayed at home and grew crops and vegetables to sell at the market. They wanted to have women participants in the pilot, social activist Nereide Segala explains. Segala, who would become the local coordinator and who was a farmer herself: “Women are often more interested in low-cost technological change because they feel more responsible for their family and household budget constraints.”

Candidates also needed to show interest in growing crops and learning from the project. And they had to be willing to share the irrigation system with another family. The water reservoirs in the countryside are almost always used by several families. Another requirement: you had to have electricity and a shed or somewhere to store your valuables.

An additional criterion for choosing candidates was that they should be in poverty, as one of their objectives was poverty reduction. Thais Corral: “We favored families who needed it.”

Florisvaldo Guimarães, the only farmer from the first round who is still involved in the program, thinks he was chosen because he also cultivated vegetables apart from crops such as beans and corn. “Then they could test more.”

In 2007, the first thesis would be written as a result of the experiment in Pintadas by one of the researchers of Centro Clima. The thesis was on how to tighten the criteria of adaptation to climate to concrete elements. The examples were based on the findings in Pintadas.

Deborah Kligerman, engineer and environmental specialist of the Centro Clima, was one of the promoters. She embraced Pintadas Solar. “For us the most important experiment in Brazil when it comes to developing a model for adaptation is Pintadas,” Kligerman said in interviews. Before starting off the experiments, Cesano and Corral wanted to share with the participants an existing experience with irrigation and water pumps powered by solar panels. It ran in Alagoas, another state in the Northeast. Thais Corral: “The best method is to see something with your own eyes.” Pintadas Solar had money for only four tickets. It was decided that Nereide Segala, who then was an educator of the Secretary of Agriculture of Pintadas would go, along with Segala’s boss, and Florisvaldo Guimarães, a young farmer and participant. They would check out the new technology in the company of the engineer Daniele Cesano. They were asked to transmit their experience to the other farmers.

Their first impressions of Alagoas have never left them: they were shocked when they toured the site. The farmers had very poorly cultivated fields in spite of an enormous reservoir of water from the San Francisco river and an irrigation system. Their conclusion? Abundance of water does not do the trick if there is no determination to produce food.

The presence of the secretary of Agriculture on the trip showed the commitment of the municipality right from the beginning. Nereide Segala was appointed by the mayor as contact person of the municipality with Pintadas Solar. She would soon after the trip become the enthusiastic local coordinator of the irrigation project. She had been one of

the three missionaries from southern Brazil and had lived in Pintadas since the late eighties. She had since then married, had children and became an outspoken and passionate social activist .

In addition to the pumps and the irrigation system, the participants also received from Pintadas Solar breeding tanks, fertilizers and technical advice. The irrigation went through a drip system consisting of thin plastic hoses with holes and connectors. The irrigated fields (and tanks) ranged from 500 to 1000 m2. The project also provided shade fabric to protect the crops from the sun and to prevent water evaporation. The organoponic system consisted of a specially built greenhouse brought in from São Paulo.

Irrigation and more

Hydroponics is a method of growing plants in water instead of in soil. The roots receive a balanced nutrient solution dissolved in the water with all the chemical elements essential for their development. The plants themselves can be put in containers, but also in washed sand, gravel or other material. It is a more efficient way of using water since the water is re-used permanently. Crop yields are generally higher than those grown in soil.

Organoponics is a system of organic gardening. Plants grow in a

confined system, in organic matter and soil, often between low-lying concrete walls. Lines of drip irrigation are laid on the surface of the growing plants. The water contains organic fertilizer produced within the garden system through composting.

Drip irrigation is a water-efficient technology that consists of a localized irrigation of the plants, at or near the roots. Drip irrigation uses 30-50 percent less water than sprinklers.

Participants were extremely proud. Proud of their new assets, but mostly because they were selected to take part, remembers Cleidene Bastos de Almeida. Bastos de Almeida, an educator and teacher from Pintadas, had helped to interview the candidates. “The project was seen as innovative,” she recalls. “It was also different from other projects because women had a role.” In a social and economic sense these first experiments had very positive results. “The project clearly increased the self-confidence of the participants, and they made more money.”

The reality was complex and tested above all the resilience of the initiators themselves. This first experiment lasted two years and generated all kinds of unexpected problems. One of them was the salinization of the water. Nereide Segala: “Because of dehydration the soil had much more salt in it.” So the only water that could be used was rainwater collected in the water reservoirs.

The response of the farmers to their instructions was disappointing. Daniele Cesano: “I thought: I visit the farm with a technician, we explain how the farmer can produce sustainably, and the farmer executes our recommendations. But it did not work out that way. Of the five irrigation systems installed, there was really only one that followed our instructions.”

When the dry season dawned and water started becoming scarce, the farmers of the project instantly stopped growing vegetables to the consternation of the project managers. As seasoned survivors of droughts to them it was irresponsible to use the limited water for irrigation. They would rather keep that water for their animals (cattle and chickens) and themselves. They had the habit of buying vegetables at the market in the dry months. They could not be convinced to try and do it differently.

During the experiment the carefully selected group gradually fell apart. One of the farmers simply disappeared taking the equipment with him. The landless peasant they had selected because she badly needed income was failing all over. It was not because she had no formal education or because she was poor, stresses Nereide Segala. “She had no land but also no sense of responsibility.” At the end they only had two participants experimenting with the drip irrigation system and one applying organoponics. The most productive farmer of the three was a woman. In the end the project lost her too when she moved to São Paulo.

Florisvaldo Merces, the young farmer that became a technician of Adapta Sertão, was the only one to continue. He learned by doing. Ever since, his farm and the changes in his property and his story are a living example of the evolution of Adapta Sertão. The same happened to Nereide Segala, who installed an irrigation system on her own property.

She experimented herself so that she might learn to guide the other farmers better.

Overall the results sometimes showed surprisingly big variations that they could not explain. Segala: “At three farms we had separated a cow. We compared how it developed. Each week we made note of everything the cows ate, the supplements they got, their weight, their milk yield. The yield difference was enormous while the farmers fed their cows exactly the same.” Project coordinator Thais Corral: “After that first experiment we perceived that there were many elements new to us, and that we were learning.”

For example, technical agricultural issues. Corral: “We knew nothing about diseases and problems with soil since we had focused on irrigation technology. Irrigation had been our main goal.”

Another issue they had not dedicated thorough thinking to was technical assistance. What did you do when a pump broke down? There was no service available in the small, remote Pintadas nor in its surroundings. Pintadas did not even have a technician who could help out. And another question: who would have to pay for the repairs? The farmer? But how could you make a farmer pay if he or she hardly had any income?

The pilot was mostly a learning experience. They concluded that they needed more knowledge about water infrastructure, soil and agricultural techniques. To have a better understanding and stronger data for a model they had to test more extensively. The instruction to participants had to be more frequent and perhaps organized in another way.

And their most important insight: if they really wanted to help smallholder farmers they could not restrict themselves to irrigation only. They had to organize loans for their

farmers and tackle all additional problems down the road in order to make it possible for smallholder farmers to sell crops and products.

Lenice Machado

Lenice Machado was one of the seven farmers chosen to experiment with irrigation at the very beginning of the project. Lenice, a mother of four children, was very satisfied with the project. She had a lot of trouble with her back from bending forward when she was still watering her vegetables with the garden hose. Irrigation with the drip technique made work much easier and she produced more. “Now I work upright, feel better and earn more,” according to the farmer in 2006.

She was earning more money than her husband Betinho, who was a construction worker and father of one of her children. She had a green thumb and her lettuce was the best on the market. On good days they sold for 500 real (almost 150 euro) per week. She became economically independent. Betinho had trouble with that.

When the project started, it was he who had shown up to sign on behalf of Lenice. Because he was the boss. At least that’s what he thought. She kept quiet because she wanted to participate. Betinho did not want Lenice to deal with Adapta Sertão employees whom he found to be much too free-spirited. He therefore made sure that he was home early every afternoon. Then she could take care of him and she could not leave the house.

When Lenice announced that she was going to Riberão Preto with the project to study irrigation systems, he wanted to take her place. That did

not happen; the ticket was in her name. Lenice went and enjoyed it, and she bought herself hip clothes from her extra earnings. She paraded through the village in a bustier and shorts. Betinho could not handle so much quirkiness. They divorced and she moved to São Paulo. Her husband takes care of the property with some of the children that they had together.

5. Moving On: Addressing Problems Down the Road

The opportunity to roll out the project came in 2008. In that year Pintadas Solar was selected from four hundred projects for a SEED award. The SEED award was a prestigious award in the world of sustainable development given by a number of United Nations (UN) agencies. The SEED platform, initiated by the German government after the UN Conference on Sustainable Development in 2002, was created to encourage local solutions for sustainable, green development and poverty reduction. The prize, at that moment still biennial, was one of its means to do so.

Corral had been a past member of the international jury of the SEED Awards and knew the importance. “It is a UN prize that generates much visibility.” She and Daniele Cesano

went to New York to receive the award. The award would also be celebrated in the Bahian capital Salvador, at the Goethe Institute, with a number of organizations that like them worked in the semi-arid region. Corral: “When we returned to Brazil we said to each other: ‘Now we must continue this project.’”

The SEED award fulfilled one of its goals: It generated publicity, new international contacts and opportunities for Pintadas Solar. Shortly afterwards in August 2008, the project caught the attention of the German Federal Environment Agency (UBA) . The agency had earmarked money to support best practices relating to climate change. However grants could only be awarded to academic institutions. It was not a major problem; it perpetuated the collaboration in Pintadas between REDEH – the NGO of Corral operating the Pintadas Solar project - and Centro Clima of the Federal University of Rio de Janeiro.

In early September 2008 the 800,000 euro contract was released. Of that amount 300,000 euro was reserved for fieldwork in the Pintadas area. A few days later the Lehman Brothers bank in the United States collapsed and the global credit crisis was a fact. Thais Corral: “It felt like a narrow escape: We were in just before the doors closed and markets went down. If our application had been on the table a month later I doubt we would have been awarded any money.”

The German grant opened many doors. Pintadas Solar could tackle more aspects and the project could be rolled out to more communities. “Upscaling was even a condition,” says Corral. The idea of the German grant givers was in fact to generate best practices that could be replicated. Co-founder Daniele Cesano who at that time was starting a post doctorate at Harvard University in the United States, decided to make the project the subject of his research. He already envisioned the next step: the commercial market

Cesano: “With thirty farmers - or rather sixty – we can test solutions for the market.”

Cesano, Corral and Segala experienced the second phase of the project almost like a restart. Important lessons were to be implemented. They were to select the participants based on other criteria. They would not give priority to the most needy; motivation had to prevail in all cases.

Another insight: Water storage was an issue to take care of. Their experience in the dry season had shown that having a well did not mean that a farmer would irrigate. Cesano: “If you want to make a farmer really resilient, he needs to have permanent access to water, even in dry periods. Then we are not talking about water wells anymore, but about a solid infrastructure for water storage. “One thing was very clear to him: The government had indeed built many reservoirs but they were outdated or not used properly.

They had also become much more aware of the psychological side of drought. Cesano: “It is tough. People are capable of nothing anymore. They sometimes become depressed. You have to take that into account if you work with them.” Nereide Segala: “We learned to be more attentive to the constraints of particular farmers. “

One thing they noticed in general was that family farmers were not keen on spending all their energy in a specific crop or activity, as they did in southern Brazil. Specialization did not appeal. They preferred to do a little bit of everything. Corral: “Smallholder farmers in dry areas are poli-cultivadores in order to survive.”

They also acknowledged there was more strategy behind this “a little bit of everything” than they had initially thought. The farmer raises chickens for eggs for his own use. He has cows because milk brings money. When the farmer has run out of water for his cattle

in the dry season he will try to sell his animals. From experience he knows that a lamb or a goat sells faster than a cow. That is why he often keeps some sheep and/or goats.

They decided to quit with solar panels although their project was founded with the focus of solar energy. Their benefits did not justify the costs. Irrigation consumed little energy and the solar panels were expensive. Besides that they had noticed in the pilot that most participants did not want to have a solar panel. They feared that the expensive panel would be stolen.

Among additional issues they had the logistics of marketing on the top of their agenda. In the pilot they had assumed farmers could and would sell their surplus of vegetables. But the farmers lived isolated in the countryside with no transport. They also did not have a space in the market and the vegetables spoiled quickly in the hot climate. It was clear: If they wanted the project to be a success, they had to tackle this.

Another issue to tackle: Should the project give, lend or have the farmer pay for equipment, fertilizer and seeds? They had noticed in the pilot that gifts were counterproductive to self-reliance and responsibility. Additionally it provoked jealousy and it produced candidates who were specifically charmed by the hand-outs. It was a fundamental issue.

Daniele Cesano thought participants should pay off the irrigation system in installments, which could create a revolving fund to allow purchases of systems for other farm families. Corral foresaw problems if the family income were less than expected. Moreover, the

poorer farmers have a lower likelihood to be able to pay. They would take ages.

The solution? Micro-credits for participating farmers. This would address many needs. The project could not keep subsidizing recurring costs, such as seeds and fertilizers, when the aim is that farmers would support themselves. Since the average micro-credit for a smallholder farmer in those days was the equivalent of 3,000 euro, the irrigation kit could not cost more than that.

Was this viable? Cesano started producing Excel spreadsheets. How many years would it take a farmer to pay back his loan? All possible variations were calculated: the size of the field, the possible crops, probable excess to sell, the investments in the irrigation kit, the fuel for the pump. Final result? It would take two to seven years for a smallholder farmer to pay for a kit with a simple diesel engine.

Attentively watching situations develop. Calculating scenarios and clear and rational decision-making. Analyzing and addressing problems down the road. It all was part of the approach of the project coordinators. As a consequence the project grew step by step in an organic way. Corral: “Each stage was the consequence of the lessons of the previous phase.” The result is a broad program that covers the entire production chain. In retrospect, this flexibility - instead of opting for a sleek multi-year program - has become one of the project’s keys to success.

In this second phase, they expanded the project to four municipalities and forty farmers. They also changed the name. Pintadas Solar did not describe their goals anymore. It became Adapta Sertão - social technologies for adaptation to climate change, which had become the main focus of action.

They started to invest more time in communication. Since the project had become a regional initiative, the radio station was used more intensively to get messages across and spread news. Since Brazilians are among the world's most avid users of interactive media, the program was early in adding a Facebook page in 2009 and they started to upload small films to YouTube.

