Evaluation of
MDS Policies and
Programs – Results

Volume I
Food and Nutritional Security

Jeni Vaitsman and Rômulo Paes-Sousa

Organizers

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*This book is dedicated to the memory
of João Domingos Fassarella.*

1943–2006

Throughout its three years of existence, the Ministry of Social Development and the Fight Against Hunger has faced challenges of all sorts in its efforts to reach its main objectives: reduced hunger, poverty and social vulnerabilities. Faced with the severe social debt accumulated over the course of the history of Brazil, which resulted in the exclusion of wide segments of its population, our actions have sought to meet a series of demands regarding promotion of equity and social development.

In the area of social protection, social assistance programs have been inserted into the food security policy and the Bolsa Família Program. We hope not only to insure better access to basic goods on the part of the most vulnerable groups, but also to invest in the qualification of people, through improvement of their health, nutrition and education. The goal is to re-define and expand the complex network of social protection aimed at the poorest and most vulnerable families.

Social and economic inclusion of the poor is one of the urgent points in the political agenda of our country, which has meant an effort on different fronts, where policies directed at the poor also intend to create the conditions necessary to enable these individuals to rise above their current condition in a sustainable manner. On the other hand, we have always been aware that innovative policies, programs and actions are not enough, it is also paramount to invest in competence, effectiveness and transparency of management, thus insuring that the goals of public policy can be met. The initiatives by MDS to reduce hunger and poverty in Brazil would not be complete without systematic monitoring and evaluation of its processes, results and impacts.

Acknowledgement of this need to create institutional mechanisms to promote transparency of our actions triggered the creation of the Secretariat for Evaluation and Information Management – SAGI. Its main task was development of an evaluation and monitoring system for programs and policies under our management, an endeavor which required the efforts of many professionals among the several units of the Ministry and raising of various sources of funds. We succeeded not only in achieving interaction between technical knowledge and policies, but also in their effective use to improve our actions. We can proudly say today that institutionalization of evaluation has allowed for effective improvement in management of public policy.

For the purpose of reporting to society, we present this set of articles, containing results of studies covering the Ministry's three areas of activity: Food and Nutritional Security, Bolsa Família and Social Assistance. Volumes 1 and 2 of the publication "Evaluation of MDS Programs and Policies: Results" will provide feedback on the work carried out by the MDS to all stakeholders involved in the endeavor – grantees, researchers, managers, government directors and civil society.

Lastly, it is necessary to thank countless people and organizations for their contribution, which made this publication possible – researchers, universities, international organizations, MDS program managers and especially the SAGI team.

Patrus Ananias de Sousa

Minister of Social Development and the Fight Against Hunger

Chapter 6

Chapter 7

Chapter 8

Chapter 9

This publication contains the first results of a set of studies evaluating programs of the Ministry of Social Development and the Fight Against Hunger (MDS) or about topics related to its policies to combat hunger and poverty.

The studies, contracted or carried out by the Secretariat for Evaluation and Information Management (SAGI), constitute one of the components in the system for evaluation and monitoring of MDS programs and policies[1]. At the start of 2007, 62 studies had been completed or were in execution or contracting stages. Dissemination of results is one of the last steps in the evaluation cycle, seeking to not only provide inputs for the technical and political debate about social issues, but also to promote transparency of processes, results and impacts of MDS actions.

In the evaluation model developed by SAGI, both decisions about points or scope of a program to be studied and definition of format and methodology took into account various considerations, including: what was desired or necessary to be known about a given program or policy; the desired and feasible deadline for achievement of results; financial resources available; access to reliable databases.

Choices made were therefore pragmatic in addition to theoretical or methodological. In spite of the recommendation in manuals that studies should be planned from the start of a program,

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1   For a detailed description of the process of construction of this evaluation and monitoring system, see VAITSMAN, J.; RODRIGUES, R. W.; PAES-SOUSA, R. **The system for evaluating and monitoring social development programs and policies**: the case of the Ministry of Social Development and the Fight Against Hunger in Brazil. Brasília, DF: Unesco, 2006. For a summarized description of the research see PAES-SOUSA, R. (Org.); VAITSMAN, J. (Org.). **Síntese das pesquisas de avaliação de programas sociais do MDS**. Cadernos de Estudos: desenvolvimento social em debate, Brasília, DF, n. 5, fev. 2007.

thus establishing a baseline integrated into its original content, in the reality of public policies and programs this rule is seldom adhered to. At the time of its establishment, in 2004, bringing together the Ministry of Social Assistance, the *Bolsa Família* Executive Secretariat and the Special Ministry of Food Security and the Fight Against Hunger, the MDS became responsible for 21 ongoing programs, formerly under the responsibility of these agencies. None of these programs had any sort of baseline from which its processes, results and impacts could be monitored and/or evaluated.

Considering that systematic information about the vast majority of the programs was also inexistent, decisions about the studies to be undertaken were made based on elements found in the organizational context. The existence, location and access to databases and information systems were dependent on not only on the organizational trajectories of policies, programs and actions, but also on their format, means of transferring financial resources and stakeholders involved in their management processes. Decentralization meant wide operational and technical diversity. The variety of formats regarding manners and mechanisms applied during implementation, as well as the wide range of local situations, limited not only the possibilities for a program to be evaluated, but also the feasibility of certain evaluation designs.

The scarcity of systematic information about the programs taken over by MDS at the time of its establishment generated strong demand for information coming from managers. Attending to these demands was one of the main elements considered in the definition of questions to be answered, which led to a large variety of research formats and methodologies, some combining different methods and objectives. If on the one hand this brought horizontal gains, expressed in diversity, wide coverage and plurality, on the other it also meant vertical losses regarding specificity and robustness of some studies.

Today, approximately three years after implementation of this experiment, with the first results of evaluation studies systematized, this stage may be called pioneering in addition to exploratory, since the SAGI team had to explore in search for answers to the main questions about MDS programs and politics asked at the time.

Although impact evaluations with *quasi*-experimental and longitudinal formats are more widely accepted by the international evaluation community, from the standpoint of those implementing the policy or program, there are limits to their execution. These studies are more costly and time-consuming, and their results can only be known and possibly incorporated into the re-design of the concept or format of the program in the long run. Evaluations of results and processes, on the other hand, are quicker and can be immediately utilized by program managers.

In addition to evaluation studies, the reader will also find here assessments and diagnoses developed with the goal of contributing to implementation and development of the policy itself: transversal research serving as the baseline; population estimates; studies of implementation processes; different types of surveys, including national household surveys, with or without beneficiaries regarding different aspects of a program, such as access, services offered and results observed; and, lastly, a *quasi*-experimental and longitudinal impact evaluation study of the *Bolsa Família* Program.
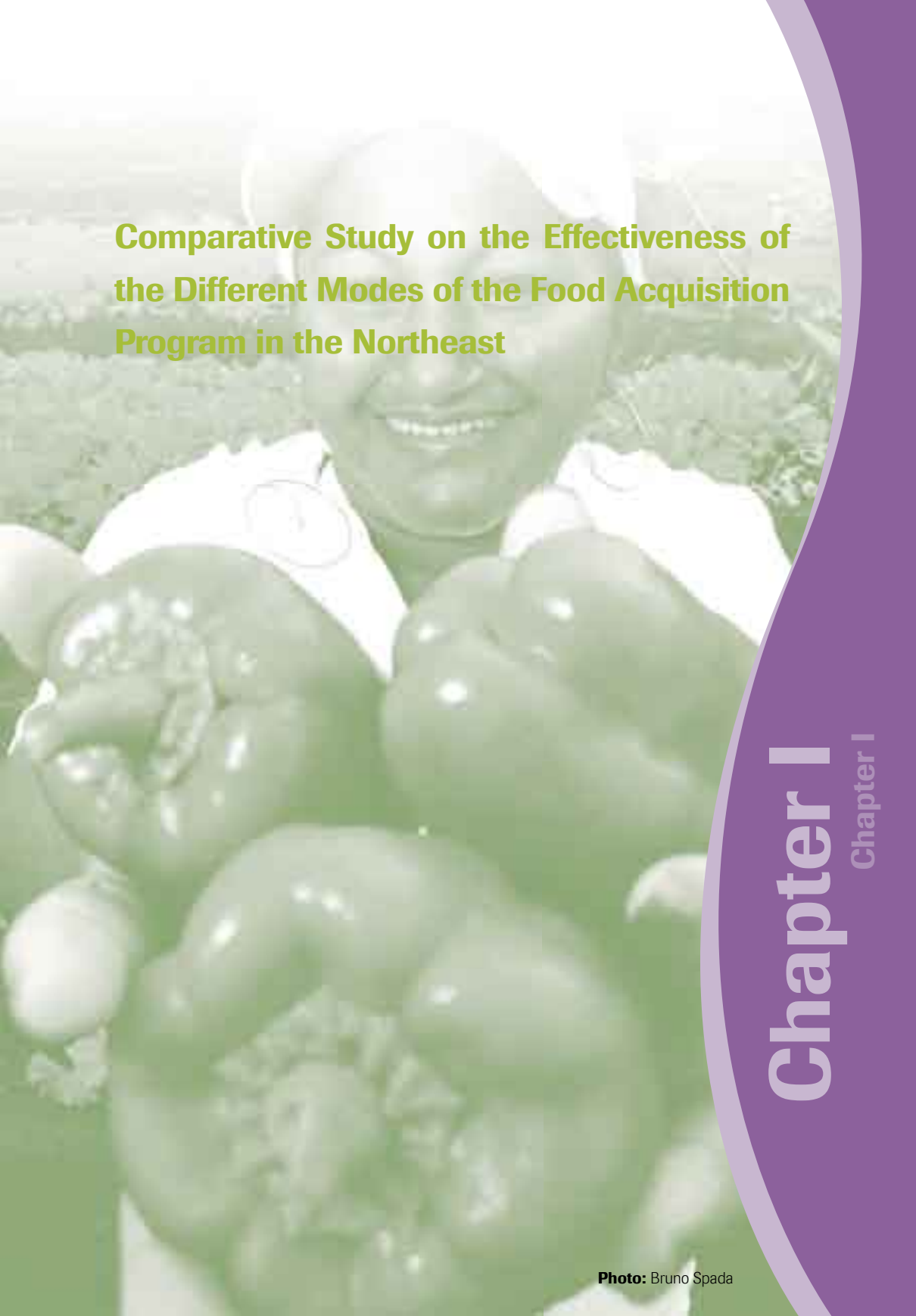
The publication is divided into two volumes and covers policies, programs and actions of the following MDS secretariats: National Secretariat of Citizenship Income, National Secretariat of Social Assistance and National Secretariat of Food and Nutritional Security.

Jeni Vaitsman
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Comparative Study on the Effectiveness of the Different Modes of the Food Acquisition Program in the Northeast

Chapter I

Comparative Study on the Effectiveness of
the Different Modes of the Food Acquisition
Program in the Northeast

Gerd Sparovek[1]

1   Introduction

This evaluation study of the Food Acquisition Program (PAA) implemented in the Brazilian Northeast was coordinated by the Luiz de Queiroz Agrarian Studies Foundation (FEALQ), and conducted by the Luiz de Queiroz Agricultural College (ESALQ), linked to the University of São Paulo. The presentation of the results initially outlines the PAA, and highlights its conditions, objectives, and modes of operation.