Since they now had to deal with more partners and more issues, they had to set clear priorities. The first priority of the program was to ensure food security to its participants. It meant that even in the dry season farmers should be able to grow enough to sustain their families. The second priority was economic security. Or simply put: increasing the income of farmers. The third objective of the program was the most ambitious: sustainable production and improving the environment.

Because the best solutions come from practice, the project managers initiated focus groups with participants. How could you make the farm more resilient to drought? Could you improve on the vegetation? Are there fruit trees that hold water?

The coordinators reported regularly on the findings of the project at meetings of the Rede Pintadas. Valdirene dos Santos Almeida, who worked as a nurse in Pintadas and would later succeed Nereide Segala as local coordinator of Adapta Sertão, remembers it as the first time she heard about the project. Cesano held an enthusiastic talk at the weekly meeting of the network. He explained about the different kinds of rain you had in Pintadas and their impact on agriculture. Valdirene remembers excitement filled the room. The audience was fascinated. "That you could see the rain in such a way was totally new to us."

In the restless search for solutions the program managers compared everything,

including policies and measures that each municipality took. If one community coped better than another with the adverse effects of drought, they analyzed the events to the smallest detail. What did that municipality do differently? They compared municipal policies, politics and cooperation among stakeholders, always on the lookout for clear-cut policy measures to be introduced. For their model, such measures obviously would be an asset.

Traditionally smallholder farmers cultivate manioc, corn and beans. But Adapta Sertão would from the start encourage vegetable production and fruit growing. One reason was that the farming families would eat a more varied and healthier diet. But it was also a way for women to have an income of their own and to get them actively involved in the business. Cows but also corn and manioc were considered male things; in the vegetable garden women were the queens. The women could sell any surplus.

Most of them did not have a clue about how to manage a vegetable garden, like Neci dos Santos Gomes, a seventy-year-old farmer, who now sells vegetables and has an income thanks to Adapta Sertão. She lives with her husband in the outskirts of Pintadas where the soil is as tough as stone and the sun is merciless. The program provided her discounts on a water pump, an irrigation system and a roof of thin netting for her garden.

The idea to shelter her vegetables from the sun had never even crossed her mind, Neci dos Santos reveals. She stresses her gratefulness at every second sentence. “Everything I do, I learned from Adapta Sertão.” Recently she had a disease that destroyed all her lettuce. “The technical advisor of Adapta Sertão came by, and he told me what to do. The lettuce is fine now. In older days I would not have had the slightest idea.”

Could the cultivation of vegetables be a larger scale operation? The climate is difficult

and vegetables require much more water than corn or beans, and also more than cows. Adapta Sertão therefore began researching brackish water. There is plenty of brackish water in the region. Could the water be desalinated cheaply? They did it well in Israel; why not in Brazil? And what crops would do well in salt or brackish water? It is still something they continue to experiment with.

They also examined and tested whether a mixed business with a vegetable garden, chickens and beekeeping could be economically viable. Adapta Sertão is still working on that option. It is difficult, Daniele Cesano admits. “You will never make reasonable money with vegetables.”

He believes cows are the best option for farmers in the sertão. “Farmers here make their money with milk and meat.” Livestock has been the bulk of the economy in Northeast Brazil for many decades and it is a major cause of deforestation. That is another reason to concentrate on cows, Cesano believes. “If you want to make impact against climate change you have to make animal husbandry more sustainable.”
Adapta Sertão did lots of testing of grazing with farmers. They divided the available pasture into plots and let the cattle alternate grazing these plots so the land had time to “recover”. They tried to improve the quality of the grass.

6. Fruits and Licuri: A Women's Project

On the outskirts of Pintadas two neatly white painted stone buildings with cemented paths contrast with their messy surroundings. Inside are white tiled walls, stainless steel tables, person-sized mixing trays, mixers and conveyor belts. We are in the brand-new fruit pulp factory of Pintadas, Delicias do Jacuipe, which means Delights from the Jacuipe (river basin). Everything shines. "Hygiene is paramount," says Girlene Almeida Oliveira, the manager.

In the factory, fresh fruit is processed into vacuum-packed and frozen fruit puree.wIn Brazilian bars, restaurants and households fruit puree is very popular as a base for making fruit juice. It is also the way to offer exotic regional fruits on menus in cities like

Rio or São Paulo. Delicias do Jacuipe processes several regional fruits, such as the siriguela (Spanish plum), umbu (Brazilian plum), caja (yellow Mombin plum), a local passion fruit, and a very exotic fruit that is known as caja-umbu, not produced industrially anywhere else in Brazil. The factory has been producing since December 2016. It is an initiative by and for women under the umbrella of Adapta Sertão. Girlene Oliveira is outspoken about its aim: “We want to encourage women to produce so that they become financially independent.” Fruit is a female business in the sertão; the men are into meat and milk.

In 2008 a handful of women of the cooperative Ser do Sertão realized it was time to also bring fruit puree on the market in addition to whole fruits. Vacuum packed puree can be kept longer and it also makes much more money than fresh fruit. The women already had a customer in mind: the schools in Pintadas. The schools wanted to serve their six hundred students fruit juice at lunchtime but for practical reasons could only work with fruit pulp.

With the help of Adapta Sertão the women made a business plan and applied for a subsidy. With the first sum of money they bought a scale, a mixer and a vacuum device. They borrowed large pots, tables, and a freezer. And off they went. During the school holidays they were allowed to run a two-week trial in the school kitchen. It was a success.

They started out in a temporary space, which soon turned out to be too small. Storage in freezers was also tight. That is how the idea for a factory arose. They received a fresh subsidy and immediately decided to raise the stakes. The current “dream factory”, as Oliveira calls it, can handle 8,000 kg a day. But they are still far from processing that much.

Oliveira, a dynamic woman in her forties, worked for years in a fruit-making factory and has now almost graduated with a degree in environmental engineering. She teaches some 150 women about native species of fruit trees and how to deliver fruit to the factory. There are many preconceptions, she notes. Many in the countryside, for instance, don't consider the Brazilian plum to be a fruit. And "women often have trouble believing that they can earn money with the fruit trees."

With the deforestation of the past decades in the sertão, regional fruit varieties have become scarce. Their place has been occupied by pineapple and watermelon grown for export. Adapta Sertão stimulates reforestation with native species, and especially with fruit trees, in order to boost family incomes. The enthusiasm of small farmers to plant new trees has not been overwhelming in recent years, but Oliveira thinks the high demand for fruit from the plant will spike a change.

Fifteen municipalities work together on this project, notes Oliveira. That does not happen often. The mayors are aware that it is good for the environment, but also for the employment of women, says the factory director. The State of Bahia and even the Ministry of the Environment are watching how the women in Pintadas are faring. They themselves realize their factory could become a model for other places.

Because it is a regional project, the promoters chose Delicias do Jacuipe as a name – a reference to the regional river basin where the fourteen municipalities are located. Delicias do Jacuipe is also the name of their brand. They sell it under the slogan Mais que sabor das frutas (More than just a fruit flavor). That "more" is that you also support family farmers through your purchase.

Three women work in the fruit factory itself. They do everything including carrying crates

with fruits inside. But 140 women in different municipalities are suppliers. Since transport is often cumbersome for small farmers, Delicias do Jacuipe organized pick-up points where farmers can deliver fruit on fixed days.

The women have big plans. They want to make jams, and obtain oil from the seeds of the passion fruit. The fiber that remains after the pressing of fruits is already being used for cattle feed. In the dream factory, Oliveira reveals hers: “That in four years’ time you can order a juice of caja-umbu from the region of the Jacuipe in a bar in Sao Paulo.”

* * *

The most exotic in the Ser do Sertão family is a cooperative of only women who work with licuri. **Licuri** is a valuable ecological nut of a palm tree that is threatened with extinction. The cooperative was in dire straits but was helped with a loan and restructuring.

There is good news in this licuri story: This is a product that enjoys the interest of a number of top cooks. It serves as the raw material for more than thirty products that are derived from it, and it is responsible for the employment of some of the poorest people. The bad news: The product is natural and threatened with extinction, the industry is insufficiently organized, and the poor who process the product are women and are severely underpaid.

We are talking about the fruit of the licuri palm (botanical name: Syagus coronate), a tree native to the dry steppes of Eastern Brazil, and one that can reach twelve meters in

height. The green-colored fruit hangs off this tree by the thousands in thick bunches. Wherever the licuri palms are, you will find “quebradeiras” (literally: nut breakers), the women who process them. You will see these women in the villages, sitting on the ground with baskets full of the small nuts beside them, and a cloth with shells and kernels in front of them. The nuts are first dried and then the quebradeiras break them with a stone to remove the inner kernel that is reminiscent of a hazelnut.

Being a quebradeira is a traditional profession, and a hard and underpaid one. The women often suffer from back problems. Many quebradeiras depend on middlemen to bring their nuts to the market, so even with good luck and a lot of effort the maximum they can expect to make is 24 reais (about six euros) per day.

Quebradeiras were discriminated against up until about a decade ago. Josenaide de Souza Alves, a social worker who has worked with quebradeiras for over twenty years, knows places where people set fire to a licuri palm in order to prevent the women from cutting the bunches. And quebradeiras did not dare to sell the kernels on the market. Alves: “There was little appreciation for licuri.”

The price reflected the lack of interest. In 1997, a kilo of licuri nuts yielded 40 centavos; the equivalent of 33 eurocents these days. Now a kilo is worth 14 real (3.5 euros) and when the kernels are toasted they go for twice as much. Licuri is on the rise. In the past, it was mainly used for soap or oil. There are now more than thirty different applications: from cocktail nuts and massage oil to granola, ice cream, chocolates, bread and liqueur. Various top chefs use licuri milk instead of coconut milk: it is more refined in taste. Licuri might also have a future in cosmetics and health. It can be used in massages, and is thought to prevent osteoporosis and help diabetic patients, among other things.

An additional problem: the palms, which mostly grow in the wild, are threatened with extinction. The main cause is urbanization. The trees are cut down to make room for houses, and the trunk of the palm is also used for construction.

In 2005 Josenaide Alves started a cooperative for quebradeiras in Capim Grosso, a small city 75 km north of Pintadas. She intended to stimulate the demand for licuri, and eliminate the middlemen so that the women made more money. Since then her agenda has grown: boosting the image of the profession and the self-confidence of the women and diversifying production are also important goals. It is a tough battle but things have changed. Since 2008 the cooperative has organized a popular annual festival dedicated to licuri. In 2014 the Capim Grosso city council voted in favor of a law that forbade the cutting of licuri palms.

COOPES (when translated stands for Productive Cooperative of the Piemonte da Diamantina region) has 230 members today. The cooperative suffered years of neglect since there were very few women with the skills or capacity to manage the organization. For example, there was no inventory for stock, and at one point it turned out that the cooperative had bought far too much licuri. Its storage became a financial burden and there was no money to pay the outstanding debt to the members who had delivered the kernels.

Then in 2011 an invitation came from Adapta Sertão to join the project. The women believed that this could be the solution to all their problems but were also nervous about joining. “We had to measure all sorts of things. And we had to make a business plan and work with spreadsheets. We did not know what that was. Most of our members are semi-illiterate. These requests made us feel even more incapable,” Josenaide Alves admits. They could get a loan through Adapta Sertão in order to reorganize the cooperative, but

they needed to come up with collateral. That was another challenge they overcame after much hesitation.

The cooperative has only 5000 reais (1250 euros) in cash and still has a big debt, but since they are now members of the Adapta Sertão platform there is light at the end of the tunnel. The cooperative is much more structured. Thanks to a donation by Petrobras (a partner in Adapta Sertão), a loan that Adapta Sertão intermediated and a prize in cash that REDEH and Adapta Sertão founders Thais Corral and Daniele Cesano donated, the cooperative in Capim Grosso hired a professional administrator and bought some machines, which has changed the life of the licuri nut breakers. Alves: “What a quebradeira used to do in a week is now done in an hour.” The work of the women shifted towards toasting kernels. The shop of the cooperative boasts a proud display of a variety of licuri products, including woven bags and other handicrafts made from the palm leaf.

Customers are mostly government institutions. “That should change,” says administrator Paulo das Mercês Santos, “We have to become mainstream.” Further mechanization and a quality standard will help. However, it is not a purely commercial project, he stresses. “It’s also about protecting a palm species that is threatened with extinction, and the culture of a region that is based on licuri, an important source of empowerment for women.”

7. A New Model Emerges: Smart Agriculture

In mid-2009 the Brazilian Minister for the Environment announced a national fund for climate projects. It was created by a fund paid by Petrobras, the Brazilian state oil company. The fund became quickly known as Fundo Clima. It would be financed with ten percent of the royalties on oil, and it was a trump card Brazil played at the UN environmental conference in Copenhagen at the end of that year. The fund would later also be open for donations, such as contributions from Western countries.

Half of the money of the Fundo Clima would go to projects in the sertão because, as the minister said, the sertão suffered the most from global warming. According to calculations, global warming would result in the economy of the Northeast shrinking by

a third. The media calculated that the fund would have about a billion reais (then, more than 300 million euros) per year to distribute.

Only in 2010 did the fund really take off. Adapta Sertão would be the first program to receive money from this fund (a bit over 2.2 million reais; in these days approximately 840,000 euros). But as is often the case with government money in Brazil, it took one year before the money was finally transferred. The project only started in 2012.

What do you do as program managers when the last of your funds is rapidly in sight? That was the situation for Adapta Sertão in 2010. Corral, Cesano and their companions decided to cut costs and focus solely on the guidance of farmers, the backbone of the program. “We were so enthusiastic. We wanted to maintain the program at any cost,” recalls farmer Florisvaldo Guimarães, at that time also a member of the technical management team.

The only financial resources available in 2010 came from a scholarship provided by CNPq, the National Council for Scientific and Technological Research. It is a federal public research institution that gives grants to university professors and academic institutions. The Adapta Sertão coordinators designed a research project together with climate professor Emilio La Rovere, as the head of research, and the grant was approved. The research was focused on analyzing results of different irrigation methods and testing the use of desalinized water with different crops and animal forage. It continues to this day.

During this research, the program would also start working with EMBRAPA, the government’s research institute for agriculture. Embrapa–Semiárido, the center of the institute that specializes in the sertão, helped Adapta Sertão with choosing and testing drought-resistant seeds.

In 2011 there was some financial relief: in April Thais Corral had the opportunity to present Adapta Sertão at the conference of the Climate and Development Knowledge Network (CDKN), which had been newly founded by British and Dutch public money. This network, coincidentally counting both South-South-North and LEAD as participants, helps institutions to design and implement climate-smart solutions. The integrated model that was experimented with in the region of Jacuipe Basin where Pintadas is located made quite an impression. The result? Adapta Sertão was adopted in September 2011 as a "change lab" for a complex problem. The Brazilians got a 112,000 pound (then about 130,000 euros) innovation grant from the network's fund.

As the coaching of the farmers went on, the program directors were continuously analyzing results in the field, always looking for key factors to orient the future of the Adapta Sertão program. The same initial question remained unanswered: Why did some farming families have success and others not?

The most consistent experiment by 2011 had been in the Jacuipe Basin where fourteen farmers had participated in the program for two years. Analysis of their results gave the following picture:

- About thirty percent of the family farmers had shown strong results. Their monthly income had more than doubled. They had managed to increase their production of vegetables and fruits. The payback time of the irrigation system for these farmers was between two and three years.

- About forty percent of the farmers had satisfactory results. Their staple crop-loss decreased from about 70 percent to 20 percent. And they had managed to increase their income by about 20 to 50 percent.

- The program did not have any impact on family income for about thirty percent of the farmers. Some emigrated to urban areas while others stopped using the system or started other jobs. In these cases, alcoholism, illiteracy and extreme poverty were reasons for their lagging behind, as well as a lack of personal drive and motivation. Adapta Sertão itself had also contributed to their failure due to a lack of engagement and appropriate coordination, the program directors found.

For better analyses the project needed to expand with many more farmers. The credit facilities had to become more easily accessible to family farmers. The cooperatives needed to be more professionally organized, and more commitment from policy makers was required. The project managers had been working on all of that. Although enthusiasm for the program among employees, participants and outsiders was still great, they themselves felt that they were stuck. They were not sure of how to continue. Farmer Florisvaldo Guimarães, who was always praised for his curiosity, recalls: “We had run out of ideas.”

They had done and tested the obvious. What they had really hoped for was to come up with better, more effective solutions. It would be the toughest drought in a century that finally would make that happen. The drought ravaged the fields but nurtured new ideas.

Toolkit for farming in dry areas

There are all kinds of systems and techniques that can be used to help

farmers in dry areas overcome their water scarcity. The crux is to find the right combination, taking into account the local context and habits. It was thus that Adapta Sertão arrived at its method. These are some of the practical examples adopted by Adapta Sertão to maximize climate resilience for the farming families:

- *Water harvesting systems for irrigation*
- *Conservation tillage systems (in order to reduce soil erosion and water loss)*
- *Recycling of sewage water*
- *Desalination of salted water*
- *Storing excess crop harvest in the good years*
- *Conservation agriculture*
- *Low-impact grazing strategies*
- *Use of drought resistant plants for fodder production*
- *Flood recession agriculture in the margin of water reservoirs (cultivating on temporarily wetted soil)*

It is common for farmers to sow their land just before the rainy season begins. In Pintadas and its surroundings the wet season normally starts in October. But from 2010 onwards farmers were increasingly uncertain about whether to sow or not. The rains seemed to come later and they lasted for a much shorter time. The farmers were afraid that they would lose their seeds if the rains did not come in time.

In 2011 it almost did not rain at all, and when it did, it was very irregularly. The project managers suspected there was a new rain pattern. To better understand what was going on, they mapped the local weather history as part of the project granted by CDKN.

They worked with data from the National Meteorological Institute. Over a period of fifty years, they looked at minimum and maximum temperatures per day, as well as rain patterns in the region and per municipality. How many wet days (with more than 1 mm of rain) had there been and how many damp days (with less than 1 mm of rain)? They also compared it with national results. They supplemented their material with in-depth interviews with farmers about dry periods in the past.

The outcome was remarkable. Their graphics showed clearly that it had not only become hotter but also drier. The temperature had increased by an average of 1.75 degrees Celsius. But in the municipalities where they worked it had become warmer by two degrees Celsius. There was thirty percent less rainfall. And if you compared the rainy days of the first twenty years with those of the second twenty, you would also notice that the rain pattern had changed. There were fewer heavy rains that filled the water basins and soaked the land, and there were more days of just drizzle.

Climate Research in the projec area

In half a century, the average temperature in the project area has increased by 1.75 degrees Celsius. That is more than twice the world average. Researchers found this thanks to the extrapolation of data from the Brazilian National Meteorological Institute (INMET).

They first mapped out all kinds of diurnal data from a period of over fifty years (1962-2012). How many hours had the sun shone that day? How warm was it? How moist? They also characterized the precipitation. During drought they watched how many days in a row it had been dry. In this way they got a picture of the dry periods and also of the various kinds of rains in each season. In addition to these statistics, interviews were conducted with older residents.

It was found that, apart from the fact that it had become considerably warmer, rainfall had also decreased by 30 percent. And the rain had changed in character. Nowadays there are fewer of the heavy rain showers that help crops recover. More often it just drizzles.

The MAIS model is the highest level of planning. With MAIS, the farmer knows how much to invest, what he has to purchase, how to set up his business and when to do what over a period of several years. The MAIS route plan is very detailed. It stipulates to the farmer not only how to prepare the cattle feed but also what the trough for the cows should look like and where on his farm he has to feed his cattle. The starting point for the planning and calculations is the size of the plot and the number of animals. For different farms (goats, cows, etc.) the model has different minimum sizes. If a farmer has more land, MAIS works in a modular form and it is possible to develop various, diverse modules.

Climate change resistance is defined within the model as realizing the maximum potential of the farm with environmental recovery and minimal variation in production due to climate change. Productivity in the model is increased by better planning and mechanization, but also with, for example, carefully composed animal feed and seeds suitable for drought. Environmental restoration is realized, among other things, by selective grazing and reforestation, but also by avoiding pesticides. Stocks of water and cattle feed make

the farmer less vulnerable to fluctuations. Adapta Sertão technical coordinator Daniele Cesano on the model: “There are fifteen to twenty factors that are important for sustainable production.”

The model for milk – the most tested – aims to provide the farmers’ families with a monthly income of at least two minimum salaries within three years. In the beginning of 2018 that amount was 1908 reais (477 euros). This is seven times as much as the average family income in this region. Most of the time the farmers succeed in raising their income in substantially faster than three years. And the first evaluation also suggests that the farmer makes much more profit than the predicted two minimum salaries.

Joselito Araújo Barbosa is a veterinarian specializing in sheep and goats, and he is the coordinator for the goat farmers at Adapta Sertão. He is one of the authors of the model for these farmers. “We help the farmer to organize himself better. First in terms of space then in terms of time.” The goat farmer, for example, spends a lot of time picking up the animals from the field in the evening. According to the instructions of MAIS, the goats must stand together on a smaller, demarcated piece of land, which has been made suitable to feed them optimally. That is a more effective use of the land and also a time-efficient solution.

“We look differently at the farmer than the traditional agricultural technician does,” explains agronomist Marcelo Bastos, who provides technical advice to Adapta Sertão. “We take a complete picture. We know from month to month what he has to do at his farm. We teach him how he can get money. We calculate with him how much he needs. We also show him what he earns and with what, and we help him to make decisions and reduce the risk of losses.”

A thorough intake diagnostic procedure precedes working with the model. Five visits from an agricultural technician are usually needed for a farmer to start. The size of the land, as well as the quality of the soil, animals, vegetation and water resources are examined and listed. It all serves to design the road map and the monthly goals of the candidate-participant.

To get an idea about how detailed the process is: for example, the inventory of the water sources also includes how many liters of water are needed per day for human consumption, for irrigation, for cleaning, for the plants and for the animals. This requires an extensive calculation. A cow that gives milk needs a lot more than a calf or a pregnant cow, and their consumption also varies with the outside temperature.

If there is an idea about the amount of water that must be stored in order to be able to bridge drought for two years, the best kind of storage for the farm in question will be analyzed. Usually it comes to a so-called barreiro trincheira, an elongated hole of about 5 meters deep that has to be dug near the field or the corral of the cattle. In this hole rainwater is collected. By stretching a tarpaulin over it or a sun-resistant mesh roof on legs, the water evaporates less quickly. Evaporation is also included in the calculation. And the technician also looks at how water can reach the livestock, how to keep it fresh, and what is needed to purify it.

Farmers can save a lot of water by feeding their animals using cactus. This too is integrated into the water calculation. Cactus consists of 90% water. The use of cactus is known locally in dry areas, but has only recently received wider attention. At the end of 2017 the UN Organization for Food and Agriculture (FAO) announced that it was time to put cactus on the menu.

Thanks to farmer Manoel Messias, Adapta Sertão has done extensive testing with the local cactus, the palma forrageira since 2012. Everything was examined. Does a cow produce more milk when she eats grass instead of cactus? Is it an option to feed the cow cactus in the wet season too, as the farmer Sergao did? How much milk does the animal provide when it receives both grass and cactus pulp? What is the difference in yield when you mix proteins and other nutrients with the cactus pulp?

More on MAIS

Adapta Sertao developed road maps for individual farmers based on measurements and experiments. They were given the name MAIS ("more" in English), the abbreviation of Module for Climate Smart and Sustainable Agriculture in Portuguese. There are step-by-step plans for farmers specializing in dairy cows or in goats and for farmers who focus on a mix of vegetables, bees and chickens. More and different modules are still works in progress.

The MAIS program is implemented over three years. It includes new technologies and farm management, but also technical assistance to guide farmers, a program to monitor progress and resilience with special software, and support for farmers in accessing the capital they need for MAIS.

MAIS guarantees that a farmer will easily cope with two years of persistent drought. The family will have a stable and adequate income. When well-implemented, production increases quickly. The model also stimulates reforestation. The latter is important because it will combat desertification in the long run and improve the water supply.

The roadmap ensures that the farmer starts to operate more as an entrepreneur. He learns to measure his results and calculate net revenue. He also learns to make plans and rational choices. There are however conditions for admission. For example the farm must have electricity. And most MAIS roadmaps are only suitable for farms of a certain size. MAIS Leite (milk), for example, requires at least 10 cows at the start on a site of at least 16.3 hectares to arrive at the model's 21 cows. MAIS Cordeiro (goats) is calculated for at least 100 goats and two breeders and needs a 23-hectare site. The MAIS Policultivo (vegetables, bees and chickens) however, only requires a few hectares.

Those who participate must invest in mechanization, buildings, etc. The "policultivo" is the cheapest: at least 7500 reais (1875 euros) at the start and annual costs of at least 2400 reais (600 euros) or more. For cows the investment for the first year is over 32,000 reais (8000 euros). But banks love MAIS and some allow Adapta Sertão to process and monitor the loan requests for the farmers.

The Inter-American Development Bank sees MAIS as a very useful model for areas with similar ecosystems and drought. Companies in the dairy sector want to invest in MAIS, as it increases production and diminishes fluctuation during dry times. In Latin America 70 percent of milk production comes from middle and small-scale farmers.

Cactus became the star of the model. "The capacity of the cactus is unknown in society," one of the technicians concluded after a whole set of experiments. "The government builds dams, water reservoirs and wells, but our biggest water reserve is the cactus," says Daniele Cesano.

The cactus turned out to be easy to plant and after two months you could harvest it. That tied in nicely with the short-term thinking of the farmers. But the plant hardly appeared to

grow if you did not weed. Weeding is a lot of work and you risk damage to the roots. You can remove weeds with much less effort using herbicides, but the project managers and the cooperatives did not encourage this method, and it was banned in the instructions given by Adapta Sertão technicians. Even so, Cesano stresses that a participant who uses pesticides is not disqualified and dropped from the program.

Cactus as feed means that as a smallholder farmer you have to maintain a large cactus plantation of more than one hectare. An adult dairy cow eats 65 kg of cactus a day in the dry season. With twenty cows of different ages you could easily top 1000 kg per day. To make perfect fodder the cactus pulp has to be mixed with bran as well as some additional nutrients, and the family farmers are instructed to supplement feeding with cactus even in the wet season.

The resistance from farmers to feed their cows with that green slurry all year long was initially high. Daniele Cesano: “Farmers experience it as a disgrace to the outside world. Cactus is feed you use when you hit rock bottom. It means you have failed since you can’t feed your cattle with grass.” And planting cactus was defying the gods. Popular belief says cactus attracts drought.

8. Changing Business, Life and Mindset on the Farms

Joining the Adapta Sertão program often means a drastic change in business and life for the family farmer. He must be willing to spend money and reorganize his farm. Sometimes something has to be built; he has to sell cattle and buy other animals. Once the process starts, data must be recorded daily. How warm is it? How much rain has fallen? How much milk has each cow produced when it is milked? And he must begin to build up food and water supplies.

Once you have stepped on board and agreed to your “roadmap”, you have to deliver. There are monthly targets set in in consultation with the technician. Agronomist Marcelo

Bastos: “Without measuring and goals it is almost impossible to achieve such good results. Most farmers have no focus. They do anything.”

They all report problems though. The intake interview always touches on these problems. All technicians underline: In a changing process, building trust and understanding is more crucial than transmitting the information. One of the technicians explains: “You need trust in order to change his mind-set and attitude, so you have to understand his problems and accept that he is tired and that he may be heavily in debt.”

A huge job like planting an acre of cactus is often done as collective work in the Adapta Sertão program. That helps. The farmers form a group that works every day on the land of one of them. Every day they change farms. One of the supervisors: “In the beginning the farmers are often scared of so much collective labor. But it also means exchanging ideas. In fact it is an innovation in the learning process.”

To chop up large quantities of cactus, the farmer has to purchase a vegetable mill with a diesel engine. Mechanization is part of the road towards revenue increase. In addition to the vegetable mill, a water pump and a motor mower are included on the list of compulsory purchases. The engine mower is multi-purpose: it can be used as a tractor, but the farmer can also harvest hay, prune and rake with it. Farmers with cows are supposed to also buy a milking machine and a milk cooling tank. In addition, things like a big weighing scale, a tank with a pressure sprayer that can be worn on the back for spraying organic pesticides on the land, and a water treatment plant are on the shopping list too. Water treatment became a necessity because of the extreme drought. It became inevitable to also use reservoirs with brackish water, of which there were many.

The roadmaps of MAIS vary from one to three years, although there is now also a

reforestation program that has a ten-year term. Bastos paints emotional scenes when a farmer is ‘discharged’: “Farmers often cry with happiness when they see how well it has worked for them. ‘My whole life has changed,’ they say.”

There are dropouts. If the farmer has not met his monthly goals twice, he is removed from the program to give the opportunity to somebody else. Bastos: “If he has promised to meet a goal, he has to do it.” There is flexibility regarding certain goals of the design of the MAIS model, but that has to be agreed upon in advance. In the first interview, the farmer has to convince the technicians that he really is committed to changing his method of working. Since change means a lot of things, tough questioning follows: Is he prepared to remodel? To take out a loan? To work collectively?