The objectives of the PAA are: to develop actions that contribute towards food security, to promote family agriculture throughout the country, and to form strategic stocks. The program's resources are distributed to people in situations of food security in hospitals and aid organizations, through children's school lunches. The program operates through the purchase of agricultural and livestock products, produced by rural family farmers registered in the National Program for Strengthening Family Farming (Pronaf), which may pay up to two thousand five hundred *reais* (R$ 2,500.00) a year per farmer. No public bid is needed for this purchase, as long as the prices are not higher than those on regional markets. In this study, four food purchase modes were analyzed:

:: Direct Purchases from Family Agriculture (CDAF), implemented by the National Company for Food Supply (Conab). These mainly aim to

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1   Associate Professor of the University of São Paulo.

ensure income for rural family farmers, so that they may market their production at fair market prices;

:: Special Anticipated Purchases from Family Agriculture (CAEAF), which ensure the prior purchase of family agricultural and livestock products directly from formally organized Pronaf beneficiaries. These purchases, which are also made by Conab, may be donated to institutions, or used to form stocks;

:: Anticipated Purchases from Family Agriculture (CAAF), which provides funds for planting, is aimed at those not benefited by Pronaf credit, namely agrarian reform and *quilombola* settlers (runaway slaves who settled in the 1800's). Funds are anticipated for planting, and the product is delivered at harvest time. This program is executed by Conab;

:: Local Direct Purchases from Family Agriculture (CDLAF), aimed at improving family agriculture production, and how and where it is sold. This promotes the development of the local economy, by directly meeting the supplementary feeding demands of the region's social programs. This is done through direct agreements between the Ministry of Social Development and the Fight Against Hunger (MDS), and the states and municipalities.

The Program, covering the entire country, involves the following actors: the MDS; a managing group with representatives from the Ministry of Social Development and the Fight Against Hunger (MDS), the Ministry of Agriculture, Livestock, and Food Supply (MAPA), the Ministry of Agrarian Development (MDA), the Ministry of Finance (MF), and the Ministry of Planning, Budget and Administration (MP); the National Company for Food Supply (Conab); the states, municipalities; and the *Banco do Brasil S.A.* (BB)[2].

The aims of this study were: a) to compare versions of the Program, identifying the implementation stage flows (awareness campaigns, registry of rural producers, selection of beneficiaries, food purchases, product delivery); b) to evaluate how the Program is perceived by the benefited or non-benefited

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2   Bank of Brazil.

target audience regarding awareness of the Program, how to sign up, the selection process, as well as relations with financial agents, the Conab, state and municipal governments, according to the type of inclusion; c) to analyze the perception managers and entity members have of the Program.

2   Methodology

The study's research universe was the Brazilian Northeast Region. Data gathering instruments were closed-question questionnaires for the rural family producers (benefited and non-benefited), and semi-structured interviews with municipal, state and Conab managers, aid entities and agricultural associations. Documents were also researched to analyze transactions. In this regard, both quantitative and qualitative instruments were used.

It was initially requested that the study follow the following stages: 1) definition of the selection criteria for the states, municipalities and beneficiaries to be included in the study; 2) gathering and analysis of Conab data and of the agreements signed by the MDS's National Secretariat for Food and Nutrition Security (SESAN) and states and municipalities for the selection of the locations to be included in the study; 3) selection of the municipalities to be included in the sample; 4) interviews with Program managers (MDS and Conab, or MDS and states and municipalities, in the case of local purchases) and representatives of rural family producer associations and cooperatives, in order to define the flows of the Program's various versions; 5) interviews with benefited and non-benefited rural producers; 6) comparative analysis of the execution flows of each of the Program' four versions, available at the MDS; 7) preparation of an analytical report, including the results, their comparison, and recommendations.

2.1 The Sample

The Program data available to determine the sample were not enough to allow a random and probabilistic definition of municipalities to be studied. In order to use the available data it would be necessary to compile a complete list of

the benefited rural producers and institutions, with specific information organized as follows: line of funding, name and address of benefited rural producer and/ or institution, product sold, date, value of the operation etc. This would make it possible to stratify the population according to the product sold, date of sale or value of the operation for each of the lines. With the respective strata, it would then be possible to produce a causal sample universe with a determined confidence interval and establish a field research plan.

As a result, an alternative methodology was adopted by which the researchers selected the states where the PAA activities were most intense, to then select the municipalities where the Program's activities were more intense. Based on these criteria, six states were selected, of the nine comprising the Northeast region (Table 1), and more than 41 municipalities (listed below), of a total of 316. It was assumed that it would be more probable that rural producers benefited by the CDAF and CAAF would be located in these municipalities given the intensity of transactions made by these programs, in spite of not having the names and addresses of the producers. Thus, research plans were defined and presented to the Program's state managers and the MDS team during the meetings, which were later adapted with the inclusion or exclusion of a certain municipality. In the locations studied, the existence of all the Program versions was verified: the CAEAF and CDLAF, as well as the CDAF and the CAAF. Rural producers not benefited by the PAA were selected mainly from communities of benefited producers or in their proximity.

Table 1: Distribution of the questionnaires by state

State	Number	Percentages
Piauí	34	13.6
Ceará	53	21.2
Rio Grande do Norte	45	18.0
Paraíba	15	6.0
Pernambuco	61	24.4
Bahia	42	16.8
Total	**250**	**100**

Source: Prepared by the researcher based on the questionnaires

It is important to point out that, due to the restrictions outlined above, it was not possible to prepare a sample plan which represented the universe of family

farmers and institutions covered by the Program. The results of the study did not allow statistical inferences to be made for the universe of the actors involved. Therefore, the projections are only valid for the interviewees included in the sample. Nevertheless, the results are fundamental in understanding how the Program functions.

The data were collected between May 19, 2005 and January 30, 2006. Overall, 398 interviews were conducted; 250 with benefited family farmers, and 148 with non-benefited farmers, benefited entities and associations, and managers, as may be seen in Chart 1.

Chart 1: Distribution of the number of interviews conducted by questionnaire type

Benefited family farmers by food purchase mode	Number	Non-benefited family farmers, benefited entities and associations and managers	Number
CDAF	57	Benefited associations	25
CDLAF	31	Non-benefited	62
CAAF	115	Benefited entities	38
CAEAF-DS	21	Local managers (municipal for the CDLAF)	14
CAEAF-FE	20	Conab managers	7
More than one mode	6	State MDS managers	2
Total	**250**	**Total**	**148**

Source: Prepared by the researcher

3   Results

3.1 Flows

The flows of the different modes were prepared and analyzed based on the interviews with Program managers, representatives of family agriculture associations and cooperatives, and family farmers, which were organized according the aims of the PAA: 1) to promote food production; 2) to promote price stability; 3) to officialize agricultural and livestock product purchases; and 4) to stockpile food in order to improve food security.

Some basic aspects are common to the Program modes studied, for example: the requirement that the *in natura* product be packaged in adequate, resistant and clean sacks; the reimbursement, by the Conab, of the same number of sacks, if the product is delivered according to the specifications; the requirement that the products be delivered to purchase centers (own or registered storage units, indicated by the Conab), or to itinerant purchase units. Other specificities of the flows of each version shall be addressed below.

3.1.1 Direct Purchases from Family Agriculture (CDAF)

This mode allows family farmers to sell their production at reference prices (which are somewhere between the minimum price and the market price), calculated through a methodology developed by the Conab, and adopted by the Managing Group. This methodology allows the direct purchase of agricultural products from the families registered in the Pronaf, either in formally organized groups (cooperatives and associations), or in informal groups.

The maximum limit the producers receive per year is R$ 2,500.00 (two thousand five hundred *reais*). In order to calculate the amount received by each producer, the production volume effectively delivered is multiplied by the established reference price.

Payments are normally made within 10 days, as of the date of issuance of the purchase receipt, according to the regulations. These payments are made through the *Banco do Brasil* (BB), the Program's financial agent. In the event a beneficiary does not indicate a bank account, the Conab issues an payment order which may be redeemed at any BB branch office, along with the presentation of the Individual TaxpayerRegistry (CPF), and official identification.

For processed or benefited products, ready for human consumption, the Program's norms also require a declaration that the *in natura* product, exempt from any forfeiture or any other similar liability, was delivered by and purchased from formally registered beneficiaries, in cash, at a price not inferior to the reference price (in effect at the time of the transaction), without deductions. It is also required that the products meet certain quality levels which, along with the established norms,

may hamper the inclusion of many producers in the Program. Not all family farmers are able to attain the minimum standards called for by the norms.

3.1.2 Anticipated Purchases from Family Agriculture (CAAF)

The CAAF version is carried out through the anticipation of funds for planting, and is aimed at family farmers registered in the Pronaf, in groups A to D. Beneficiaries of this version also include: agrarian reform settlers; agro-extractivists; families affected by dams; rural landless workers in camps; indigenous communities, and family farmers in special conditions – i.e., those not benefited by operating credit and that are, necessarily, organized in formal and informal groups.

In the region studied, these individuals were mainly located in settlements, with very few exceptions. The formalizing of the operation during the period studied took place after the information was analyzed by the financial agent, and the Rural Product Certificate (CPR-*Alimento*) issued, which should be specific for each product. In many cases sampled this did not take place, which made it more difficult to settle the outstanding amounts after the expiration date (for example: CAAF, in the state of Ceará).

The financial agent only checked whether the documentation was in order, such as the CPF of the family farmer, with no consideration given to the risks involved, the feasibility of the production, and the profile of the farmer, as is common in other credit operations.

In the sample of analyzed transactions, the anticipated value was equivalent to 100% of the purchase price, based on the reference price multiplied by the estimated production quantity expected to be delivered. The amount is made available in the current account held by the beneficiary at the financial agent issuing the CPR-*Alimento* (BB). The study detected late payments, which affected the expected crop plantation levels (such as sorghum, in the state of Rio Grande do Norte) and even impeded plantation, as was the case of beans and corn in the state of Pernambuco. In the latter case, the family farmer had even bought animals with the anticipated funds. The CPR-*Alimento* settlement process took place as expected. Frequently, the family farmer interested in settling the CPR

was not adequately oriented by the BB branch office. An example of this was the declaration of a BB branch manager in a town in the interior of the state of Bahia. When interviewed, he stated not knowing whether the CPR had to be paid, and in the event it had to, if payments had to made at the BB. Farmers in the state of Pernambuco, interested in settling their contracts, went to their local branch offices, but to no avail, due to the total lack of information on part of the bank personnel on how to proceed.

The insolvency expected resulted when the conditions established by the CPR were not met. Consequently, the beneficiary or the group, and respective members were included in the Conab insolvency list, and the relevant judicial measures were taken to collect the amount due. Up until when the managers were interviewed, these measures had not been taken, for debt payments were predominantly being negotiated.

3.1.3 Special Anticipated Purchases from Family Agriculture (CAEAF)

In this version, family agricultural, livestock or extractivist production is purchased anticipatedly. It is aimed at forming stocks or the simultaneous donation of the production to populations in situations of nutritional risk, who are covered by social governmental or non-governmental programs. In the Program, there are two types of beneficiary: the suppliers, represented by formally organized producers, and the consumers, which are governmental or non-governmental institutions involved in publicly recognized social work for people at risk.