Recently, a climate-resistant model for farmers who grow vegetables as their main activity has been developed. That could be an alternative for poor farmers with little land. For the vegetable model (which includes bee keeping and chickens) the farmer needs a plot of at least 300 square meters.

That is a tremendous difference from the candidates for the milk model. The farmers with dairy cows are supposed to have at least 18 hectares Technicians in the program estimate some 70 percent of family farmers won’t qualify for the milk model because their plot is too small. Nonetheless, they recently admitted a farmer who only had a few hectares of land. He was young, energetic, smart and very motivated and so they decided to admit him anyway. “That is an exception. Sometimes you have to be flexible,” Cesano says. The young farmer is a human dynamo.

But deviation – in project terms “the distance from the module” – always has an effect on the result, stresses Cesano in the same breath. “A farmer needs to invest a minimum

of 130,000 reais. If he invests less, the risk that he does not increase production grows." Because the technicians measure and compare everything, it is easy to identify faltering elements in the farm's production. For instance, it could be the composition of the livestock or the lack of food stock.

The number of drop-outs must be reduced, says Cesano. Because the admittance and start-up procedure is so intensive, every drop-out means a lot of wasted energy. The solution is, paradoxically, an even more intensive intake.

Florisvaldo Guimarães explains: "We hold many meetings at the beginning. One of the reasons is that we want to test the attention of the participants. The project is not for everyone because it makes high demands." Livestock doctor Igor Cezar, the main author of the model for dairy farmers, is in favor of a still more 'rigorous' selection. "We have to choose the best. If the farmer has no money, no cows and no cactus, the model will not help him. You cannot achieve anything in three years besides convincing him that he should not participate," says Cezar.

The MAIS model was able to be developed thanks to the Fundo Clima. In 2012 Adapta Sertão began to receive the two million reais pledged years earlier. Finally the program could be extended to another ten municipalities. With this money Adapta Sertão established a presence in fourteen – later in all fifteen - municipalities of the Jacuípe river basin. A hundred farmers could now participate.

For research purposes, but also to prepare farmers better, four meteorological stations would be introduced to the area. And no longer three, but six cooperatives would, from now on, receive assistance from Adapta Sertão. Three of them would also serve as an outlet for equipment and a center for technical assistance. The cooperatives would

organize technical advice for their members.

Thanks to the Fundo Clima they would also have more technical advisors, not only for training and advising the farmers but also for sales and marketing. And the best news for some of the participants: Adapta Sertão would provide the three fundamental pieces of equipment for mechanization of the farms to all one hundred new participants.

Increasing scale is crucial to arrive at reliable and scientific conclusions. To conclude that something works is not adequate. A method takes into account variables and is reproducible. It means measuring and systematizing everything all the time and all over, in order to compose the MAIS model.

How well did the cow produce that only ate cactus? And a cow that only ate grass? Did it matter what kind of grass? Did it matter how heavy the cow was? Did income increase change something in the division of roles in the family? How much time did the farmer spend on which task? And was there a relationship between the time and the result? The questionnaires were endless. And every day and week the most obvious things had to be weighed and noted. It was an unremitting struggle, recalls Cesano, who coordinated the research on the model. “Farmers did not record anything.”

The first version of MAIS was launched in 2013 but since then they have been continuously improving it. Daniele Cesano recalls it took three years of hardship explaining, experimenting and pushing before he started to receive good and complete data sheets. In the end, it was the technical consultants themselves who filled in the sheets, together with the farmer. That was the only thing that worked. The advisers could not convince the farmers to do so. Cesano understood: “That was a new role for the technicians, who were used to only giving advice. It was difficult for them.” But the technicians also had to

be called on. Cesano managed but only by wielding a big stick: “When a technician had not fully completed the datasheet, he received no salary.”

With fifteen municipalities, a hundred farmers and six cooperatives, the program had grown. It required a lot of management capacity. Thais Corral, the coordinator: “You had to go over everything in the smallest details. Daniele and Marcelo were very good at that.”

Information meetings about the program in the municipalities and presentation of results were already programmed well before they started. Public policy and replicability of the MAIS program became a main focus point in this period. Corral and Cesano again collected data about municipal policies and how they affected climate change resilience. The pair frequently traveled to tell authorities elsewhere about the program and its results. Several times they presented Adapta Sertão in the capital Brasilia, always with the hope that policymakers and officials would adopt the program and the lessons learned or would integrate the MAIS model with their own policies. It would not happen, in spite of the fact that the project had been funded by the Ministry of Environment of Brazil through the Fundo Clima.

However Adapta Sertão was chosen in May 2014 as one of the thirty best projects for carrying out the Millennium Objectives in Brazil. The prize was delivered personally by President Dilma Rousseff to Nereide Segala, then local coordinator of the program, in Brasilia.

2014 was also the year the IDB stepped in. The bank had a special program to help low income groups. And two years later it was decided that the bank should invest thirty percent of its loans to climate change projects. The IDB immediately saw in Adapta

Sertão and in MAIS a very useful mechanism for testing resilience in dry areas. It wanted the program to continue well after 2014 and to expand further. The state of Bahia would become a partner.

On a morning in the beginning of May 2014, with due fanfare, a ceremony took place in the governor's palace in Salvador. The governor of Bahia, a representative of the IDB, and Thais Corral of the NGO REDEH (responsible for the institutional management of Adapta Sertão) signed the agreement to further expand the climate change resilience program. Representatives of cooperatives from the region were present. It felt like an important moment, they said to each other afterwards. "A breakthrough." For the first time ever, the regional government had come on board and taken the helm on a subject like agricultural advice to family farmers.

The project was to be scaled-up further. Another 600 family farmers would become resilient with the Adapta Sertão model. The project coordinators were already discussing MAIS 2, the improved MAIS model. For guidance, 24 technical advisors were hired for at least two years. A condition for an IDB contribution was that the state of Bahia government would pay for technical assistance. The bank had stated that it would, under no circumstance, pay for technical assistance. Thais Corral: "That was a matter of principle. The bank was of the opinion that technical assistance for family farmers was the duty of the government and should be organized by the government."

The state of Bahia would pay sixty percent of the agreed costs. That amounted to 4.2 million reais. The IDB accounted for the remaining forty percent. But the state failed to live up to the agreement. It paid – almost one and a half years after signing – 340,000 reais (7 percent of what had been agreed) for technical assistance and equipment, and did not renew any contract with the hired technicians. The project coordinators of Adapta

Sertão unsuccessfully tried to bring the government into the program in a different way. They opened negotiations with government training centers to collaborate on agricultural advice. The talks did not bear fruit. New negotiations with the regional government also yielded nothing.

With the government money that had been paid out, 380 family farmers had one-and-a-half years of agricultural advice. It meant that the complete road map of MAIS could not be fulfilled.

Now that the funds were cut short and only the money provided by IDB remained, the plans had to be adjusted quickly. Guidance to a hundred farmers was a feasible maximum. But in order to save time and transportation costs the farmers had to live close to each other. They decided to allow fifty participants with dairy cows into the program; the other fifty were goat farmers. With the latter they would try out the newly developed resilience model. “We practically started all over again,” says Daniele Cesano. Out of the 380 farmers from 2014, only a few could be maintained after the reset of the program.

The IDB had no problem in keeping Adapta Sertão as a recipient of aid. It skipped the condition of a government contribution. The bank thought the program was innovative and interesting. The project was considered a reference. In Colombia and Chile there were similar projects in vulnerable areas, but they were not as efficient or successful as Adapta Sertão.

At the bank they were thinking of suggesting the Adapta Sertão project to other areas. What appealed to funding agencies was that the project required little money and was easy to implement. And the fact that the model served both as a road map but also as a risk analysis of the business situation was a big plus. The MAIS model translated climate change vulnerability into a detailed risk factor analysis.

At the end of 2017 the dairy giant Danone, together with ProAdapt, a platform that works among others with the IDB to try to mobilize the private sector on climate resilience, organized a workshop in São Paulo. The subject: how to improve climate resilience among smallholder farmers. Cesano was invited to present Adapta Sertão. And the economist Tomas Lópes Teixeira, responsible for innovative projects for family agriculture, also gave a talk. He presented Adapta Sertão as an example of a new trend: climate change adaption as a great business opportunity. He showed his audience a graphic that illustrated how the dairy production of the MAIS family farmer remains fairly constant in the dry season thanks to re-education by Adapta Sertão. Previously the farmer's milk production had dried up during these months.

At this event Lópes also explained what the future of a successful program like Adapta Sertão should be: expansion and roll-out. Expansion by enrolling more participants in the program. And roll-out by turning it into a business and involving large companies with know-how.

A week later, an interim evaluation of Adapta Sertão and MAIS circulated on various desks. It was carried out at the request of the IDB. Independent experts had been recruited for this and they had interviewed thirty participating farmers.

The farmers praised the program. Three out of four felt that nothing had to be changed.

And they said they wished farmers from elsewhere could also enjoy an Adapta Sertão. Four out of five had already met their legal forest reserve, meaning 25% of their property was being conserved. Most impressive to the IDB consultants were the sales volume curves, which climbed abruptly. The farmers with cows had already produced 64 percent more milk after twenty months. There was a farmer who, after only two years, produced five times as much as when he started. The production curves of the goat farmers also increased. The MAIS Program had furthermore increased the cattle farmers' incomes (204%), decreased production oscillation (by 30%), stabilized the supply and improved product quality. That last element was also important since milk from family farmers is usually of low quality.

The experts praised Adapta Sertão not only for the MAIS model but also because of its cooperation with universities, its flexibility to integrate local knowledge, the continual training of their own people and its cooperation with so many different parties. In short, the project was seen as a model in itself.

The idea of turning the MAIS program into a business has been further developed since the state governments show very little appetite for improving their technical assistance to smallholder farmers. Integrating the MAIS method and model with government policies was seen as crucial by the team at Adapta Sertão for many years. The hope was to start with Bahia and other states that suffer from prolonged drought. In May 2017 the IDB organized a meeting with the regional ministers of agriculture from all the northeastern states of Brazil to discuss the results and possibilities of the MAIS model. Although the cost-benefit of the model for a state government is a no-brainer, the officials resisted any change to the costly and ineffective governmental technical advice program.

Brazil is very bureaucratic. Changing the system of agricultural advice on regional level

would first require changes in the law. If put into effect it would limit severely the way politicians and officials use the program for their own (electoral or personal) benefit. Which might explain why there is little enthusiasm on their side.

Money would not be the biggest hurdle. The IDB is contemplating a fund for states that wish to change. But in order to move it forward, it needs a change of paradigms plus the people and infrastructure to execute it. “You are talking about leaving behind a welfare model of hand-outs and moving to a model that focuses on impact,” Daniele Cesano comments. “The government program provides visits to farms but never monitors any results in terms of productivity, environmental recovery or increased income.”

Adapta Sertão monitors everything, including the technicians. More recently, it does so with the help of specially developed software that works on a tablet. It is easy to use, even for farmers themselves. The program has been able to reach quantitative targets of producers, as the IDB experts confirmed.

In contrast with those of Adapta Sertão, government technicians are neither qualified nor trained during their assignments. Adapta Sertão aims to soon finalize a partnership with the State University of Bahia for its training. This means that in the future the technicians who demonstrated impact when working with farmers will receive a recognized diploma.

The government program on agricultural advice is not related to the government credit facilities for smallholder farmers. That is dramatic. Cesano: “Without capital the farmer in the government program cannot advance.” Adapta Sertão has been working hard to solve this problem. The organization is being registered now as a “bank correspondent” to obtain loans from government credit programs for smallholder farmers. In the near future Adapta Sertão will sign the farmers’ installment requests and the bank will subsequently

transfer the money. Adapta Sertãao is like the coordinator of the transaction.

Because of the lack of enthusiasm and entrepreneurship within the local governments, Adapta Sertão decided to invest in partnerships with companies. Food processing companies would be a logical first option. For these corporations, small and medium-scale farmers are important since they still account for the bulk of the raw material in Latin America. Eighty percent of cocoa, for example, comes from small to medium-scale farmers; they still provide 70 percent of the milk and 40 percent of coffee and meat. Other initiatives like the TNC Cattle Ranching Initiative and PECSA focus on medium and large-scale producers, which is much easier. Direct investment in medium and large-scale farms is possible and there is more control over the investment. Investing in family farmers is difficult and costly. Transaction costs are much larger, and both monitoring and contract enforcement cost a lot. Working with smallholder farms is also seen as risky. But with MAIS, Adapta Sertão proved it is possible to make family farms more efficient and productive.

The idea is that corporations, starting in the dairy sector will, in the near future, pay for the technical assistance to implement these climate-smart solutions at a farm level. Daniele Cesano: “A corporation gets paid back from the financial benefits of having more stable product supplies and more highly standardized quality products.”

In some regions milk production fluctuates more than 50% between the rainy and dry seasons. This represents a loss for the dairy companies that have to operate often at suboptimal capacity. Cesano and others calculated the costs and benefits in a commercial pilot program with two cooperatives. The outcome? All the benefits for the corporation compensate by far for the investment in the MAIS Program, with an annual return on investment of about 40%. Cesano: “Supply stability increases revenues, helps in the

financial planning, guarantees supplies in wholesale markets, thereby paying back the investment of the corporation in the MAIS Program."

Adapta Sertão aims at performance contracts with corporations. The economic benefits will be split between the company and the operators of the MAIS program. To kick off, Adapta Sertão needs a concessional grant – from the innovation fund of the IDB for instance. Whenever a specific milestone or indicator is met the corporation pays back part of the grant. The concessional grant would allow Adapta Sertão to build a track record and then start capturing capital on the market.

Cesano is confident that it will work out well. "Over ten years we have been able to fine-tune the way in which we engage and transfer knowledge to the smallholder farmers and lead them to climate-smart and profitable investments. Very few initiatives have been able to do that in Brazil so far." And some day regional governments might also make a turnaround. The banking deal is, in that sense, a first breakthrough, since it is made with the Banco do Brasil. Though this huge bank is traded on the stock exchange, it is government controlled. It has a very strong position in retail banking and operates the bulk of farmer credits. That this conservative financial giant started linking payments to smallholder farmers for technical assistance and climate-smart agriculture is a first but significant step. And every big journey starts with a first step, as a Chinese proverb says.

It also feels like justice.

The Eight Rule for Action

Since its inception, Adapta Sertão has tested various arrangements. Through errors and successes it has been able to identify 8 priority lines of action that, working together, make family agriculture in the region more resilient to climate change.

1- Productive model

MAIS (Intelligent and Sustainable Agrclimatic Module)

The program has developed a specific production system called MAIS (Intelligent and Sustainable Agroclimatic Module) in the MAIS Milk, MAIS Goat, MAIS Caatinga with Pasture and MAIS Vegetables lines, based on more than 20 strategies and technologies, including land reclamation to ensure animal feed and water security for at least 3 very dry years, making the families resilient to climate change.

2 - Access to credit

In order to guarantee financial resources for the implementation of MAIS, which requires between R$ 15 and R$ 35 thousand in annual investments over three years, Adapta Sertão managed to have the “PRONAF Correspondent” function as a bank branch for granting the loans. The correspondent helps the producers by designing the projects, organizing the information and documentation, and then signs a document assuring that the project is viable so the parcels may be disbursed. For this the correspondent receives 5% of the value of the project and has to carry out the technical follow-up. Thus the producer has the security to apply for a loan and for the bank to grant it.

3- Strengthening of cooperatives

Strong, organized cooperatives are critical to engage farmers and facilitate

market access. In the past, cooperatives have faced chronic management problems, lack of working capital and infrastructure, as well as difficulties in ensuring the delivery flow of raw materials and products. With the training received, they were able to professionalize their management and began to play a new role in the distribution of technology.

4 - Technical assistance by the cooperative

To ensure MAIS proper implementation, Adapta Sertão's technicians train farmers on how to implement the system correctly, using the available financial resources. Cooperatives have played a key role in the process by becoming technology transfer centers.

5 - Food Processing

Adapta Sertão has worked to make regional food more widely used by local people and institutions, encouraging small processing units to add value to production, diversify revenues and increase product shelf life. In order to do so, it sought partners that developed functional machines so that licuri breakers would have more dignified work, as well as the creation of a factory to process the native fruits mainly collected by women. In addition, other equipment was installed such as ration house, a store for sale of equipment, milk coolers (20 thousand liters), an abattoir, and machines for pineapple dehydration and the manufacture of cereal bars.

6 - Marketing of the product

There is no point in increasing production if there are no sales channels. An important achievement was inclusion of the products in the government programs PAA/PNAE and tents in the fairs of the municipalities of the Jacuípe Basin. In addition, Adapta Sertão has been investing in the development of new products.

7 - Research and development

Adapta Sertão has established partnerships with important scientific institutions and has shown that the Jacuípe Basin area has undergone more

severe changes due to climate change than the world average, thereby establishing the importance of developing specific adaptation policies for the region. In addition, all the work developed by MAIS is accompanied by scientific criteria to prove its effectiveness and replicability.

8 - Public Policies

Adapta Sertão believes in policies that are less focused on safety nets and that lead to the sustainability of family farming in the northeastern sertão. The program maintains a permanent dialogue with governmental agencies of the state and the territory of the Jacuípe Basin to elaborate or adapt public policies that respond to the needs of climate change. Recently dialogue with the corporate sector began, which could represent an way to promote the MAIS system more sustainably, using market mechanisms and subsidies that are independent of government.

9. Perspectives on Adapta Sertão

A MALE FARMER

Jose Angus Carneiro

Jose Angus Carneiro (46) lives with his wife, son and mother in São Pedro, a distant hamlet that is part of Pintadas. In the nineties he worked “like everyone” in São Paulo – as an assistant on construction, doorman, guard. You name it. When his father fell ill, he returned to take care of his parents. He sold his house in São Paulo and bought a piece of land and cattle. His father has since died.

Until recently Carneiro ran his farming business as he had learned from his father. “According to the old model,” he jokes. He is now one of the farmers of Adapta Sertão.

He admits that he used to cut down a lot of trees. Not anymore because he learned that they are important for water. He has even planted some trees. “And now I’m arguing with farmers who deforest and use pesticides.”

He has 20 cows, 25 goats, a mare, a pig and over 21 ha of land. He grows corn, tomatoes andocra, as well as grass for his cows, and since he has been with Adapta Sertão, he also grows cactus. As a trial he has now confined three cows and feeds them with chopped cactus, according to the recommendations of the Adapta Sertão advisor. But “they eat gluttonously, which means that he has to prepare a big supply of cactus with his newly acquired chopper. For now, his conclusion is that it’s not doable. “It’s a lot of work.”

Nevertheless Carneiro is extremely enthusiastic about his Adapta Sertão technical advisor. “He sometimes comes by twice or three times a month to watch.” He does not milk his cows twice a day - as recommended by the advisor - “because I do not have a cooler yet.” His vegetable garden is somewhat poor. That’s because the regional pump system that provides water for irrigation to São Pedro, has been out of order for half a year already. The state of Bahia is responsible but does nothing. “Everything that you plant now dries,” he concludes.

Yet the farmer is a cheerful man. Carneiro’s dreams for the future are modest. He hopes the cows will give more milk. “And a car would be nice.” With a big smile he talks about the highlight of the past few years: a visit by a delegation from Adapta Sertão to his farm. “Two buses full of Indians.” Afterwards, they congratulated him on his work. Carneiro: “You always get criticism, and then someone comes from very far and says: “What a great job you have been doing. That must have been hard work. My compliments on that.” He admits: It still moves him when he thinks back to that.

THE TECHNICIAN

Jocivaldo Ferreira Bastos

Jocivaldo Ferreira Bastos (30) learned to love farming as a young boy. His father had ten hectares of land and his mother five, where she raised chickens. When he was 22 he got his diploma as an agricultural technician. For years he was employed as an adviser to farmers by the state of Bahia. In 2014 he switched to Adapta Sertão.

He visits farmers participating in the program and gives them advice on agriculture, just as he did before for the government. However, there is a world of difference in the way he does. In his previous job he aided 125 farmers per year. That meant he could only visit them about three times during that year. It was hard work, even more so because of the distances and bad roads. In order to see enough farmers, you learned how to be clever, Ferreira confesses. You drummed three or four farmers together. Then you had a little more time to explain something. But you would never see their field nor their animals. That did not matter. If the farmer signed the certificate, then you could show your boss that you had “done” your job.

At Adapta Sertão, Ferreira accompanies a farmer half a day or a full day every month. “There is much more involvement.” His experience has been that you need have trust if you want to innovate.

“People are suspicious. They always have the feeling they are being scammed by others. You do not get confidence from a farmer by signing the certificate, but by working together on his farm.” He is flattered that he is almost always asked to stay for lunch. Ferreira: “Some farmers consider me their son. They always felt that they were alone with their problem. Now they have someone.”

When the new method produces results, you notice the joy and excitement. “The farmers see that they can earn money even in times of drought. Their reality is changing.” Jocivaldo’s reality has also changed. Ferreira: “Adapta Sertão is a school for all of us. Everyone on the team has their own specialty and I dare say that as a professional I have grown tremendously in the last two years.”

THE FIELD RESEARCHER

Stella Rodrigues dos Santos

The educator Stella Rodrigues (69) has been working for years at the University of Bahia where she is a specialist in social-anthropological fieldwork. She was born near Pintadas and knows the sertão like she does the contents of her handbag. At the request of Adapta Sertão, she interviewed sixty families to get an idea of the thinking of participants and non-participants. The efficiency and maximization that the project aspires to causes friction with the (more modest) self-image of the farmers, she noted.

Time for farmers is different from that of the project, for example. Farmers think in short terms - read: months – and the project thinks in years. The rational cost-benefit thinking is also another planet to them. For example, most farmers do not count the costs of their own work. At Adapta Sertão success is expressed in numbers. For the farmers success is relative. You are already successful if you harvested more than last time. Or as one farmer stated: “Doubling would be very nice.”

Conclusions that surprised her? Rodrigues: “If the farmer’s wife has more education, he himself feels more confident and takes more risks. He is also more interested in technology.” And something else that struck her: people are proud of their land. “They

give their piece of land very high marks, a nine." In spite of everything, they see the potential. "When it rains everything grows here," they say."

For this reason, she is struggling with phrases such as "resilient." It is economically conceived and not from the perception of those involved themselves. "People here have resisted the drought for many years. They are resilient, only in their own way."

THE POLITICIAN

Neusa Cadore

The ex-missionary Neusa Cadore (63) was mayor of Pintadas when the plan for Pintadas Solar was born. Cadore stood out. A female mayor in the sertão, known as a conservative male stronghold, was special. Moreover she was a member of the left-wing PT. And she also managed to get things done. When she took office, half of the children had never gone to school. After three months 95 percent were in school and she had introduced a test for the teachers.

Partly because of her firm leadership, Corral and Cesano had invited her as one of the speakers at their seminar on solar panels and irrigation in Barra de San Miguel in the nearby state of Alagoas in 2005. Cadore told them right away that the project they implemented in Valente would suit Pintadas very well. When the first experiments in Pintadas started later, the municipality became a partner at the very beginning. At that time she was the Secretary of Agriculture of Pintadas.

The core strength of Pintadas Solar/Adapta Sertão is its flexibility, according to the former mayor. "The people of the project are very open to what they see and hear on the

spot. They engage in dialogue and are prepared to learn from local experiences. Not everything is ready." According to her, that contributes to the credibility of the project.

Today Cadore is a member of the regional parliament of Bahia. As a parliamentarian she lobbies vehemently for small farmers and women. She calls Adapta Sertão a "solid and sound project" that Bahia and the whole of Brazil could to learn from. In her opinion, government policy should be linked to the results and insights of Adapta Sertão. Until now, she pleaded to deaf ears at ministries and institutions for support of Adapta Sertão so that the project could be rolled out. "Information does not always lead to engagement," she says gloomily.

She does not intend to give up. Cadore says, outraged: "For the salary of a doctor, you can send three agronomists into the field. But the government does not see the importance of technical advice to small farmers. Nor is it regarded as the responsibility of the state." To her that is mismanagement. Small farmers produce more than half of the food that appears on the table in Brazil. "How will we get to eat later?"

THE NUN

Velzi Stolf

Veuzi Stolf (77) is a catholic nun and has lived in Pintadas since the 1980s. She came with two other nuns from Southern Brazil after the bishops in Bahia had communicated to their peers in the South that there was a shortage of evangelists in their region. Stolf was shocked by the poverty, drought, desolation and lack of everything in Pintadas. Through their own contacts abroad, the missionaries managed to get help – from milk powder to money for wells. Stolf remained socially active, in and outside the church. She

now also runs a small hotel in Pintadas where emergency workers, representatives and construction workers from elsewhere often stay overnight.

She has never seen such a well-organized and well-thought-out agricultural project in Pintadas, says the nun about Adapta Sertão. Thanks to the project, sustainability has become a topic in the region. Stolf: “When we fought for land in the 1980s, we set fire to clear the land. We were ignorant. We did not know the value of the plants and the trees. Now we do, thanks to the project. And if someone uses pesticides, he undoubtedly receives critical comments from his peers and neighbors.”

She does think that the project should be more stringent when new participants are admitted. Many want to get involved because of pure greed, but in her eyes they lack the appetite for work. Stolf: “When you become a participant, you get a water reservoir of 50,000 liters. Everyone wants that. The project must scrutinize people and encourage them to work.”

In her view, the biggest challenge for Adapta Sertão is to ensure that farming becomes attractive in this dry land. Stolf: “Young people do not have the appetite for working hard in the countryside. And less so if they do not see any money in return.” The young people are the farmers of tomorrow, she ponders. “If they do not want to stay, how and what will we have to eat?”

THE ACTIVIST

Julita Trindade de Almeida

“We are poor because we seldom look beyond the tips of our noses,” says Julieta de

Almeida (54). “But Adapta Sertão has expanded our horizons.” On working visits organized by the project, she has seen that the technology is available, and an encounter with Peruvian farmers – also through the project – made her realize that drought is not such a disaster compared to the earthquakes and volcanic eruptions that people suffer from in Peru. “Drought is manageable.”

Almeida was number two of the credit cooperatives, a councilwoman of public health. She fought for water wells, led Rede Pintadas (the umbrella of community-based associations of Pintadas) for years, and is a champion of the left political party PT. Her conclusion is that the real problem in her region is politics. Investments must be made, but the current political leaders show no interest. There is no debate. People, especially young people, out of frustration or complacency, are hardly interested in politics. “They suspect a thief in every politician.” Yet she has hope. “Pintadas does not have to be like the rest of the world. We own our own story.”

She has been an owner of her own story ever since she was a teenager. Almeida, born and raised in Pintadas, was thirteen when she founded Young people in Search of Liberation (Jovens a Procura da Liberacao) in Pintadas with others in the movement. The teenagers resisted the idea that you had to migrate in order to survive. And that drought was a punishment from God. The liberation theology that believed that faith should be translated into political struggle against “sinful” social structures was their ideology. They were 22 youngsters and were given a plot of land outside the village to be built on by a politician who thought the experiment exciting. There they formed their own “basic community” for years. They believed in solidarity and working together to solve problems.

Adapta Sertão, with its emphasis on cooperation and cooperatives, is to her a “new

reading of everything we have done before." The fact that several young people from those days are now active in Adapta Sertão as 50-year-olds does not surprise her. "You build one stone up on top of the other."

THE BOSS OF THE SLAUGHTERHOUSE

Valcyr Almeida Rios

Valcyr Almeida Rios (49) is a dynamic man. He has known Adapta Sertão from many different positions: as manager of the credit cooperative, as mayor (for the left-wing PT) and as director of Frigbahia, the cooperative slaughterhouse. He now holds the latter position. In addition, he is a farmer; a big farmer with a fair amount of land.

His experience is that after ten years Adapta Sertão has become synonymous with quality far beyond Pintadas. "A farmer wants a technical advisor from Adapta Sertão. He is not interested in talking to another one. Many farmers want to become technical advisors with Adapta Sertão because they know that they will become good and will always have job offers anywhere." And officials from elsewhere recently said to him, half complaining: "Why don't we have Adapta Sertão in our municipality?"

Farmers want to participate in the project and not only because they get things for free. Almeida: "They are confident that, thanks to the method of Adapta Sertão, the money they invested will come back. The project guarantees their sales and provides technical advice, regardless of whether you are a large or small producer."

The main difference between Adapta Sertão and other agricultural projects in the region was that Adapta Sertão brought something new, he says. The new thing was

organoponics. And further on Adapta Sertão introduced excellent technical advisers who continuously visited the farmers. “That had never been the case before.”

The fame and name of the program now also shines on Pintadas. People elsewhere in the region now associate Pintadas with “well organized.” Almeida was recently about 120 km away to visit milk producers and to buy milk for the cooperative of Pintadas. Nobody made a fuss about the payment. Almeida: “Because it was Pintadas.”