In this procedure which is operated by the Conab, benefited producers must be formally organized and registered under the Pronaf, according to the criteria established by the Program. Also included in the group of benefited producers are, agro-extractivists, *quilombolas*, families affected by dams, rural landless workers in camps, indigenous communities and rural producers in special conditions duly authorized by the Conab.

The delivery of the products by the producers at the collection posts followed a schedule determined in the Participation Proposal, which is one of the

documents required to participate in this version of the Program. The social control of the donations is carried out with the involvement of the municipal and state National Council on Food and Nutrition Security (CONSEA) or similar agency, such as the Municipal Sustainable Rural Development Council (CMDRS).

The documentation required by the Program limited the participation of family farmers because few cooperatives were able to produce the necessary documents.

The funds were transferred to the current account of the cooperative or association within 10 days, as of the formalizing of the Special CPR. It is important to point out the following: if the farmer had any outstanding debts with the financial agent (*Banco do Brasil*), the anticipated funds could not be used to settle these debts.

The use of the funds by the entities was authorized by the Conab. In most cases, the anticipation was 100% of the total value of the Special CPR, with the submission of a detailed budget to the Conab. The funds were used to cover the costs of raw materials, to purchase packaging and labels for processed products, to cover product processing costs, as well as other items approved in the budget. Since the withdrawal of funds by the cooperatives dependeds on prior authorization granted by the Conab, payments were significantly delayed, which also affected payments made to the family farmers.

In Mirandiba (PE), this caused serious misinterpretation problems among benefited farmers, for it was widely known that the amounts would be deposited in the current account of the non-governmental organization (NGO) responsible for the operation. In Palmares (PE), delays took up to 21 days, forcing the entity to use its own funds to pay the supplying family farmers. In Remanso (BA), some of the farmers interrupted the delivery of their products, due to the payment delays.

Another relevant aspect detected regards the packaging of the products which, according to the norms, was required to be done in packages provided by the rural producers. The products' sanitary and quality control, in the case of stock formation, was conducted by an entity officially recognized by the Ministry of Agriculture, Livestock and Food Supply (MAPA) and contracted by the Conab.

The objective was to evaluate the products according to identification and quality standards and to issue classification documents, in name of Conab, for purchase and removal purposes.

The stock formation reference prices are those defined by the Managing Group, or those specified in the Special Participation Proposal accepted by the Conab. In the operations analyzed, it was verified that these mechanisms were used, and products certified as ecological or organic had their prices increased by 30%, when certified.

3.1.4 Local Direct Purchases from Family Agriculture (CDALF)

The CDALF version aims to promote articulation between family production and local social programs aimed at meeting supplementary food and nutritional demands. This version supports the acquisition of products sold by associations, cooperatives and informal farmers' groups, to be distributed at day care centers, hospitals, popular restaurants, and charitable and assistance organizations. This version, in comparison with the others, is operated by the MDS, through agreements with state or municipal governments.

The target audience of this version is comprised of families and individuals assisted by local social programs. The participating producers are family farmers and agrarian reform settlers who submitted a Pronaf Eligibility Declaration (DAP), and who are organized in formal (cooperatives and associations) or informal groups.

The state and municipal governments assumed the responsibility to operate the Program, through an agreement signed with the MDS, to ensure its full execution.

The prices of the products were determined in the Participation Proposal, ensuring that said prices were those practiced on the local/regional market.

The quality and sanitary controls observed were the MAPA and Sanitary Surveillance identification and sanitary norms, and products of animal origin needed to meet the surveillance norms of the municipal, state or federal

inspection services. The consumer (benefited entity) then issued a Receipt and Consent Term, attesting to the quality of the product received. If the level of quality were 20% inferior to the level stipulated in the Participation Proposal, the producer/supplier was excluded from the PAA.

In the situations analyzed in this study, all participating family farmers belonged to informal groups, which controlled the operations and payments on an individual basis. Payments were made within ten days as of the delivery date, which were controlled through reports submitted by the registered entity to the section responsible for the execution of the Program at the MDS.

3.2 Profiles of Beneficiaries and Non-beneficiaries

The characterization of the profiles of beneficiaries and non-beneficiaries is important because it allows the evaluation of the focus of the Program, as well as of adjustments aimed its improvement, with regard to the more specific characteristics of its target audience[3].

Most of the beneficiaries interviewed, nearly 73%, were between the ages of 31 and 60; 13.5% were 61 or older, and only 0.8% were under the age of 20. The age distribution of the family farmers benefited by the PAA indicate a small number of young people, confirming the ageing trend of the rural population, due to the urban migration of younger individuals and technological changes in the field, reducing the need for manual labor. Also noteworthy is the high percentage of male interviewees (83%). Regarding marital status, 56% were married, 14% single, and 23% informed some other status.

The illiteracy rate among beneficiaries was also high. Nearly 25% did not know how to read or write, a percentage which is approximately equal to the rural population illiteracy rate for individuals over the age of 15 in the Brazilian Northeast (29%). Only 20% of interviewees had concluded the 4th grade.

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3   It is important to point out once again that although the profile information is presented in percentages, tending towards a quantitative interpretation, these values refer only to the total sample and not to the totality of Program beneficiaries.

The families of 51% of the interviewees were comprised of up to 4 members. Of family members under the age of 18, 92% were studying.

The area of the properties of non-beneficiaries, in comparison with those of PAA beneficiaries, tended to be smaller. Half of the non-beneficiaries resided on properties of up to 7 hectares, and beneficiaries, up to 10 hectares. The smaller property size is associated with the lower production capacity and generation of surpluses to be commercialized on the market. This may be confirmed by the reasons given for not participating in the PAA, as shall be seen below.

With regard to family members who work outside the property, 50% of interviewees stated that no family member worked out of the property; 30% said that one member did so, and the remaining 20% had two or more family members who did not work exclusively on the property.

3.2.1 Perception of the Program

The PAA beneficiaries were more socially articulated than non-beneficiaries: 91% of the former participated in some social movement, as opposed to 82% of the latter. The lower social articulation of non-beneficiaries may hamper their inclusion in the PAA, either due to the lack of information, or to production support.

Most of the non-beneficiary family farmers interviewed knew of the existence of the PAA, gave it a positive evaluation, and manifested their desire to participate. For most of these (53%), the main sources of information on the Program were community leaders or family members; friends and neighbors were the second most frequent source of information (17%).

The Program was positively evaluated by both beneficiaries and non-beneficiaries; 91% of each group considered the Program good or very good. The highest level of dissatisfaction with the PAA was with regard to the CAAF, which may be associated to the version's high default rate, because of harvest losses due to adverse weather, to lack of technical assistance, as well as the lack of information regarding the insurance coverage provided by the Agricultural and Livestock Activity Guarantee Program (Proagro). This latter issue brought

about unsatisfactory results with regard to the respective coverage. This resulted in registry restrictions for benefited family farmers and the denial of future credit by the financial institution.

There was a high percentage of interviewed non-beneficiary family farmers (nearly two-thirds) wanting to participate in the Program. The main reasons were the sale facilities and the reasonable prices paid by the Program, and for being a means through which anticipated credit could be obtained.

The non-benefited family farmers who stated in the interviews that they did not want to participate in the PAA mainly justified their position for fear of not being able to pay off the debt or for not obtaining adequate production levels. However, the non-beneficiaries who manifested the desire to participate indicated that the quantity and quality or their products were the main limitations to their participation in the Program.

This data indicated the lesser productive capacity of non-benefited family farmers – whose production, in terms of quality and quantity, would not be enough to meet the conditions of the PAA – had a stronger influence on participation than did bureaucratic problems, which were not significantly limiting.

Regarding the level of awareness of the PAA, most beneficiaries declared not having a clear understanding of the Program, and consider it a production credit program, and not a sales support program.

Most of the family farmers are superficially aware of the existence of the PAA, but have no knowledge regarding how it operates. Most of the non-beneficiaries (66%) have sought or would seek more information on the PAA, especially at the trade union (24%).

Technical assistance proved to be scarce for both beneficiaries and non-beneficiaries, although the situation was worse for the latter. Sixty percent of Program beneficiaries do not receive technical assistance; among non-beneficiaries, the percentage reached 72%. For 10% of beneficiaries and non-beneficiaries receiving assistance, the type of technical support was poor; the rest (30% of beneficiaries and 18% of non-beneficiaries) considered the assistance received

good. It must be pointed out that settlers receive technical support from the Rural Extension and Technical Assistance (ATER) office, and from the National Agrarian Reform and Colonization Institute (INCRA), and that a significant portion of the interviewees, mainly CAAF beneficiaries, is comprised of settlers.

The product delivery posts were another relevant issue for which the study reached important conclusions. In three of the versions analyzed, CDAF, CAEAF and CAAF, deliveries were concentrated at the Conab, and at farmer associations.

The interviewees also stated delivering their products at municipal government offices, at benefited entities, cooperatives, NGOs and other locations, as in the case of the CDLAF.

The graph following grapf shows the distribution of production delivery points. The Conab is the main point, followed by rural producers' associations and benefited entities.

Graph 1: Distribution of the production delivery points by benefited farmers
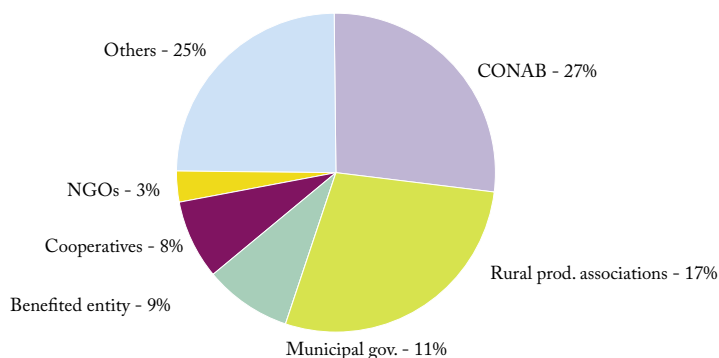
Source: Prepared by the researcher

The rural producers' associations play an important role in the Program, not only as production delivery points, but also as sources of information regarding the Program. Nearly 75% of benefited and non-benefited family farmers belong to some type of rural producers' associations. These associations operate as intermediaries between the Ministry and family farmers, which facilitates not only the implementation of the PAA, but also of other programs aimed at the target audience.

Other relevant issues investigated, related to the Program's understanding and operation, were the sacks used to transport the production, as well as the transportation itself. To package the production, sacks provided by the producers themselves were used more frequently than those furnished by the Conab and others. Regarding transportation, government support was limited, with two-thirds of producers of benefited family farmers using hired or their own transportation. The federal, state and municipal governments jointly represent 6% of the transportation of interviewees production.

The PAA should include alternative means of transportation, as way of promoting more access to economically underprivileged non-benefited farmers.

Lastly, regarding the CAAF and CAEAF, many family farmers had gone into debt for not being able to pay back the CPRs. Part of the default problem arose from the aforementioned problems related with the lack of information on how Proagro operated or from the difficulties in meeting the quality standards required to classify the products, as well as harvest losses due to adverse weather conditions. The problems may also be explained in part by the fact that the CAAF and CAEAF were mistaken for production credits (such as those provided by Pronaf), without the necessary monitoring, support and guarantee mechanisms. As a result, there were situations in which participation in the PAA ended up generating debts for the farmers, aggravating their situation.