He calls Adapta Sertão “a legacy” for Pintadas. But at the same time it is a burden and a responsibility, he says. “You cannot fail.”

As a farmer he also benefits from Adapta Sertão. He is now growing cactus on his land, planting the leaves close together. “Then they grow flatter and bigger.” That is knowledge he picked up from Adapta Sertão farmers.

A FEMALE FARMER

Marinalva Mendes de Silva

Marinalva Mendes da Silva (65) lives in the empty and barren outland area of Pintadas, only accessible via an unpaved winding road. She is known as a hard and disciplined worker and, thanks to Adapta Sertão, has become a top supplier for the weekly market of Pintadas. She can now even afford to pay two men to work with her in her huge vegetable garden.

The vegetable garden is next to her house and is a feast for the eyes. Mendes grows potatoes, quiabo, lettuce, beets, coriander, peppers, squash, and fruit trees. Thanks to a

sun-resistant mesh roof, the vegetables are fresh and juicy. The vegetable beds are sleek like boxes on graph paper and are separated by cement paths. She herself invented the paths that slope in a way that the water flows from bed to bed. As a result, she wastes little water and limits spraying to a quarter of the time needed in the old days. She had always sold vegetables on the market, but before she joined Adapta Sertão she collected the water with buckets from far away when the nearby lake fell dry. Now she has a water tank specifically for the irrigation of the vegetable garden. At her house she has two more water tanks. These are huge concrete bins that are partly underground. They are fed by a reservoir with a dam located further away. The water tanks have been constructed by the government.

Marinalva Mendes is a woman of few words, except when the subject comes to former president Lula. The politician, who himself grew up in a dry region, had promised “water for all” almost ten years ago. And to the inhabitants in the dry northeast he had said: “I’ll help you quit the watering can.” The farmer’s conclusion: “He lied.”

She feels cheated by him. Her six children have all left for São Paulo and have built a life there. “If we had this support and structure ten years ago, they would not have left.”

THE CLIMATE SCIENTIST

Emilio Lèbre la Rovere

Emilio Lèbre la Rovere (63) is probably the most quoted climate scientist in Brazil. The engineer/economist has an impressive curriculum when it comes to energy and the environment. Among other things he directs the Centro Clima of the Federal University of Rio de Janeiro, a research center for climate change and adaptation. Lèbre la Rovere

is also a member of the Intergovernmental Panel on Climate Change (IPCC) and a winner of the Nobel Peace Prize in 2007. His center and Adapta Sertão have been working together for more than ten years. He is a fan of the project.

“The expansion of Adapta Sertão – always to solve problems – is remarkable. It is no longer a project but a program that is in line with government policy and with financing. Adapta Sertão has made it clear that you can only achieve resilience if you also tackle other structural problems at the same time. That is an important merit.”

Did he himself learn something new from the project? Yes! La Rovere: “The vague concept of ‘resilience’ has become more concrete. For the poorest it is food security and for the farmers who have a little more certainty, it is assurance that they can produce as much or more during drought.”

Opinion polls show that Brazilians are very interested in the climate change issue and consider action necessary. That is mainly due to the Amazon, according to the climate scientist. “We have been hearing for half a century that the Amazon is important for the climate, including in our own country. The drought in southern Brazil, which is related to the changes in the Amazon, makes Brazilians even more aware of climate change, just like the hurricane in New York did with Americans. But climate has not yet reached the economic agenda, he notes. The issue lives exclusively within the Ministries of Environment, Science and Foreign Affairs. The Plan for Adaptation to the Climate, launched by Brazil, excels in vagueness. Even the goal is not described.”

La Rovere is convinced that Adapta Sertão can deliver numerous policy recommendations. Working in four areas – advice, credit, training and production – at the same time, as MAIS does, could be very useful for other parts of Brazil and even other countries, such

as in the Sahel. “If adjusted, because every region is different,” says La Rovere. But he is also a scientist: “It’s necessary to expand the model to three hundred farmers to check the guidelines.”

10. Keys to Success

Leaders and personalities.

Thais Corral, Daniele Cesano and community leaders like Nereide Segala from Pintadas and her colleagues from Rede Pintadas turned out to be golden partners from the start. They complemented and stimulated each other. Corral brought in a network and experience. She had the name and fame and was the strategist. She came up with the story, managing to find new partners and common ground for them in a platform. Cesano was primarily a scientist with a passion for data analysis. As an engineer he had knowledge about irrigation and he was a driven and methodical worker. Corral and Daniele had together an integrated, all-encompassing vision which combined technical and social potential to reach more innovative and sustainable results than any achieved in the past; Cesano was very systematic and had an eye for the smallest details. Even

when the project got huge, he meticulously checked whether everything was aligned with the big picture. “We were busy day and night, pushing each other, and we were very passionate about what could be achieved,” Corral says about her inspiring collaboration with the Italian engineer in the first years. The local community leaders were driven, enthusiastic and above all generous and modest. Valdirene dos Santos Oliveira, nowadays local coordinator of Adapta Sertão: “Empathy and modesty are crucial if you want to work together as partners.”

Good local organizations to work with.

A well constituted local partner provided the project with not only credibility but also guaranteed contacts and experience. The local organizations had a tradition of debating policy issues and a track record of achievements. Their seasoned community leaders knew what worked and what did not, and who best to contact for what. These community leaders became the local eyes and ears. They were also ambassadors of the project. And they proved tireless when it came to Adapta Sertão. Thais Corral: “Real change is only possible with local leaders who have prestige and power. We always talk with community leaders who have regional appeal. Sometimes we are stuck, but they are enthusiastic and always help us out. They are aware that the project is bigger than some egos.”

Demand-driven.

In business, the response of the market dictates policy and investments. This mobility is not given to most NGOs. Ideas almost always come from the top, are motivated by a vision, worked out behind the desk, and are encapsulated in multi-year plans. Adapta Sertão’s way of working is almost the opposite. There is no strictly-defined program. The project is interactive and dynamic. It began in response to a request for help from Pintadas. The coordinators continued to respond to requests and problems that came up when the project was running. They always asked themselves: What are we missing

for it to run smoothly? Nereide Segala: “With every problem we had, Daniele Cesano, the technical coordinator, went in search of us.” Solutions were scrupulously developed into strategies. The openness and solution-oriented approach of coordinators and employees generated sympathy and credibility in the local community. You could speak of collective leadership at Adapta Sertão. It becomes obvious in the monthly evaluations where farmers, technicians and coordinators exchange experiences. That is special and even more so in the sertão where policies are imposed and open dialogues are scarce. And also special: Adapta Sertão always managed to attract donors that appreciated this.

Shared ownership.

From the very beginning Adapta Sertão organized excursions with participants to visit farmers and companies that seemed to have solutions. There were excursions in the region but also to other states and even to foreign countries. They inspired and made participants feel still more part of the project. The same counts for the technology transfer, presentations and collective working sessions in the field. Farmers are taken very seriously. In their surroundings participants with success are automatically treated as opinion leaders. Taking people seriously also means not treating them as victims. Adapta Sertão supports poor farmers with skills and knowledge but stresses their own responsibility in turning their participation into a success. Adapta Sertão also breaks with the idea that something should be done against the drought. Residents must be taught how to live even better with the drought. That is a message that catches on. In Pintadas, many already feel the front of a new movement.

Simplicity.

The model that Adapta Sertão introduced is simple. You can implement the recommendations and then most likely have success. It is smart agriculture that is close to the farmers. Everything has been developed partly on the basis of refined local

knowledge and needs, and it is brought in a language that a farmer without formal education understands.

Defining an old problem in a new way.

Adapta Sertão linked migration to climate change, the subject of the moment. You have to "sell" a project. You have to make connections and make a storyline. Drought and migration have always been major characteristics of the sertão. Adapta Sertão gave the known poverty-migration story new urgency by making clear that the exodus will only increase as a result of climate change and that ad hoc measures such as benefits or water deliveries are no solution.

Good timing.

In 2003 Brazil got a left-leaning government. Its president, Luis Lula da Silva launched the Fome Zero (No Hunger) program. For the first time, the federal government paid attention to the output of small and medium-sized farmers and food security for Brazilians themselves. Additionally, the subject of climate change and its causes, and the damage being done in Brazil began to appear frequently in public opinion from 2005 onwards, fed by images of dry riverbeds in the Amazon and the Kyoto Protocol. Moneywise it was also excellent timing: Climate change was (and is) internationally a topic fit for funding, especially when dealing with solutions and supporting the most affected populations.

Ambassadors/lobbyists with prestige.

Adapta Sertão gathered in the flow of the year's firm believers in the project, who helped Adapta Sertão to gain visibility internationally. The most prominent of them is the Brazilian

climate scientist Emilio Lèbre la Rovere, coordinator of an important climate research institute in Brazil and, since 1992, a member of the prestigious Intergovernmental Panel on Climate Change (IPCC). Such personalities are needed to open doors and to call attention especially with funding agencies that are flooded with requests.

Relentlessly searching out and connecting potential partners.

Adapta Sertão has never stopped looking for partners. In its contacts with the government it has always taken the initiative. On many occasions representatives of the program went to Salvador (the regional capital) and Brasilia (the national capital) to make presentations to the authorities. The project quickly turned into a coalition of partners. To stress their open character, they themselves preferred to call it a platform. Its members have been proactive – visiting or inviting potential partners, looking for common interests and addressing them on their responsibilities. Not only cooperatives, but also technology suppliers became partners of the project and increasingly deal directly with each other. Thais Corral: “Working with many partners is difficult, but you must persevere. As coordinators we had to invest time in assuring a common understanding. We have to show that we all adhere to the same purpose.”

Communication anywhere, anytime.

Working together means communicating and communicating again. Adapta Sertão has been very active on radio, creating a network of radio programs and presenters and also an online radio named Radio Adapta Sertão. The program is also active on social media and has an up-to-date website. Since the early days of Pintadas Solar many videos were produced and all posted on the Adapta Sertão YouTube channel. Every year, Adapta Sertão has organized a forum meeting for all its partners. The first Adapta Sertão Forum happened in 2007 and gathered participants from different institutions that worked in the semi-arid region in the Northeast. It was sponsored by the Irish aid organization Trócaire.

Every year from then on a forum would take place, and it has become the way to present results and strengthen the debate about the challenges faced.

As much collaboration as possible with the government.

NGOs that are efficient and active in areas where the state is absent or weak are often seen as a replacement for the government. Pintadas Solar/Adapta Sertão escaped that trap. From the very beginning it sought collaboration with the government. It managed not to be sucked into political struggles. The program managers never stopped networking at all levels of government: municipal, regional at Jacuípe Basin, regional at the level of the state of Bahia, federal government as well as with specific state institutions and official research entities and advisory bodies. Through collaboration with the government, Adapta Sertão was able to further disseminate best practices from the project and had the opportunity to show a path for policy regarding adaptation to climate development. The lessons learned about collaborating with government were also presented in a paper and published in a prestigious scientific magazine on climate policy.

Prominent role for data mining.

By investing a great deal of energy in measuring and recording almost everything, problems could be diagnosed and understood, results made visible and stakeholders convinced. Adapta Sertão thus showed that the area benefitting from the project suffers more from global warming than elsewhere. Similarly, it showed that the milk yield in the region had decreased despite the fact that more cows had been raised. The data mining also helps banks identify risks when making loans to family farmers in the program. And the government can link its investments to results. Not unimportant: If facts are the basis of a dialogue, it becomes easier to align practical partners and parties that are ideologically different.

Flexibility.

Adapta Sertão was (and is) flexible in several ways. What worked was rolled out; what did not work was abolished. It made the program efficient. Such a drastic approach, however, demands an open mind, curiosity and willingness to give up one's own ideas for a better plan. The focus shifted from irrigation to the entire production chain based on milk and meat production. Flexibility also aided in response to the capriciousness of Brazilian government policy. A crisis in Brazil is never far away. In 2001, when the financing dried up, the program was immediately cut back so that it could survive. In 2015 when the state government failed to meet its contractual agreement with the IDB, Adapta Sertão found itself forced to recalculate the budget overnight. It succeeded with flying colors.

11. Some Lessons Learned

Do not become discouraged by indifference.

Thais Corral, Adapta Sertão coordinator: “You have to work through the indifference of a community. This type of project always gives the feeling of ‘malhar em ferro frio,’ that you are flogging a dead horse. There are few people who dare to take up the challenge. It is however important to maintain and deliver results. If there is success, adhesion grows automatically.”

It is all about how you tell it.

Camila Godinho, political scientist and researcher of the project: “Working with people in the countryside is particularly difficult. There is a general resistance against new things.

How you communicate things to smallholder farmers is therefore crucial. You cannot say: ‘This is how you should do it.’ You have to explain why and give examples with references they are familiar with. And you have to make clear what their interest is. A smallholder farmer does not think about sustainability; he thinks about his harvest. He is busy with surviving. If you explain to him that if he does not reforest, sooner or later he won’t have water anymore, you have his attention.”

Don’t tell, show it.

Environmental protection is, for most farmers, no reason to take action. But with Adapta Sertão this changed when the farmers noticed there was a return. The farmers planted cactus and now have more food for their cattle. They planted fruit trees and have discovered that their cattle are less often ill because they stand in the shade of the fruit trees. Daniele Cesano, Adapta Sertão technical coordinator: “We now limit the teaching classes. A farmer learns very little by listening. We go out in the field. A farmer learns mainly by seeing, listening and doing.”

A farmer learns best from his peers.

Daniele Cesano: “Farmers accept new concepts better in an exchange with other farmers, even if they have slightly different viewpoints. We no longer ask engineers to teach. A farmer who has been trained is the best agricultural consultant.”

Good intentions are overestimated in relation to success.

Thais Corral: “The classic idea is that if you want to, you can do it. But that is a myth. Reality is far too complex. We started by observing the daily routine. The first thing we found out was that you need a different solution for every type of farm. And that you cannot limit yourself to agriculture. Furthermore, analyzing is not enough. You have go out and do your own research. You have to constantly separate what you can believe

believe from what people say. The only way to get a good idea about what is going on is to be very close to your sources, to develop feeling, make friendships and exchange ideas all the time."

Hire the best experts.

Daniele Ceano: "We had no expertise with regard to climate and drought. We discovered everything by experience. Looking back, I say: Hire the best technicians for developing a project. However expensive they may be, it is worthwhile. We now work with the best technicians, experts in their area. We should have done that much sooner. Cheap is expensive in the end."

Skilled management is indispensable.

Thais Corral: "There is always an emphasis on technical knowledge in development projects. But technical knowledge alone is not enough. Just as important is the capability of management. One of the biggest failures we faced during the ten years of the project was the bankruptcy of the local dairy cooperative." The reason: lack of management capacity and experience with the dairy sector. Creating change involves frequent adaptation to new situations. You have to use existing resources (think: credit, mechanization, advice, cooperatives, carbon credits) in a different way. You must be able to handle and oversee such a process.

You must carefully regulate your own presence.

When it comes to their own presence Thais Corral and Daniele Cesano, initiators of Adapta Sertão stress: "You have to have a really close check on everything." But that is not the same as being at the location every other day. On the contrary, Cesano claims: "If you are there for a week, everybody runs around that week and the week before you arrive. Then activities fall back again. If you are there too often it becomes your project.

You will execute the project instead of the local people. You have to force a breakthrough of inertia and put the project on track, but in such a way that people continue to work when you leave. That fine tuning took us years."

Do not complicate things unnecessarily.

Daniele Cesano: "At one point we had money to spend. We pushed the farmers to purchase appliances that they might not need. But if a farmer has to do too many different things, it does not work. That was not well thought out. Now we only recommend the minimal necessity of mechanization; there are only three devices."

Do not grow too big too fast.

In 2011 Ser do Sertão got money from the National Fund for the Environment to found a fruit juice factory. The state would also contribute. Thais Corral: "Because there was so much money, a large factory was projected. When the project was underway it appeared there was too little money to finish the project. And now the factory is there and the supply is a problem. Since it has a very big capacity, there is not enough fruit for it to run properly." The fruit must now be bought elsewhere. But you can only take the risk of buying if there is a demand for juices.

Aid sucks away people's interest in undertaking the work.

Almost everyone in Pintadas and its surroundings receives a cash payment from the government: bolsa familia (translated: family benefit). Thais Corral: "People have become dependent on this money, and you clearly note that it provokes passivity. These safety net programs have helped poor communities to survive, but if they are not connected to a training program and opportunities for small business initiatives, they perpetuate poverty."

The government in Brazil is an unreliable partner.

Daniele Cesano: “The government is responsible for technical advice to smallholder farmers in Brazil. Our idea was that that the government support the technical assistance of Adapta Sertão. But the government broke the contract to support. Technical advice to smallholder farmers is not a priority for the government and most decisions are politicized.”

Women become invisible if you do not explicitly involve them.

Thais Corral: “Smallholder farm businesses are almost always family businesses with the women as the backbone. But if the man is around, the women move into the role of assistant. Men negotiate and do the things that bring in most money. By introducing new technology we focused on men, since technology is almost always about livestock. Men manage the cattle. We did not realize this enough. Women are quickly invisible unless you explicitly involve them in a project like this.”

Supporting the poorest is not the same as poverty reduction.

Thais Corral: “In the first round of the project we had chosen a poor landless woman as a participant. Although poverty reduction is an objective of the project, we now realize that it does not mean that you must give support to the poorest. If the poor person does not have a productive mentality, it is useless.”

12. Changing of the Guard: Another Challenge

At the start of 2018 the program had a hundred participants. Thirteen of the forty farmers from the first and second round are still participants. One of them is Florisvaldo Mercês Guimarães, the young farmer. Guimarães is considered the walking memory of the project since he was there from the very start and has accompanied tens – perhaps hundreds – of farmers. “There is no farm I have not been to in recent years,” he admits. He also saw many come and go. “Dropouts are usually people who want to keep doing the same as they were doing.”

In 2008 Florisvaldo Guimarães was the one of the farmers who tested irrigation with solar panels. Since he was enthusiastic and eager to learn, he was also the first farmer who learned how to do repairs on the pumps and irrigation system. Because of his experience, bright mind, enthusiasm and commitment he almost automatically started advising newcomers and reporting measurements. Guimarães is now a qualified environmental technician, working for the secretary of Agriculture of Pintadas. He still has his own farm.

In the middle of 2016 Adapta Sertão was approached by Brazil's most important television channel for an experiment. It was logical that Florisvaldo Guimarães would provide technical advice. A popular entertainment program, named Caldeirao do Huck – Huck's Cauldron, named after the presenter, Luciano Huck – had given a village elsewhere in the sertão a water well. It was a village like Pintadas, but located in the sertão of Pernambuco. In the words of the TV presenter, Luciano Huck: "With only wind and sand." The village was also obviously chosen because of its name: Caldeirao (like the program).

With the advice of Guimarães and agronomist Marcelo Bastos, who had been involved in the project since 2008 (the second phase) residents from Caldeirao threw themselves into the cultivation of vegetables and crops. Drip irrigation systems, shade fabric to protect the crops, mixed vegetable beds: All the tips and tricks from Adapta Sertão were applied. After seven months the results were shown on TV: a green corn field, and an impressive vegetable garden with enough to supply the village. Plus the possibility of growing pickles from the garden for sale elsewhere.

Nevertheless, Guimarães was not impressed. He thought the inhabitants could have done much better. "They have less rain but more water than us and better soil. And yet poverty is greater." He could not stop wondering why. After months he concluded: "It's the people." He thought they were too inert and lacked entrepreneurship. "They do

nothing."

That is different in Pintadas. Participants are eager. And the inhabitants embrace the program. "It has wings here," says Guimarães. That is also the experience of the founders. Thais Corral: "People in Pintadas see and seize opportunities." The program planted seeds. The enthusiasm for agriculture is growing nowadays among young people. Many young people are inspired by the successes of Adapta Sertão and want to become agricultural advisors. Four youngsters from Pintadas are studying at university to be agronomists, and one of our own has already graduated.

The prizes the program has won and the outside interest for Adapta Sertão fills the residents with pride. No two months will pass without a visit from delegations within or outside of Brazil, or a presentation somewhere. Now, in 2017, regional ministers of agriculture, dairy giants, councils of cooperatives from elsewhere, entrepreneurs who believe in sustainable business and, of course, agronomists, have all shown their interest and have popped up in Pintadas.

In the meantime about 600 farmers in the region have become acquainted with Adapta Sertão. Some have stayed for months as participants and others for years. In addition, there are farmers who were never members, but copied some of what they saw at farms that do participate.

"Everyone who gets to know Adapta Sertão is delighted," says Valdirene dos Santos, local coordinator of the platform. What is still more remarkable: The exodus to São Paulo to work and earn money there stopped a few years ago. Dos Santos: "Now young farmers remain in the village. They see a future for themselves here again. We still have a long way to go but the beginning is there."

13. The Legacy

The legacy of Adapta Sertão after twelve years is considerable and varied. There is a scientific heritage: The program has determined how the microclimate has changed in recent decades. The vague concept of “resilience” or “weather resistance” in policy documents has gotten hands and feet thanks to Adapta Sertão.

In the field, Adapta Sertão has provided new technical insights; for example, how to grow cactus optimally and how you can best use it as animal feed. The platform has also demonstrated that you can use fewer pesticides thanks to the cactus and how to prevent water evaporation in a cheap, practical way.

The level of facilities in Pintadas made a leap thanks to Adapta Sertão. There is now a network of well-trained supervisors for smallholder farmers. Machines and devices are available locally and technical assistance is also at hand. Adapta Sertão organizes a lot of information meetings on sustainable agriculture as well: seminars, round table discussions, courses, dialogues and information desks. There are four locations in and around Pintadas where farmers can go for technical advice.

Cooperatives with huge problems are now functioning again. They have been reorganized and professionalized and are partners in the Adapta Sertão platform. Ser do Sertão, the farmer cooperative, is responsible for the training and supervision of the participating farmers. New production lines were introduced by Adapta Sertão, such as fruit processing and the many uses of licuri, a coconut from a native palm species.

Smallholder farmers got new sales channels via the reorganized cooperatives and via the market stall of Adapta Sertão. But also thanks to arrangements that Adapta Sertão managed to convert into sales channels, such as supplies to schools and food programs for the poor.

A large number of the participants managed to increase their income with the techniques and guidance of Adapta Sertão. Some within just a year. Women who work on the farm or even run the farm on their own because their husbands are migrant-workers have become more visible and more independent thanks to the platform. The program has contributed to the status of the smallholder farmer; he or she also brings in knowledge.
Indisputably, Adapta Sertão has given Pintadas, and its surroundings, a new dynamism. The platform has brought all kinds of people from outside to Pintadas. New connections and collaborations were born because the platform got groups around the table that would otherwise never have met. It has built bridges between governments and companies.

Another huge leap forward: Sixteen municipalities work together in the program. For industry the municipalities had joined forces in the past, but they never felt the urge to do so for smallholder farmers.

There is ample experience with community-oriented technology transfer. The experiences and knowledge gained with the community-oriented approach were systematized by Adapta Sertão in order to share both locally and internationally.

Another result: Success in farming got another connotation. Farmers who have participated understand that quality is more important than quantity. They have seen with their peers that you can produce more with less if you work methodically and smartly. Just as Nereide Segala, the local coordinator of the early years, summarizes: “In the past, people measured the success of a farmer in terms of how many cows and how much soil he had. Now we know that productivity counts. How much food does he produce per square meter?”

Last but not least: Adapta Sertão has introduced a workable model for sustainable agriculture by smallholder farmers. With this so-called MAIS model, technicians and farmers can get started and follow through to completion. The model shows you how to create the conditions for sustainable harvesting in dry areas, and it can be used – with modifications – for dry areas elsewhere, in Africa, Asia and Latin America. MAIS offers smallholder farmers a real chance to improve their living situation despite the deterioration of the climate. As one of the participants says: “With Adapta my dream may become a reality.”

You can use the MAIS model and its underlying analysis of the farm to translate uncertainty in climate into risks. This serves not only farmers but also banks and policymakers.

Based on the MAIS model Adapta Sertão formulated a questionnaire for banks to calculate the risk of a loan to a family farmer who participates in the project. Thanks to the program policymakers got leverage to enable them to integrate resilience against climate change and sustainability into their development plans.

The Challenges

What are the challenges in the short and medium term? What is on the to do list?

Still: money. First and foremost, money for the participants. Farmers who want to apply the MAIS model have to make investments. The provision of credit for smallholder farmers is still very bureaucratic and the requirements regarding collateral are difficult for smallholder farmers. Adapta Sertão gave the banks that issue these loans suggestions on how this process can be made more flexible and targeted. Nothing has been done about it.

Rolling out the program was and still is an important challenge for the near future. There are many farmers and municipalities interested in doing something with Adapta Sertão, but who pays for the intensive support for the farmers? Adapta Sertão wants the government to step in. The investment can be done easily, as calculated by the platform. It goes without saying that when farmers implement the MAIS model, the government gets more taxes because the farmer produces more. And the government saves on benefits and other expenses that it may otherwise incur if the farmer cannot get by.

The focus for cooperation with the state lies primarily on the regional government. This is usually the executor of federal programs for smallholder farmers. Another facility that

is executed by the regional government is certification. Adapta Sertão wants a quality certification for a hundred farmers participating in the program. These quality ratings could open new niche markets for products from the program. Apart from certification of smallholder farmers and their production, (agricultura familiar) on the “to-do-list” there is also a rating for organic crops (produced without pesticides) and, in the case of fruit, the certificate for fruticulture.

If the state remains aloof, Adapta Sertão must seek other financing. This goes hand in hand with another challenge: to devise a business model for Adapta Sertão. If Adapta Sertão needs and wants to financially support itself, there are several options.

If farmers are willing to pay for their guidance, an important step has been taken. But the question is whether family farmers want to; they are used to free technical assistance in Brazil and making their own investments worries them. They are not ready to borrow money in order to pay a technical consultant.

Are the industries and companies that purchase products from smallholder farmers in that case prepared to invest in guidance to their suppliers? The industries have an interest in assuring quality and having a stable supply, preferably from producers who are close to each other. In some sectors smallholder farmers are (altogether) important suppliers to industries, so who knows. Adapta Sertão is now researching the willingness to invest in this model within the dairy industry.

Furthermore, Adapta Sertão – or one of the partners from the platform – can act as an investor by borrowing the money from a third party. The IDB for example has a fund of fifteen million dollars to spend on climate change projects by 2020. The condition is that Adapta Sertão must prove that its model actually counteracts – mitigate in climate

jargon – climate change. So far the project has concentrated on climate adaption.
There are also technological challenges waiting to be met. Despite the many wells and reservoirs, there is still insufficient water for agriculture. Evaporation is one of the problems. Adapta Sertão experiments with cheap solutions. For example, it has developed an underground storage with sailcloth.

Another challenge, both technological, economic and organizational, is reforestation. Farmers are expected to tackle their deforested grassland step by step. The platform has experimented on its own with the cultivation of seeds from native species. That seems to work, and it is cheap. Reforestation could be co-financed through the Clean Development Mechanism (CDM), the project fund for sustainability in the Kyoto climate agreement. According to a first estimate of the platform, for one out of three farms, reforestation will never pay for itself in savings or in higher production. The CDM would be a godsend in these cases.

The MAIS model must be fed with data from the field to stay up-to-date. The passing on of accurate measurements and results continues to be an organizational challenge. In times of great drought, farmers do not plant anything anymore. Then, there is no more data coming in; there is little to do about that. And what will happen to data transmission when the project gets much bigger?

Now, it is just a handful of technicians who transmit the list of weekly readings per farmer. Everybody knows about everybody. Informal exchanging and checking is part of the daily communication. Soon there might be two hundred technicians who must enter the data of 10,000 or more farmers. How do you follow it and who guarantees that everything is right? Social control won't do it anymore.

The organization will have to be organized differently, predicts Daniele Cesano, technical coordinator. Technicians will get coordinators and there will also be a supervisor from outside who will do random checks. Cesano's policy recommendation: zero tolerance. The technician who does not fill in data accurately and on time should be dismissed on the spot.

Developing MAIS models for other crops and other biospheres is also an assignment that Adapta Sertão sets for itself. The list of crops includes: coconut palms, coffee, cocoa and acai, a native palm berry. And as for biospheres, the researchers are talking about a model for agriculture in the Amazon, but also for the tropical coastal forest, the so-called Mata Atlântica. A logical next step would be an ISO quality mark for the models that would facilitate introduction abroad. Colombia and Paraguay have already shown interest.

Adapta Sertão is not an island. Brazil is politically divided to the bone. You see the national conflict reflected in the villages. The challenge for the platform is that it should not allow itself to be sucked into this battle. Thais Corral, coordinator: "If you don't watch out you will spend your energy in confrontiation instead of in connection."

Questions That Remain

In every project there are issues that cause friction. Decisions where the consequences are incalculable. Questions that simply do not have an answer. A successful project like Adapta Sertão is no different.