Beneficiaries also suggested improvements for the Program. The main suggestions included increases in the purchase limits and in prices paid by the PAA, better technical assistance and information on Proagro, better articulation of the PAA with other programs and levels of government, and more adequate funding timing to make funds available.

3.2.2 Income and Durable Goods

The study indicated that the average of the total income of PAA beneficiaries was higher than the average family agriculture income for the Northeast. A real increase in the family agriculture's average income was observed, for both

PAA beneficiaries and non-beneficiaries, in comparison to the average of the 1995/1996 Agricultural Census[4].

This increment may be partially explained by the Federal Government's income transfer programs, since 75% of family farmers who are PAA beneficiaries receive resources from some other program. On the other hand, land access and family agriculture support programs (such as the Pronaf, among others) may have brought about an increase in production and productivity for some family farmers.

Another interpretation for this difference may be a PAA selection bias by which better structured and higher income farmers are favored. This hypothesis may be justified by the need for greater production volumes, better final quality of the products and the capacity to meet the bureaucratic requirements. Those capable of meeting the requirements may also be those with higher income. The hypothesis that applies to the PAA may only be determined through specific impact evaluation studies.

According to Table 2, respectively 73% and 70% of those benefited and non-benefited received some type government income transfer, pension or retirement benefit, the main of which are: *Bolsa-Família* (22% and 25%), Gas vouchers (19% and 21%) retirement benefits (18% and 13%), *Bolsa-Escola* (14% e 14%), Food cards (8% and 11%), Child Labor Eradication Program (PETI) (8% and 6%), pensions (6% and 6%) and the Continuous Cash Benefit (BPC), (4% and 3%). The annual average income of PAA beneficiaries assisted by a social program mentioned above is R$ 2,190.00, while for PAA non-beneficiaries who are also assisted by a program it is R$ 2,016.00. This average, however, is strongly influenced by extreme values, particularly in cases in which there are more than one retirement benefit or pension per family. The median annual income (revenue of half the rural producers) coming from the government not influenced by extreme values is respectively R$ 960.00 and R$ 882.00. Table 2 shows the distribution of the other sources of income received by PAA beneficiaries and non-beneficiaries.

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4   This period was considered a reference for being the most recent data available. No other Agricultural Census has been done since then.

Table 2: Distribution of the benefits received by PAA benefited
and non-benefited farmers

Benefits	Benefited farmers (%)	Non-benefited farmers (%)
Bolsa Família	22	25
Gas vouchers	19	21
Retirement benefits	18	13
Food cards	8	11
PETI	8	6
Pensions	6	6
BPC	4	3

Source: Prepared by the researcher

By comparing the total annual income of PAA beneficiaries and non-beneficiaries, it may be perceived that the income of the former is inferior to that of the latter, especially with regard to the sale of agricultural products. The higher proportion of income of the former is related to work off the property. Most non-beneficiaries consume all their production, which may be due to their low opportunity cost, given the sale alternatives outside the PAA. Income coming from other governmental programs and from work off the property is practically equal for both beneficiaries and non-beneficiaries (Table 2), the greatest difference being the sale of agricultural products. More non-beneficiaries work off the property, which is related to the lower sale of agricultural products.

Government programs, such as the *Bolsa Família*, for example, constitute an important share of the income of PAA beneficiaries and non-beneficiaries. The distribution of these benefits is quite similar between beneficiaries and non-beneficiaries, indicating that this Program was not selective with regard to family farmers not assisted by other benefits.

In spite of presenting similar levels of income in terms of governmental programs and work off the property, the agricultural production income of benefited family farmers is nearly three times greater than of non-beneficiaries, the difference being partly associated to the sales to the PAA. On the other hand, the low level of agricultural production sales by non-beneficiaries is due to the fact that nearly all their production is self-consumed.

In order to illustrate the differences between farmers benefited and non-benefited by the PAA, Table 3 summarizes ownership of durable goods. Benefited farmers were better off as far as ownership of durable goods, except for three of the 12 goodes listed: fixed telephone, personal computers and pulverizer.

Table 3: List of durable goods owned by benefited and non-benefited farmers

Durable goods owned	Benefited farmers (%)	Non-benefited farmers (%)
Fixed telephone	2.4	3.2
Cellular phone	35.6	25.8
TV set	78.8	74.2
PC	0.8	3.2
Radio	79.2	77.4
Refrigerator	73.6	67.7
Automobile	16.0	8.1
Motorcycle	27.2	22.6
Truck	4.8	4.8
Tractor	19.2	9.7
Planting machine	8.0	6.5
Pulverizer	16.4	24.2

Source: Prepared by the researcher

3.2.3 Structuring Actions

Based on the information contained in the forms regarding the prices of products, it was possible to observe that the PAA prices are, overall, higher than market prices. This helped improve sale conditions for PAA benefited family farmers, who previously depended on intermediaries as their main sales alternative.

This information coincides with Balsadi's analysis (2004), according to which income improvements for benefited farmers may already be perceived. Also according to this author, indicators regarding the average values received by farmers, the ratio between the prices paid to farmers through direct purchases and the minimum prices paid for the product, as well as the indirect effects brought about by the increase in prices in locations where the Conab set up family agriculture purchase points were some of the benefits produced by the Program.

On the other hand, although there were changes in relation to retailers, this situation is less frequent for CAAF beneficiaries, particularly due to production problems for farmers benefited by this version, who did not sell their production.

One aspect which is not frequently considered in PAA analyses – besides support of self-consumption production, surpluses for sale, and consumption subsidies – are indirect benefits obtained by the producers through the recovery of their products' prices. This has occurred both in locations covered by the Conab purchase points, and in others where institutional purchases are made through agreements entered into between the MDS and state and municipal governments. There have been cases in which the simple announcement of public purchases of a certain quantity of product is enough to increase agricultural prices (DELGADO et al., 2005).

Regarding the impact on production of the eventual termination of the PAA, two-thirds of beneficiaries declared that there would be decline in their production. On the other hand, in comparing the consequences of the end of the PAA for each of its versions, it was perceived that CAAF and CAEAF beneficiaries were more dependent on the Program. This is a result of the funds anticipated for production or stock formation, and is frequently the only source of resources for family farmers who do not have access to the Pronaf.

The greatest increment in the production area as a result of the PAA was observed among the CAAF beneficiaries (54%), and the lowest was for the CDAF (19%). These results confirm the lower dependence by beneficiaries on direct purchases, in comparison with anticipated purchases. In relation to CAAF family farmers, it is probable that, without the PAA funds, they would not have planted.

If the Program was terminated, there would be a strong impact upon the sales of nearly 70% of those interviewed. The CDAF and CAEAF beneficiaries would be the most affected; CDLAF beneficiaries declared that they would be less affected. Once again, CDLAF beneficiaries proved to be more independent for they would have other sales alternatives, although at prices lower than those paid by the PAA.

Regarding the CAAF, certain specific problems deserve comment. Extremely high default rates were detected for this version, especially as a result of production losses because of bad weather conditions, and to Conab product refusals due to bad

quality. On the other hand, in light of the limited selection of products accepted for the CAAF, family farmers benefited by the version were, in many cases, obliged to plant crops for they had insufficient technical expertise and experience. Most of the family farmers benefited by the CAAF did not receive the CPR payment invoice, possibly due to the difficulty in locating the properties. The Proagro, besides the lack of information regarding its operation, was not adapted to the conditions of the PAA, and thus insufficient to cover the family farmers' losses. In most cases in which losses were incurred, the family farmers did not seek insurance when they should have, either due to the lack of information, or the motivation to do so. Consequently, Proagro's response rate was too low to cover the CPR costs. The negative results of the CAAF reflect a higher degree of dissatisfaction of family farmers benefited by the PAA, which may lead to future credit restrictions, due to CPR defaults.

3.3 Benefited Entities

For the CDLAF and, in some cases, the CAEAF, products are directly donated to assistance entities or local schools. Overall, 38 entities and 14 municipal managers were interviewed, the latter intermediating the relation between the PAA, the family farmers and the entities.

In general terms, the flexibility in the supplying of products allowed by the CDL, and the classification done through a term of acceptance, issued by the entity, facilitated farmers' participation in this version. The variety of products supplied varied according to the needs of the entities. The PAA donations are an important element in the food offered by these entities, substituting other suppliers, mainly supermarkets and wholesalers. The resources saved through the donations are invested towards the improvement of assistance provided to the entities' target audiences, and in expanding service offerings. The most evident changes were the food variety and quality as reflected by the well-being and health of the those assisted. The Program's food security aspect is clearly reflected by the version, and may be considered one of the most efficient and complete of the PAA.

Entities are concerned with the continuity of the food supply. In many cases, there is the desire to purchase the food directly from the family farmers, in the event the PAA is discontinued. This desire may be considered a structuring

reflection of the Program, which would ensure the continuity of the sale channels after participation in the PAA. Relations between the entity manager and the municipal government are cooperative and complementary. The municipal governments easily incorporated the PAA routines in their actions.

Integration between family farmers and entities is relative. Farmers are frequently aware of where the donations go, and thus strive to improve quality, avoiding pesticides and classifying their products better. The intermediation of the municipal government prevents a more direct relation between family farmers and entities.

3.4 The Managers

This study also conducted qualitative interviews with the PAA managers. The institutional managers complement the vision and experience of the Conab, the MDS and local state and municipal agents where there are CDLAFs. The qualitative information captures how PAA is organized on a micro level as well as the interests and points of view of the executing institutions.

3.4.1 Positive Aspects

According to the managers interviewed, the PAA proved to be effective in various aspects. The family farmers' demand for the Program was greater that its assistance capacity, despite bureaucratic requirements and the limit of R$ 2,500.00/year, which only selects less structured farmers.

The managers stated that family farmers were very satisfied with the price paid for their products, regardless of not being higher than the market reference values. The PAA actually created markets where before there were none, or prevents the exploitation of the farmers by the intermediaries in less structured regions. In essence, the Program extends the conditions and opportunities of the better market structured farmers to the family farmers. Under these conditions, the underprivileged family farmers are able to structure their production, improving yields and income.

There are also structural reflections generated by the PAA that go beyond its specific actions. Intermediaries are practically obliged to establish a better and more just partnership with the farmers, as well as with those not covered by the PAA. In other words, the benefits introduced by the Program extend beyond those directly intended for its beneficiaries. Better paid, the family farmers tend to improve their production infrastructure, thus increasing outputs and aggregating value to their production.

Another structuring measure is the adaptation of the farmers to more complex and bureaucratic commercial systems. The meeting of classification, quality and sanitary standards, the handling of documents, and the preparation of formal proposals based on plans are lessons and experiences that are useful in the development of new private marketing channels.

Managers stated that the Conab was more valued, revitalized, and that there was a dramatic change in the staff's performance and perception of the entity's institutional mission. The Conab, as an agent of social transformation, which brought direct benefits to the family farmers within their area of activity, as well as the interaction with social movements and entities, rescued and strengthened the self-esteem of its employees. This new vision and approach with society will certainly reflect upon other end activities of the Company.

The CDLAF and CAEAF, with simultaneous donations, promote the insertion of family farmers in their communities as social agents. Their products, with more zeal and quality than before, are supplied to schools, day care centers, homes for the elderly and other relevant entities that provide assistance to the needy. The benefits for these entities are immediate and help improve the nutritional intake of those assisted. The farmers feel proud and valued for helping and, in doing so, are justly remunerated for their production. The CDLAF is also a version that allows more social control, as a result of the intense involvement of local agents (municipalities); it is also more flexible and less bureaucratic with regard to purchases. Thus, more farmers and a wider variety of products may be included. The CDLAF is certainly one of the most promising and socially relevant versions of the PAA. In summary, the Program, as a means of promoting fair market practices for family farmers, proved to efficient and, although not being considered an assistance

program, it introduced structuring effects with regard to the food security of needy families, social promotion, and the valuing of family farmers.

3.4.2 Aspects that May Be Improved or Revised

The managers pointed out various aspects that require consideration in order to improve the Program.

In relation to the Conab, managers mentioned that more collaboration is needed for technical assistance and production support. Integration with other institutions is also weak, and activities go beyond its scope of competence.

Regarding the MDS, managers stated that there was no micro-planning nor a central instance of multilateral management. This posed difficulties in monitoring activities by states and municipalities, distancing the Ministry from the effective overseeing of the Program. Certain expectations which may not be met due to the lack of resources may lead to the Program's discontinuation.

They also complained that documentation difficulties end up excluding many farmers and associations. There is no global fund disbursement planning which take harvest specificities into account. When the farmer is ready to sell, the PAA is not always ready to purchase. There are no clear criteria for the defining of areas of activity. Indications and surplus offerings define the regions where PAA operates, not always giving priority to areas in which the social return is greater.

With regard to the Program's awareness, the managers consider that, on a national level, it was timid or simply did not exist, with support actions being restricted to the local level. Locally there would be more awareness and actions would be less subject, eventually, to corruption and exploitation. Actions aimed at target audiences were affected by local agents who, in most cases, were indicated by the INCRA or social movements, to initiate the work which was later expanded.

There was no formal enrollment process to select family farmers to participate in the PAA. This lack of control affects the dimensioning and planning of the actions and resources of the PAA. The selection process indefinition also restricts the possibility of establishing criteria (geographic, social and economic) for the

selection of family farmers to be included in the PAA, which could potentialize results and help to those most in need. This procedure, if adopted, would increase the transparency of the Program's actions.

Managers also considered that in the anticipated purchase programs, namely the CAAF and CAEAF, default rates were quite high, as was the influence of social movements in the normatizing and execution of the operations. Many farmers did not participate in the process due to the difficulties in meeting the bureaucratic requirements, as well as the quality and sanitation standards of products.

The Program's financial agent (*Banco do Brasil*) faced, in some cases, difficulties in making payments on time and, in many cases, in receiving the payment of the CAAF and CAEAF bonds. The decisions made at the higher instances do not reach the local bank agencies. Part of the problem was solved through the issuing of bank payment invoices, by the Conab, with the due date printed on them.

Proagro presented operational problems, as well as trouble adjusting to the PAA (as pointed out above). There were delays and difficulties in the BB inspections, and thus the CPRs ended up being due before the final procedures for the insurance were concluded. Thus, while this insurance's compensation table was based on the production cost, the value of the CPR was based on market prices. Therefore, the compensations values were always less than the CPR values, which meant that even if the compensations were paid, the beneficiary still owed money to the financial agent. This debt was generally paid after the due date, consequently incurring interest and monetary correction.

The social controls of the PAA actions were predominantly ritualistic in nature, such as the bureaucratic requirements, for example, and thus cannot be considered Program improvement, management and supervision mechanisms.

4   Final Considerations

The Food Acquisition Program is aimed at family farmers presenting profiles in accordance with the Program's objectives, whose characteristics are similar to those of the Brazilian Northeast's rural population, in terms of age and schooling.

It focused on farmers who do not own land, working on small properties, where there are high concentrations of agrarian settlers and non-settlers, non-owners, as well as Pronaf beneficiaries.

In comparison with non-beneficiaries, PAA beneficiaries presented better conditions in terms of indicators such as income, access to the Pronaf, own means of transportation, average size of property and participation in social movements. There may be a possible bias in the selection process regarding participation of more needy family farmers. These family farmers were unable to participate in the PAA, for being unaware of the Program, and because their production was insufficient in terms of quantity and quality. However, these non-beneficiaries would nevertheless like to participate in the Program, and declared not having done so due to the lack of production conditions. It is therefore recommended that there be a better articulation between the PAA and other family agriculture support programs, in order to offer better conditions for the participation of non-beneficiaries in the PAA.

The PAA was positively evaluated by both beneficiaries and non-beneficiaries, in spite of neither fully understanding how it operates. Better planned and more detailed awareness campaigns are needed so that more information is made available.

There are sharp differences among the versions of the PAA. The beneficiary profiles of the direct purchase (CDAF and CDLAF) and anticipated purchase groups (particularly the CAAF) were clearly different. The total annual income of family farmers benefited by the direct purchase programs was higher than that of those benefited under anticipated purchase schemes. This difference may be partly due to the nature of the programs themselves, since the family farmers must, *a priori*, without the support of the PAA, be able to produce quantity and quality suitable for consumption, so that their products may be accepted by the Conab. The dependence of beneficiaries on these versions, in comparison with the PAA, is also lower, since they have other production and marketing alternatives.

However, the largest portion of the total income of CAAF beneficiaries – comprised almost exclusively by settlers, whose total income is lower – comes from the PAA. As opposed to the CDAF and the CDLAF, which make anticipated purchases, the PAA income is an alternative to production expenses,

which allows family farmers to plant. Without the PAA, they would not be able to plant or would not have access to the market, restricting their production to self consumption. The dependence of these farmers on the Program is significant, not only with regard to sales, but also production.

Insufficient articulation with insurance and technical assistance programs along with unfavorable climatic conditions have meant production losses and high debt rates in the CAAF. This has had negative implications with regard to the access to credit by the more needy family farmers. It is recommended that there be a better articulation among PAA managers, technical assistance programs, and financial agents regarding Proagro's conditions. The anticipated purchase program – practically inactive since 2004 – should be reviewed from a direct purchase perspective, complemented by funding and price regulation mechanisms.

The PAA plays a fundamental role in supporting the sale of family agriculture production, a role no previous governmental program has played. In this regard, the PAA has two functions: to establish an agricultural policy for family farmers by guaranteeing the sale of their production at market compatible prices, and to promote food security for people attende by benefited entities. With regard to the second function, the CDLAF is the most efficient version, and should continue to be improved and promoted, to improve channels of collaboration with the entities involved, and to expand coverage. According to the majority of family farmers interviewed, the relations with entities would come to an end if the PAA were terminated.

Regarding the agricultural policy function, the PAA should continue to propose adequate minimum prices for agricultural products, in order to stimulate the expansion of family agriculture. The PAA has allowed prices to be determined for the region's producers which are higher than market prices, leading to important gains for family agriculture, as an alternative to intermediaries. Thus, the Program effectively carries out its regulatory function on the market where it operates.

In a possible scenario without the PAA, the most affected would be the needy family farmers, for whom the Program represents a significant portion of their total income. These farmers do not have alternative marketing sources for their production and, under the best of conditions, if they were able to produce

surpluses, they would be subject to intermediaries who offer prices which are much lower than those of the Program. Family farmers supported by adequate conditions, especially those in the CDLAF program, would not be so seriously affected, for they would have other market alternatives. Nevertheless, the end of the PAA would certainly mean that losses would be sustained, since production would not marketed at higher prices.

In terms of transportation and packaging, the Program provides little support to family farmers, which may increase the difficulties faced by the disadvantaged, by creating another selection bias, which counters the Program's objective of reaching out to its target audience. It is therefore recommended that transportation and packaging alternatives be integrated into the Program.

In the future, the PAA should create conditions in which beneficiaries, whose profiles make them eligible for the CAAF, also become CDAF or CDLAF beneficiaries. Toward this end, they may be offered, in conjunction with other programs, production funds, technical assistance and insurance. This would enable them to produce the quantity and quality needed for consumption, providing them the means to become CDAF and CDLAF beneficiaries.

The PAA's focus may be considered adequate for being strongly focused on family farmers on small properties, and thus coherent with its initial conception. On the other hand, priority must be given, within the PAA, to the inclusion of non-beneficiaries since they, on average, present the worst socioeconomic conditions than beneficiaries on smaller properties.

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Annex

States and municipalities where interviews were conducted for the versions of the PAA-NE	
State	**Municipality**
Piauí (five municipalities)	Canto do Buriti
	Dom Expedito Lopes
	Inhuma
	Picos
	Valença do Piauí
Ceará (nine municipalities)	Aracati
	Chorozinho
	Fortim
	Icapuí
	Icó
	Itaiçaba
	Pacajus
	Quixeramobim
	Russas
Rio Grande do Norte (eight municipalities)	Apodi
	Ceará-Mirim
	Jandaíra
	João Câmara
	Pau dos Ferros
	Taipu
	Touros
	Umarizal
Paraíba (four municipalities)	Alhandra
	Conde
	Ibiara
	Rio Tinto

States and municipalities where interviews were conducted for the versions of the PAA-NE	
State	**Municipality**
Pernambuco (thirteen municipalities)	Água Preta
	Caruaru
	Catende
	Exu
	Lagoa Grande
	Mirandiba
	Orocó
	Palmares
	Petrolina
	Pombos
	Santa Maria da Boa Vista
	Vitória de Santo Antão
	Casa Nova
Bahia (seven municipalities)	Curaçá
	Euclides da Cunha
	Juazeiro
	Licínio de Almeida
	Remanso
	Tapiramutá
	Uauá

Source: Prepared by the researcher based on the sample

The Food Acquisition Program in the South and Northeast Regions

Chapter II

Photo: Bruno Spada

The Food Acquisition Program in the South and Northeast Regions

Cláudia Baddini Curralero[1]
Jomar Álace Santana[2]

1   Introduction

This article discusses the results of the research on the Food Acquisition Program (PAA) in the South and Northeast regions, contracted by the Secretariat for Evaluation and Information Management (SAGI) of the Ministry of Social Development and the Fight Against Hunger (MDS), by means of the Food and Agricultural Organization of the United Nation (FAO), and coordinated by Univesity of Brasília Foundation (FUBRA)[3].

The purpose of the research was to compare the implementation and the sustainability of the PAA in the Northeast and South Regions and its effect generated

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on the involved actors in the commercialization of products of familiar agriculture. A sample of involved social actors in the program was selected and the information was obtained by means of questionnaires and semi-structuralized interviews.

Although the beneficiaries in both regions have distinct profiles (in the South they present better economic conditions that in the northeast) they have related problems when it comes to the role of the farmers organizations, in terms of techical assistance transportation and storage of the production. Program communication, the involvement of the local governments and the participation of the Council. In all the researched states the PAA made possible the creation of improved commercialization channels for family agriculture, raising its income, and easing its insertion in the local markets. The research also points out the importance of the Program, working alongside beneficiary institutions that receive food donations, in contributing to food security.