It is worthwhile to look at the considerations that lead to certain decisions. Is, for instance, your choice based on practical reasons or idealistic motives? Do you opt for visibility in

the short-term or invisibility in the long-term? What is socially important to you? In the open culture of Adapta Sertão dilemmas are discussed. It does not mean that in the end there is unanimity.

The most pronounced opinions come from the two founders, Corral and Cesano. Below is a selection of dilemmas they brought up:

Take the “economization” of the program, the increasing emphasis on a business approach and increase in turnover. The technician who visits the farmer with cows knows that he has to focus on the cattle in order to get good averages from that farm. One of the instructions in the production schedule is that everything that costs money but gives no or little return should be dismissed. “But sometimes these are things that give life,” says Corral. Like the vegetable garden that improved the family diet.

She is also wary about the fact that the term “weatherproof ” is narrowed down to a desirable monthly income. The IDB, the main donor of Adapta Sertão in recent years, does so. If a farmer’s family in the sertão has a monthly income of 1,874 reais (about 500 euros), by the bank’s definition, it is not in danger. Corral finds it too one-sided and too money-oriented. “Maybe the family needs less income if the farmer produces more and better food for himself.”

Co-founder Cesano sees it differently. If you would like to perpetuate a farmer’s farm, the farmer must be financially independent. That is only possible if he has enough income. The average farmer has a goat, chickens and a vegetable garden for his own use. It gives the family little or no money. Cesano believes in specialization. “If you want to add a lot of value to your product, you have to specialize. You cannot be good in milk and also in fruit. The focus on technology and return is necessary if you want the farmer to be able

to do well in the market."

For the same reason – financial sustainability – Cesano believes that Adapta Sertão should go commercial. Technical assistance must be paid for soon. And his idea is that the technical advisor should also financially benefit if "his" farmer produces more. He should get a percentage, in Cesano's eyes. "That will motivate him even more."

Cesano stresses the P of Profit in People Planet Profit; Corral puts the emphasis on People. Corral: "In my opinion, humanization is an important component of sustainability. People must be able to feel ownership of the project. If not the project collapses after we have left. For consultants and benchmarking, it is interesting to focus exclusively on what works. But for the participants it might be a bit too economical and too technical." Her fear is that a very technical program would alienate the farmers and above all the women. Corral: "Women in the sertão care about having enough food and good water. For them money is not the key element".

Her choices are different as a result. If you go commercial, you are actually dropping the poorest. For a farmer with two cows and a few acres there is no place. Her criterion for success is when the lives of people improve, including that of the poorest people. Daniele Cesano explicitly does not see the poorest as the target group of Adapta Sertão. "They often have multiple problems. They do not become producers for the market." Corral stresses that the original objective of the project was to assure life improvement and food security to the marginalized people of the sertão, mainly women and children, who are left out in this new model.

Another dilemma that is discussed at Adapta Sertão is livestock farming. When things get better farmers bet on livestock farming. Keeping cows is less work than maintaining

a field. Adapta Sertão helps the farmers to grow their business,but if farmers keep more cattle, it is worse for the environment. That is at odds with environmental sustainability.

Daniele Cesano: “Livestock is the most important sector of the regional economy. If you know how to make this sector sustainable, you have a real impact on improving the environment. And if you show that it is possible and you can make even more money, it will explode,” he predicts. “That is the strong point of capitalism. Success is copied.”

Another pressing problem: the cooperatives. They are important for implementation, for sales channels and for technical assistance, including assistance in the field. The employees of the cooperative Ser do Sertão and the fruit factory are now paid with money from the IDB. It supports the program at least until the beginning of 2018. The investments and turnover of the cooperatives must increase rapidly in order to continue to pay the wages and to pay off the debts.

But with fifty or sixty members, the deposits and the turn-over are limited. The underlying question is: Can a cooperative with fifty or sixty members (and corresponding working capital) be financially self-sufficient? And if that is not the case, what do you do as Adapta Sertão? Do you have to look for another intermediary for something as practical as technical assistance in the field?

Women have benefited too little from Adapta Sertão over the past decade. The wish to get this right is shared by all. But how? Thais Corral: “If Adapta Sertão

concentrates on cattle and milk, women do not appear in the story anymore." Perhaps women enter more readily in the Adapta Sertão program if they get easier access to credit? Should they not put more emphasis on assisting the activities women do in the farms? Perhaps they have to ask more women to become technical advisers? Two of the twelve advisers for Adapta Sertão were women, but they fell out of the boat when the program had to shrink. Moreover, it is a tough job. Daniele Cesano therefore is not sure whether that is the solution: "You have to drive a hundred kilometers on a motorbike on unpaved roads. Not many women are into that."

Changing of the Guard

It was twelve years ago that Corral and Cesano, in close collaboration with local activists and the municipality, developed the first irrigation project in Pintadas. They think it is time to pass the baton. Local organizations like the cooperatives have to start managing the program.

Thais Corral: "Every project has a life cycle. You have to ask yourself regularly if there is another function for you." Now it is her NGO, REDEH, that is executing the project. The organization seeks financing, draws up contracts, issues assignments, reports to agencies and organizes exchanges and presentations. As Adapta Sertão continues to be managed by REDEH, people from Rio de Janeiro continue to come. They have to be paid for this and the program continues to have their influence and twist. In Corrals eyes, however, it can perfectly be guided by local people. Corral: "It is time for a new generation. There are enough capable people who know everything about training and planning."

What, ultimately, do they hope that Adapta Sertão will achieve? Daniele Cesano thinks

large, “My goal is to provoke a radical change in climate. And you get changes especially when you work with businesses. They must become interested in resilience to climate change.”

Thais Corral thinks first of the local community: “I hope that things achieved continue to improve as REDEH and the group founders are no longer executing. We have invested a lot in organizations, persons and management so that progress can continue. After all, the transformation of a region takes much longer than the cycle of a project.”

List of Abreviatons

CCLB – Central de Cooperativas de Leite da Bahia

CDKN - Climate and Development Knowledge Network

CEMINA - Comunicação, Educação Informação e Adaptação

Centro Clima da UFRJ – Universidade Federal do Rio de Janeiro

CNPq - Conselho Nacional de Pesquisa Cientifica e Tecnológica

COOAP - Cooperativa Agroindustrial de Pintadas.

COOPES - Cooperativa de Produção do Piemonte da Diamantina

Coopofitte - Cooperativa Polivalente Filhos da Terra.

CONAB – Companhia Nacional de Abastecimento

Copaita - Cooperativa Agroindustrial de Itaberaba.

COPPE - Instituto Alberto Luiz Coimbra de Pós-Graduação e Pesquisa de Engenharia

Embrapa - Instituto Brasileiro para Agricultura e a Pecuária

FAO - Organização das Nações Unidas para a Alimentação e a Agricultura

FONTAGRO - Fundo Regional de Tecnologia Agropecuária

Fundação COPPETEC – Fundação Coordenação de Projetos, Pesquisas e Estudos Tecnológicos

FUMIN – Fundo Multilateral de Investimentos

IABS - Instituto Brasileiro de Desenvolvimento e Sustentabilidade

IDB – Inter-American Development Bank

INMET - Instituto Meteorológico Nacional

LEAD - Liderança para o Meio Ambiente e Desenvolvimento

MAIS - Módulo Agroclimático Inteligente e Sustentável

MDL - Mecanismo de Desenvolvimento Limpo

List of Abreviatons

ONG – Organização Não-Governamental

ONU – Organização das Nações Unidas

PECSA – Pecuária Sustentável na Amazônia

PRONAF - Programa Nacional de Fortalecimento da Agricultura Familiar

REDEH – Rede de Desenvolvimento Humano

REEEP Parceria pela Energia Renovável e Eficiência Energética

SEED – Promoting Entrepreneurship for Sustainable Development

SICOOB - Sistema de Cooperativas de Crédito do Brasil

TNC – The Nature Conservancy

UBA - Agência Federal Alemã de Meio Ambiente

WEDO – Women, Environment and Development Organization

WRI - World Resources Institute

People Interviewed by Ineke Holtwijk

Founders

Daniele Cesano

Thais Corral

Local coordination and project execution

Florisvaldo Merces Guimaraes da Silva Igor Cézar

Jocivaldo Ferreira Bastos Joselito Araujo Barbosa Nereide Segala Coelho Valdirene dos Santos Oliveira Researchers

Emilio Lebre la Rovere Stella Rodrigues dos Santos Cooperatives

Girlene Almeida Oliveira (Delícias do Jacuípe / Ser do Sertão) Josenaide de Souza Alves (COOPES)

Milton Aparecido Pessoa Ramos (SICOOB) Norma Rios (Ser do Sertão)

Valcyr Rios (FrigBahia)

Public managers and opinion makers in Pintadas

Cleidenea Bastos de Almeida (Pintadas city councilor)

Jorge Henrique Macedo de Almeida (journalist, communication business)

Julita Trindade de Almeida (administrator and social activist)

Neusa Cadore (state legislator and former Mayor)

Nilza Nunes de Almeida (Head of State Nomal School of Pintadas)

Velzi Stolf (religious and activist in Pintadas, owner of Pousada Colina Verde)

People Interviewed by Ineke Holtwijk

Farmers

Edilson Dil

Epifanio Reis Rios

Erinaldo Isidor Souza

Gilmara Macedo de Oliveira

Jose Anjos Carneiro

Josue da Silva Oliveira

Lindinalva Lima Rios

Marilson Arisvaldo

Marinalva Mendes da Silva

Nelci dos Santos Gomes

Sponsors

We thank all the public and private foundations that allowed Adapta Sertão's experience to develop between 2006 and 2018

2006 - Fundação Cariplo (Italia)

Executor: REDEH

Amount: €30,000

2007 - Ministério da Cooperação Holandesa by South-South-North (South Africa)

Executor: REDEH

Amount: €25,000.00

2008 - Agência de Meio Ambiente da Alemanha

Executor: Centro Climático through COPPETEC/ UFRJ e REDEH

Amount used at Jacuípe Basin: € 300,000.00

2009: CNPQ - Conselho Nacional de Desenvolvimento Cientifico e Tecnológico

Executor: Centro Clima / Prof. Emilio La Rovere

Amount: R $ 150,000.00

Comune di Castelnuovo di Monti (Itália) € 14,000.00

2010 - Itaú Social (Brasil)

Executor: REDEH

Amount: R $ 45,580.00

2011 -FNMA - Fundo Nacional do Meio Ambiente (Brasil)

Executor: Rede Pintadas

Amount: R $ 293,881.20

Sponsors

CDKN - Conhecimento em Desenvolvimento do Clima NewtorkNetwork (United Kingdom)

Executor: REDEH

Amount: £ 112,176

2012 - Ministério do Meio Ambiente - Fundo Clima (Brasil) Executor: REDEH

Amount: R$ 2,204.68000

CAR -Companhia de Desenvolvimento e Ação Rural da Bahia Executor: Cooperativa Ser do Sertão

Amount: R$ 170,000.00

2013 - IABS - Instituto Brasileiro de Desenvolvimento e Sustentabilidade (Brasil)

Executor: REDEH

Ammount: R $ 100.000,00

2014 - Caixa Econômica Federal / Prize Objetivos do Milênio (Brasil)

Executor: REDEH

Amount: R $ 100,000.00

2014 - Petrobras (Brasil)

Executors: REDEH / Consultoria SER Salvador

Amount: R $ 1,909,736.00

2014 - Banco Interamericano de Desenvolvimento / FUMIM - Fundo Multilateral de Investimentos

Executor: REDEH

Amount: US $ 1,293,559.00

Sponsors

2015 - Secretaria de Agricultura, Pesca e Pecuária (Bahia) Executor: Cooperativa Ser do Sertão

Amount: R$ 373,804.64

2015 - Good Energies Foundation (Holanda)

Executor: Word Resources Institute (Brasil) / REDEH

Amount: € 150,000.00 euros

Awards

2006 **Wisions (Wupperhalt Institute).** The prize promotes good practices and resources efficiency through the publication of relevant and successful projects on energetic efficiency

2008 **SEED Award.** Adapta Sertão was one of five projects to receive a prize for their expansion potential among 400 others

2008 **United Nations Habitat.** Best Practices Data Bank to improve life quality

2012 **Celso Furtado Prize, Ministry of National Integration.** Given by the Ministry of National Integration to acknowledge initiatives that contribute to the regional development in Category 3 – Innovative Projects to Implementation in the Territory

2013 **Mandacaru Prize/IABS.** Program Cisterns, Innovative Projects and Practices for Water Access and life in the Semi-Arid

2013 **Millennium Development Goal Prize, Category "Poverty Reduction", Brazilian Presidency.** Incentive to actions, programs and projects that effectively contribute to the implementation of the 8 Millennium Development Goals

2015 **FONTAGRO Prize**. In the category Producers and NGO's Association, given by the Interamerican Bank of Development

Awards

2016 **Best technical assistance program in Bahia, Bahia Government.** The MAIS Module was certified by the State of Bahia as the most innovative experience in Technical Assistance

2016 **Prêmio Mulheres de Destaque da Bahia.** Given to Nereide Segala for her participation in Adapta Sertão

2017 **Best Rural Impact Business of Brazil.** Promoted by UNEP – United nations Environment Program with SEBRAE

2018 **Momentum for Change.** Award given by the UNFCCC to Adapta Sertao/ MAIS

Adapta Sertão

Adapta Sertão is a program whose purpose is to develop and put into practice strategies to adapt family agriculture to climate change. Developed for 12 years (2006 to 2018) it has the support of a platform which congregates organizations that work in the Brazilian Semi-Arid. The program initially focused its actions in Bahia, especially in the Territory Identity of the Jacuípe River Basin and surrounding municipalities.

The strategies developed in the program are articulated through cooperativism. They have as their fundamental premise technical capacity building through the MAIS methodology (Módulo Agroclimático Inteligente e Sustentável), carefully designed through experimentation and practical observation aiming to allow agricultural families to keep on producing food even during the annual droughts or when there is a prolonged dry period.

The program encourages the entrepreneurship of the farming families to face the challenges, creating mechanisms of access to loans, to the right processing of products e to sales mainly through cooperatives.

The Adapta Sertão platform also includes partnership with universities which operate through scientific research and the participation of institutions responsible for the implementation of public policies in order to improve the allocation of technical, financial and human resources.

Cooperatives that Implemented the Adapta Sertão Program in The Jacuípe River Basin:

Ser do Sertão, COOAP, COOPAITA, COOPES, SICOOB, FRICBAHIA Pintadas