2   The Food Acquisition Program - PAA

The Food Acquisition Program (PAA) aims to address one of the main problems faced by Brazilian family agriculture: the sale of their products. The Program is part of an effort by the Federal Government to redirect public policies in the area of agriculture, which in Brazil were traditionally aimed at large and medium sized properties, benefiting the so-called "landowner agriculture". Since the 1990s however, the population whose subsistence depends on family agriculture has become the focus of governmental investments, through policies specifically aimed at the strengthening of this segment of the population. The importance of a full understanding of the environmental, historic, social, political and economic issues associated with this activity is also under debate, in order to better address the problems faced by this population and its extension.

In spite of the fact that policies have traditionally been aimed at large and medium-sized properties, as mentioned above, family farmers are very important in the Brazilian rural scenario, given their role in local sustainable development, and in generating new job and income opportunities for its population and adjacent groups. However, regardless of this new focus, there is still much to be

done, given the concentration of landownership, and extreme inequities among Brazilian regions. According to a study conducted by the National Institute for Colonization and Agrarian Reform (INCRA), and the United Nations Food and Agriculture Organization (FAO) in the year 2000, 85.2% of Brazilian rural properties engage in family agriculture, representing 30.5% of the total area used for agriculture. Family agriculture properties are responsible for 37.9% of the gross national agricultural production, but received only 25.3% of funding aimed at agriculture, according to data of the latest Brazilian Institute of Geography and Statistics (IBGE), conducted in 1996. In spite of the differences in the base years, these data serve as a reference to better understand the context in which the Program operates, whose results are evaluated in the study.

The Northeast Region concentrates the largest number of rural family agriculture properties (49.7%), which only represent 31.6% of the total area occupied with agricultural production. According to the above mentioned IBGE Census, the Northeastern farmers are responsible for 16.7% of the gross family farming production, and receive 14.3% of the rural financing earmarked for this category. The South receives 55% of the resources used for family agricultural production in Brazil, and concentrates 21.9% of the properties engaged in this type of agriculture – representing 18% of the total agricultural production area and 47.3% of the respective gross production.

The PAA was established in 2003 by the Federal Government, in an effort to structure policies aimed at alleviating hunger and poverty in the country. The program was conceived to strengthen Brazilian family agriculture, comprising a set of actions for the purchase of agricultural and livestock products, and their distribution among groups of individuals in situations of food insecurity.

Schmitt (2005, p. 83) pointed out that, by setting up purchase measures based on reference prices differentiated for family agriculture, the Program:

> "creates the necessary conditions so that the State may operate on the agricultural product market, not only to have a regulatory effect on regional prices, but also to treat family farmers differently, seeking to reinforce their autonomy with regard to 'intermediaries' and to strengthen their position before the different market agents."

The PAA is comprised of four modes of food acquisition: Direct Purchases from Family Agriculture (CDAF), Special Anticipated Purchases from Family Agriculture (CAEAF), Anticipated Purchases from Family Agriculture (CAAF), and Local Direct Purchases from Family Agriculture (CDLAF), outlined in Chart 1, below.

Chart 1: PAA Modes

Mode	Description/mechanism
Anticipated Purchases from Family Agriculture **(CAAFs)**	This mode anticipates funds for planting, for farmers considered eligible by the National Program for Strengthening Family Farming (Pronaf), groups A to D, including: agro-extractivists, quilombolas, agrarian reform settlers, families affected by dams, rural landless workers in camps, indigenous communities, and family producers in special conditions, not benefited by the cost credit nor necessarily organized in formal or informal groups. The products covered by these acquisitions include: rice, cashew nuts, Brazil nuts, manioc meal, beans, corn, and sorghum of the 2003/2004 and 2004 harvests. This mode of the program is operated by the National Company for Food Supply (Conab), agency of the Ministry of Agriculture, Livestock and Food Supply (MAPA).
Direct Purchases from Family Agriculture **(CDAFs)**	This mode allows farmers to sell food to the State, at reference prices (prices between the minimum price and the market price), which are calculated by a methodology developed by the Conab. These acquisitions are part of a strategy, aimed at supporting family agriculture, as well as at building strategic food reserves, in order to form stocks to provide basic food baskets to be distributed to people at nutritional risk. The products covered by these purchases include: rice, cashew nuts, Brazil nuts, manioc meal, beans, corn, and sorghum of the 2003/2004 and 2004 harvests, whole powdered milk, and flour. This mode is also run by the Conab.

Mode	Description/mechanism
Special Anticipated Purchases from Family Agriculture **(CAEAFs)**	Products of agricultural, livestock or extractivist origin are purchased, produced by family farmers, aimed at the forming of stock or for donations to people at nutritional risk, who are assisted by governmental or non-governmental social programs. Benefited producers must be organized in formal groups and meet the criteria established by the Program. In cases of simultaneous donations, the products must be delivered according to a schedule submitted along with the participation proposal. The social control of the donations shall be carried out be the Food and Nutritional Security Council (state or municipal) or similar agency. This mode is also run by the Conab.
Local Direct Purchases from Family Agriculture **(CDLAFs)**	Are aimed to promote the articulation between family farming and the local supplementary nutritional demands of social programs, through purchases of products sold by associations, cooperatives and informal farmers' groups, to be distributed at day care centers, hospitals, popular restaurants, and social assistance entities. Run by the Ministry of Social Development and Fight Against Hunger (MDS), through agreements with state and municipal governments.

Source: PAA Study (FUBRA, 2006)

PAA products are purchased through the National Company for Food Supply (Conab) for the CDAFs, CAEAFs and CAAFs; for the CDLAFs, the acquisitions are made through the states and municipalities with which the Ministry of Social Development and the Fight Against Hunger (MDS) has entered into agreements. The prices paid for the products may not surpass those practiced on the local/regional markets, and are determined by the Program managers on a regional level.

This comparative study aimed to observe the implementation and the results of the PAA with regard to family agriculture in the different contexts in the Brazilian South and Northeast. Research was conducted by public federal and state universities in the states studied, between November, 2005 and April, 2006.

This chapter is structured as follows: First, the methodology used by all the participating centers is described along with their respective results; subsequently, the profiles of beneficiaries in the South and North are outlined; lastly, the overall results of the qualitative studies conducted in the states of Paraná, Santa Catarina, Rio Grande do Sul, Bahia, Pernambuco and Rio Grande do Norte are presented.

3   Methodology

A comparative study was conducted on the implementation, impacts and sustainability of the PAA in the Northeast and South, focusing on the following aspects:

- :: effects generated by the PAA on the actors involved in the sale of family agriculture products;

- :: effects generated regarding the food security of recipients of food purchased by the PAA;

- :: the institutional design of the Program, focusing on optimizing the access family farmers have to local markets;

- :: the comparison of the results of the PAA on the local markets of both regions.

To achieve this, qualitative and quantitative research techniques were combined: secondary data were collected at executing agencies and local social organizations involved with the PAA, and primary information was obtained through questionnaires answered by the social actors involved, as well from semi-structured interviews conducted with other local actors.

3.1 Qualitative Research

The qualitative research was coordinated by a team of the University of Brasilia Foundation (FUBRA), with the collaboration of researchers from the following institutions located in the South and Northeast: Federal University of Rio Grande do Sul, Federal University of Santa Catarina, The Paraná Agronomic Institute, State University of Maringá, the Social and Economic Studies Superintendent of the state of Bahia, the Federal University of Rio Grande do Norte, as well as individual researchers.

The following actors involved in the Program were interviewed: federal, state and municipal managers, direct beneficiaries (producers and members of

institutions receiving food), indirect beneficiaries (shop owners, staff of official bank branch offices, day care centers and hospitals), members of municipal social control instances, official technical assistance and rural extension agencies, and financial institutions.

3.2 Quantitative Research

The Program's beneficiary and non-beneficiary questionnaires were applied by researchers under the coordination of FUBRA, responsible for research in the South, and by researchers oriented by the Luiz de Queiroz Agrarian Studies Foundation (FEALQ), responsible for research in the Northeast. The samples were defined according to different criteria for each region.

In the Northeast, due to the lack of information which would allow a random sampling of beneficiaries, three states were selected where the PAA was more active, and from these, the municipalities where operations were more intensive. The farmers who were not benefited by the Program were selected from or near the benefited farmers' communities.

In the South, it was decided that the questionnaires would be applied in all three states comprising the Region. The criterion used to determine the municipalities was proportion of family farmers benefited by the PAA of the total of family farmers in each municipality. Based on this criterion, the three municipalities with the highest proportion of benefited farmers in each state were chosen.

In order to determine the cases that met this criterion, data provided by the Conab and the MDS on the total number of beneficiaries were used, as well as the study "*Novo Retrato da Agricultura Familiar – o Brasil Redescoberto*" (New Portrayal of Family Agriculture – Brazil Rediscovered) to obtain the number of family farmers in the municipalities. In those cases where the percentage of family farmers exceeded 100% those who could not be attributed to any specificity were considered ineligible for the sample.

Considering the criteria adopted to define the sample, it is not statistically representative of those municipalities where the questionnaires were applied,

neither of the universe of farmers benefited, or of those who could be benefited by the Program.

The states and municipalities analyzed, and the number of beneficiaries and non-beneficiaries interviewed are listed in Table 1, below:

Table 1: States, number of municipalities, beneficiaries, and non-beneficiaries surveyed

State	Number of municipalities where interviews were conducted	Number of beneficiaries interviewed	Number of non-beneficiaries interviewed
Bahia	10	42	15
Pernambuco	12	61	17
Rio Grande do Norte	8	45	5
Paraná	3	85	38
Santa Catarina	3	61	15
Rio Grande do Sul	4	43	12
Total	**40**	**337**	**102**

Source: Prepared by the researchers, based on collected data

4   Comparison of the PAA in the Northeast and the South

In this section, a comparison is made of certain results obtained from the quantitative research of the Northeast and the South. Although the FEALQ collected information on six states in the Northeast, in this study only the three states in which the qualitative research was conducted were analyzed. This was done to establish a correspondence between the two approaches (quantitative/ qualitative), thus allowing a more realistic and precise comparison regarding the information collected, without the need of transversal interpretations of the data. Thus, the Northeastern states studied were: Bahia, Pernambuco and Rio Grande do Norte.

Table 2 presents the percentage of families receiving some type of cash transfer benefit from the Government. Nearly 70% of Northeastern beneficiaries interviewed declared receiving some benefit, as opposed to 37% in the South. Except for the question regarding other types of benefits, in all other income transfer categories - *Cartão Alimentação*, retirement pension, *Bolsa Cidadã*, *Bolsa Família*, pensions, Continuous Cash Benefit (BPC), Child Labor Eradication Program (PETI), *Bolsa Escola*, Gas Vouchers or other state program – a higher percentage was detected for the Northeast.

Table 2: Percentages of families receiving some type
of government income transfer benefit

Benefit	Selected Northeast states %	South %
Cartão Alimentação (Food Card Program)	8.1	0.0
Retirement benefits	16.2	11.0
Bolsa Cidadã (Citizen Grant Program)	3.3	0.0
Bolsa Família (Family Grant Program)	21.6	6.9
Pension	4.7	2.1
BPC	2.0	0.0
PETI	12.2	1.1
Bolsa Escola (School Grant Program)	14.8	9.0
Gas Vouchers	21.6	2.6
Other benefit	4.7	6.9
At least one benefit	70.3	37.0

Source: PAA Study (FUBRA, 2006)

The differences between the two regions are clearly discernible. Overall, it may be stated that beneficiaries interviewed in the South declared having better socioeconomic conditions than those in the Northeast. Initially, the revenue obtained from the properties' agricultural production was greater for beneficiaries in the South, as may be seen in Table 3. Only 3.7% of those interviewed in the South declared not receiving income from their agricultural production, while 29.7% of those interviewed in the northeast gave the same answer. In comparison with the Northeast, the South also presented a larger number of interviewees with monthly

incomes between R$ 1.00 a R$ 700.00, between R$ 1,051.00 and R$ 1,400.00, and a higher group earning R$ 3,001.00 or more. In the South, the incomes obtained from the properties predominated between R$ 1.00 and R$ 700.00, as stated by nearly 71% of family farmers, as opposed to 40% in the Northeast.

Table 3: Percentages of interviewees according to the average level of agricultural production income of the property (in *reais* – R$)

	Northeast %	South %
No income	29.7	3.7
1 to 350	27.0	52.1
351 to 700	12.8	18.6
701 to 1050	12.8	8.0
1051 to 1400	2.0	3.7
1401 to 3000	12.2	9.6
More than 3001	3.4	4.3
Total	**100.0**	**100.0**

Source: PAA Study (FUBRA, 2006)

The average revenue increase in the PAA was greater among interviewees in the Northeast that those in the South. For the former, this increase was nearly R$ 327.28, and for the latter, R$ 96.51 (Table 4). The difference between the two values may be explained by the situation of poverty in the Northeast, which increases the impact of an increase in income provided by the Program.

Table 4: Beneficiaries – average increase in income after participation in the PAA

R$	Selected Northeast states	South
Average	327.28	96.51

Source: PAA Study (FUBRA, 2006)

The Program was positively evaluated for most of interviewees in both regions. Nearly 88% of those in the Northeast, and 98% in the South, considered the PAA good or very good, as shown in Table 5.

Table 5: Opinion of interviewees regarding the PAA

Opinion	Selected Northeast states %	South %
Very good	21.4	27.0
Good	67.3	71.4
Bad	8.8	1.1
Very bad	2.4	0.5
Total	**100.0**	**100.0**

The existence of a municipal council or of groups of individuals responsible for the monitoring of the Program was another important issue analyzed, and the results obtained for the South were higher than for the Northeast. In the former, 56% of interviewees stated having a council for this end; in the latter, only 24% of family farmers confirmed the existence of a councils of this nature (Table 6).

Table 6: Municipal council (group of individuals) responsible for Program monitoring

Existence	Selected Northeast states %	South %
Yes	24.3	56.1
No	75.7	43.9
Total	**100.0**	**100.0**

Regarding land ownership, the results were as follows: 76% of family farmers benefited by the PAA residing in the South declared being owners of the land where they produced; in the Northeast, this rate is only 30% (Table 7).

Table 7: Ownership of the productive property

Owned	Selected Northeast states %	South %
Yes	30.4	76.2
No	69.6	23.8
Total	**100.0**	**100.0**

Most of the family farmers interviewed in the Northeast (62.5%) live or work on properties of up to 10 hectares, while in the South, these properties range between 20 and 50 hectares (Table 8). Family farmers interviewed in the South had a more equal distribution in the first three property size groups (Table 8) than those in the Northeast. Observing both distributions, it may be inferred that farmers in the South are more homogenously distributed than those in the Northeast, and very few of the latter declared belonging to the larger property groups.

However, when inquired about the size of the area used for planting, most, in both regions, stated using less than 10 hectares for this activity. The second smallest area range was the second most cited by interviewees in both regions. The sum of these two groups reached 94.3% in the Northeast, and 92.6% in the South, indicating, as expected, the predominance of small plots for planting.

Table 8: Percentage distribution of the total land size and the area used for planting, in hectares, of PAA beneficiaries in the Northeast and South

Hectares	Total land size		Land area used for planting	
	Selected Northeast states	South	Selected Northeast states	South
Under 10	62.5	35.4	85.1	63.5
10 to 20	17.4	23.3	9.2	29.1
20 to 50	11.8	38.1	2.8	6.9
50 to 100	6.3	3.2	2.1	0.5
Over 100	2.1	0.0	0.7	0.0
Total	**100.0**	**100.0**	**100.0**	**100.0**

Source: PAA Study (FUBRA, 2006)

The impacts of the Program on production also differed between the regions, as may be seen in Table 9. After joining the PAA farmers in the Northeast (37.2%) started producing new products more than in the South (26.5%).

When questioned whether the increase in production was a result of the Program, the family farmers in both regions responded positively, with similar percentages: 43.2% in the Northeast, and 41.8%, in the South.

The changes in relations with consumers were greater among farmers in the South than in the Northeast, 51.9% and 35.1%, respectively.

Table 9: Consequences of the PAA

		Selected Northeast states %	South %
Are you producing new products?	Yes	37.2	26.5
	No	62.8	73.5
	Total	**100.0**	**100.0**
Did your production increase?	Yes	43.2	41.8
	No	56.8	58.2
	Total	**100.0**	**100.0**
Did your commercial relations change?	Yes	35.1	51.9
	No	64.9	48.1
	Total	**100.0**	**100.0**

Source: PAA Study (FUBRA, 2006)

The use of more technology was also investigated. Table 10 shows the percentages of interviewees who adopted different technology after joining the PAA. Overall, there was not a massive increase in the use of more technology in either region. The farmers in the South used more technical assistance and fertilizer than in those in the Northeast; with regard to organic agriculture, implements, machines, irrigation and other types of technology, it was the opposite.

Table 10: Percentage of interviewees using more
technology after participating in the PAA

Technology	Selected Northeast states %	South %
Technical assistance	12.8	18.5
Fertilizer	19.6	29.6
Machinery/equipment	27.7	21.7
Irrigation	11.5	1.6
Organic agriculture	18.2	11.6
Other types of technology	22.3	9.5

Source: PAA Study (FUBRA, 2006)

Transportation of the goods was another important aspect of the Program. Table 11 shows the percentages of interviewees using transportation and the respective type, during the previous month. Family farmers in the South used their own individual or collective transportation more frequently than those in the Northeast, possibly reflecting the better social and economic status and collective organization of the former as compared with the latter (as mentioned above).

Table 11: Type of transportation used in the last month (%)

	Selected Northeast states %	South %
Own individual	8.7	15.4
Own collective	4.7	22.7
Hired	27.0	20.6
Provided by municipal govt.	2.7	0.0
Provided by state govt.	0.7	0.0
Provided by federal govt.	2.0	0.0
Other	11.5	0.0

Source: PAA Study (FUBRA, 2006)

In verifying the benefited family farmers interviewed, it was perceived that there was a larger proportion of farmers in the South choosing to join the Program in a collective manner, either through associations, cooperatives or informal groups, more than in the Northeast. While 85.2% of farmers in the South joined the PAA through some sort of social group, only 44.6% of farmers in the Northeast did so (Table 12). Two factors particularly contributed to explain this difference: the landowning structure and the collective organizations in both regions.

Table 12: Form of participation in the Program

	Selected Northeast states %	South %
Individual	55.4	14.8
Collective	44.6	85.2
Total	**100.0**	**100.0**

Source: PAA Study (FUBRA, 2006)

The manner by which both regional territories were historically occupied has favored more collective organizations in the South. Occupation there is relatively more recent and is based on family agriculture introduced by European immigrants. In the Northeast, large and highly concentrated properties prevailed in the Region for a long time (where there are still strong roots and examples) where access by small farmers was limited.

5   Qualitative Analysis of the South and Northeast

The results of the study pointed out that, in spite of the differences verified in the family agriculture practiced in the Southern and Northeastern regions of the country and of minor differences observed regarding the implementation of the PAA, the difficulties identified and the impacts generated may be generalized for both regions.

In all the states surveyed, the PAA promoted the creation of favorable sales channels for family agriculture, increasing income and insertion on local markets. Particularly with regard to the CAEAFs and CDLAFs, positive results were perceived, both from a family agriculture perspective, as well as for the food security of populations at risk.

These results were observed even in spite of these programs, given that farmers would be potentially benefited if they were better organized and could count on better production conditions. These two programs allowed several institutions, benefited by the Program's donations, to improve their nutritional quality and diversity, and to save funds that could be used to expand or improve the services provided.

The Program modes mentioned above, where production is destined to institutions such as schools, day care centers, hospitals, popular restaurants etc., the Program also plays an important structuring role which increases the chances of sustainability in the long run. This was observed in locations where the food

was delivered directly at the institutions by the farmers themselves, without the intermediation of municipal governments or any other private or public entity.

The bringing together of farmers and institutions was perceived in municipalities in the states of Paraná, Santa Catarina and Pernambuco. In these locations, there was a manifestation of interest in the direct acquisition from family farmers, regardless of the continuity of the Program.

However, the results indicated that there were certain problems faced by the direct delivery of food to the end users. Transportation problems affected farmers benefited by all modes of the Program, with regard to the payment of freight – as in the state of Paraná –, or in the actual transportation itself – as was the case in Bahia.

Some of the problems faced in implementing the PAA concerned the delays in disbursement of funds, and the lack or insufficient provision of technical assistance, especially for the more needy farmers, the settlers. Although technical assistance is a problem for practically all PAA beneficiaries, the settlers are the most affected, for having the worst production conditions. Above all for the CAAFs[4], which presented the highest number financial and economic performance problems, the lack of technical assistance and the delays in fund disbursement were determinants in the loss of harvests and in defaults.

Another problem detected in this program was access to insurance, the Program to Guarantee Agricultural Activity (Proagro), due to the lack of information and experience of the farmers, as well as to faulty assistance by the financial agent, the *Banco do Brasil* (BB)[5].

Concerning the dissemination of the Program, problems were detected ranging from the calls for proposals to their actual functioning. Especially with regard to the programs implemented by the Conab, farmers and implementing agencies were quite distant.

Lastly, the participation of all PAA social control instances and councils are analyzed. According to the results, with the exception of the state of Santa Catarina

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4   The CAAFs were the mode that presented the worst results, due to harvest losses and subsequent defaults on loads. Of all the modes of the PAA, had it not been discontinued, this one would need the most improvement.

5   Bank of Brazil.

– where the Food Security and Local Development Consortium (Consad) played an active role in the execution of the Program -, in all other locations, when the existence of some council was mentioned, its participation was not effective, since the large majority of farmers were unaware of their existence, or did not know how they functioned.

In the following section, a more detailed analysis shall be made of the PAA implementation results for the states surveyed in the South and Northeast.

5.1 The South

5.1.1 Paraná

In the state of Paraná, the municipalities surveyed were Querência do Norte[6], Imbau[7] and Cerro Azul[8], locations where family agriculture has been predominant, but where land ownership concentration has recently increased. In this state, the PAA is operated by two entities: the Conab and the SETP, the latter being the Program's state managing agency for the CDLAFs.

In the first two municipalities, the great majority of PAA beneficiaries were agrarian reform settlers, through the CAAFs and CAEAFs. As of 2005, the municipality of Querência do Norte joined the CDLAFs. In Cerro Azul, the PAA was implemented by the State Labor, Employment and Social Promotion Secretariat (SETP), with the support of the respective municipal government and social action secretariats.

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6   Querência do Norte is located in the northeast of the state Paraná and has a population of 10,597 inhabitants. According to the 1995/96 Agricultural Census, 33.1% of establishments are of family farmers, of which 16.1% belong to the "almost no income" group, with 4.1% of the area; landowner agriculture occupies 19.4 % of properties, with 59,695 hectares (81.2% of the total area). In the last 20 years, this municipality's land occupation structure has changed dramatically, due to the agrarian reform settlements in large properties.

7   Imbau was created in 1997, formerly being part of Telêmaco Borba. The municipality is mainly characterized by family farms. The family members encompass 89.1% of establishments, 57.8% of the total area, 88% employed individuals, and 49.8% of the gross production value sold.

8   Cerro Azul is characterized by the predominance of family farms (family member and family employer). Of the total of family farmers, noteworthy are those who conduct their activities exclusively with members of the family.

An analysis of the evolution of the PAA in the state of Paraná, with regard to the entities responsible for its implementation indicated that, between 2003 and 2005, participation increased, currently reaching 75% of the total value of resources destined to proposing entities under its responsibility. The Program now includes 47.4% of the state's municipalities, in both agriculturally advanced regions, as well as in areas where the geography, fertility, and technical and economic resources are limited. The total number of farmers benefited by the PAA between 2003 and 2005, including those modes overseen by the Conab and SETP, represents only 3% of the total number of potential farmers who are eligible for the National Program for Strengthening Family Farming (Pronaf), according to Doretto *et al.* (2001).

Conab is present in 96 municipalities, executes 67.8% of the projects, and assists 53.9% of the state's benefited farmers. On the other end, SETP distributes food to 59.3% of the benefited entities, which directly assist 70.8% of the state's individual beneficiaries with donated food.

In the food donation studies, there was evidence that a considerable amount of food produced for the PAA, in the municipalities of Querência do Norte and Cerro Azul, is donated directly to institutions such as day care centers, schools, hospitals etc. In Imbau, the production of corn, beans and wheat purchased through the CAAFs, should have been delivered directly to the Conab, which would then distribute it. However, due to the payment delays, the beans and corn were planted after the recommended period, which provoked a total loss of production. Wheat, which had never been planted by farmers, was affect by the drought. With the total loss of production, the BB was called, through the Proagro, which refused to grant coverage for six months.

The recipient institutions unanimously gave the PAA a positive evaluation. In Querência do Norte, half the production was donated to municipal entities, and the rest were used to form stocks, which were later transformed into benefited rice and delivered to the Conab in Apucarana.

Schools, and the Association of Parents and Friends of Disabled Persons (APAE) receiving food declared the PAA increased food quality and availability, and delivered the food regularly. For the mayor of Querência do Norte, the Program

positive points are: cheaper school meals, strengthening of family agriculture, elimination of intermediaries, and the stimulation of the local economy. Other neighboring mayors, such as in Floresta and Umuarama, pointed out that if their municipalities were cut from the Program, the city halls would make all efforts to ensure the continuity of similar actions, thus demonstrating the potential sustainability of the PAA.

In Cerro Azul, the receiving institutions were also highly satisfied by the direct supplying if food from the family farmers. They stated that if the PAA donations were to cease, they would also be willing to purchase directly from the farmers, through some other source of funding.

With regard to the councils, it was observed that in Querência do Norte there is a *Fome Zero* (Zero Hunger) managing council comprised of eight members, but which is not very active. The Cerro Azul Council was positively evaluated by those interviewed, since the food acquisitions and the supervision of how funds are spent are conducted by individuals at locations where the Program is being executed.

Another important result to be pointed out regards the knowledge farmers had of the existence of the councils, as well as of the councils' supervision of Program in the municipality. The answers provided by PAA beneficiaries and non-beneficiaries indicated that more than 90% did not know what a council did, and more than half did not even know they existed.

For the interviewees, the success of the PAA depended on the proximity between farmers and entities through partnerships, regardless of the political stances of the members of the entities. Although the Program was open to all entities in the municipalities eligible to receive food, information provided indicated that most of these entities were unable to provide the necessary documentation. The inclusion of entities was considered positive because there was an increase in the demand for products, which led to an expansion in production, with regard to both the agro-industry itself as well as for products destined to self-consumption. In the state of Paraná, the agro-industry has been receiving production incentives for some time; but in Cerro Azul, it was through the PAA that there was more interest in agricultural products transformed into bread, crackers, brown sugar, molasses and sweets.

In Imbau, where the PAA was apparently less successful, public technical assistance was considered inadequate, making it difficult for farmers, both agrarian reform settlers as well as all other farmers in the municipality, to engage in agricultural activities[9]. Besides, the farmers stated that the PAA was not divulged in the municipality, which limited the expansion of the Program, due to the insufficient time to prepare proposals. In spite of the difficulties, they were emphatic in stating the market guarantee for the products was fundamental, ensuring a steady flow of income.

In Cerro Azul, it was also perceived that local public technical assistance was unable to provide assistance to the universe of family farmers in the municipality, given the reduced technical staff and the precarious communication between the proposing entity and the farmers. As in Imbau, there were also delays in payments. Another aspect in the case of Cerro Azul regarded the transportation of production to the entities, which was predominantly done through the payment of high freight fees.

The main difficulties pointed out by farmers with regard to participation in the PAA were: the lack of documents, followed by the products' quality requirements, and the production quantities to be delivered. As expected, these difficulties were more evident among benefited farmers without the Pronaf: 82% stated that documentation was the biggest problem, while 50% indicated that the quality of the products was one of the main problems. This may be attributed to the fact that farmers not covered by the Pronaf, as well as non-beneficiaries, found it more difficult to obtain the necessary documentation, and did not have much experience in dealing with financial institutions to obtain credit for their production units.

Concerning the results observed regarding the implementation of the PAA, most farmers stated that their incomes had increased. The farmers who most benefited from the Program were those who were not covered by the Pronaf, whose incomes increased 43%, although their income bracket was mostly (82%) under one minimum salary. On the other hand, the agricultural incomes of PAA beneficiaries covered by the Pronaf, in the one to three minimum salary bracket, increased 25%.

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9   Of the individuals interviewed in the municipalities surveyed, two-thirds of benefited farmers reside in agrarian reform settlements; non-benefited farmers represent 74% of the total.

Also verified was a large income disparity between PAA beneficiaries and non-beneficiaries; the majority of the latter (95%) had incomes of one minimum salary.

5.1.2 Santa Catarina

In Santa Catarina, the municipalities surveyed were: Dionísio Cerqueira, Guaraciaba and São Miguel do Oeste. The municipalities were chosen considering their geographic proximity, since the aim was to evaluate the impacts of the Program for a group of municipalities integrating the same geographic micro-region, with similar economic, social and cultural characteristics. These municipalities are located in the extreme west of the state, where family agriculture is the predominant economic activity. Since the 1990s, this micro-region is a location of populational emigration. Even in more structured municipalities, such as São Miguel do Oeste, there has a been a reduction in the total population, due to migration to other regions, to ensure their social reproduction.

The extreme west of the state of Santa Catarina is known for a historic process with the reduction of the land ownership concentration. The region is characterized by the predominance of small properties and production units. This region has one of the state's best land ownership distributions.

As in the state of Paraná, in Santa Catarina the PAA was implemented not only by the Conab, but also by the state and municipal governments that entered into agreements with the MDS. There were payment delays with regard to the CDLAFs by the state government. In November, 2005, for example, concrete actions agreed upon between the MDS and the Santa Catarina state government at the end of 2004 had yet to implemented. On a municipal level, where the CDLAFs are made through an agreement with the MDS, the results were varied. However, the involvement of municipal governments increased significantly as of 2003, especially those in the west, where family agriculture predominates. In the municipality of São Miguel do Oeste, the study concentrated only on the mode operated by the Conab, since the CDLAFs had not yet been initiated, in spite of the agreement with the MDS having been signed. In the other two municipalities, the PAA was being operated by both the local administrations and the Conab.

The Program was divulged in the municipalities of Dionísio Cerqueira and Guaraciaba through radio programs, newspapers, meetings with community leaders, meetings between municipal agencies and local businesses and entities, as well as by direct notices made to the public at large. The local National Council on Food and Nutrition Segurity (Consea) also helped implement the program in Guaraciaba, with the direct participation of local farmers' associations.

In Dionísio Cerqueira, a local steering committee was set up, which dealt directly with all entities and public agencies involved in the Program. In this process, the local administration considered that the institutional arrangement was satisfactory, but that the level of awareness of farmers with regard to how the PAA operates, and its conditions, need improvement.

The following criteria were followed to consider the eligibility of farmers: individual production capacity, be organized in groups, and recognized as family farmers, according to the Pronaf norms. This study indicated that in Dionísio Cerqueira, 25% of participants are agrarian reform settlers, the rest being family farmers organized in groups. Two characteristics were evident for the two groups: low levels of income, and small properties.

Interviews with farmers indicated that the PAA purchased the following products in that municipality: milk, manioc, sweet potato, beans, corn meal, sweets, honey etc. Products were transported by the farmers and by the Municipal Administration Secretary. The products were not stored; they were simultaneously passed on to social entities registered at the local municipal government, especially municipal schools, day care centers, hospitals, and municipal social assistance agencies to meet the needs of a local program called *Casa da Família*.

The products purchased in Guaraciaba included milk, eggs, beans, rice, wheat meal, sugar and meats. These products were transported by the farmers' associations, which were delivered directly to the registered social entities, especially municipal schools (school lunches), hospitals, the APAE, and low income families assisted by the municipal government.

The following entities were benefited by the PAA food in all the municipalities surveyed: schools, hospitals, day care centers and a recycling association. These

entities evaluated the importance of the Program, and pointed out the following benefits: the variety of products, the improved quality, the savings, the expansion of assistance, and better integration with producers' organizations which allowed the direct acquisitions from the producers.

In both Santa Catarina and Paraná, the PAA plays an important social role by stimulating the direct supplying of food to consumers, as well as by creating bonds between people and social entities, strengthening their role in those communities.

The main problems mentioned in Dionísio Cerqueira were, for the municipal government, the difficulty in transporting the production to a specific warehouse if the Program were to be expanded, and for the farmers, it was the difficulties in production, since most of them do not have the conditions nor the capital to produce all year round. In Guaraciaba, a difficulty faced by the municipal administrations was the lack of qualified personnel to coordinate the Programs actions.

Although the municipal CDLAFs in São Miguel do Oeste are still in an implementation phase, there was a certain degree of social articulation with regard to the Program, which is expected to aid its implementation. Major roles were played by family farming workers union, and the Consad.

There was a predominance of CAEAF beneficiaries among the interviewees, strongly concentrated in group D, according to Pronaf criteria. This category is comprised of farmers who are better positioned in the region's family farming context. Most interviewees (82%) were also eligible for the Pronaf credit lines, indicating the complementarity between public credit and commercial policies in the state.

Regarding production, several aspects were mentioned. The first was that the product basket purchased by the PAA must meet two basic criteria: the products must be easily distributed and meet regional eating habits. It was thus detected that rice, corn, beans, mil, honey, crackers, fruit and vegetables predominated in the simultaneous acquisitions and donations. The second aspect is associated with products considered potentially purchasable, but that were not included in the Program. For example, processed products and animal products were excluded, due to sanitary problems. Quality control is performed by the recipient agencies, who reserve the right to reject products.

On the state level, the Program's management is centralized at the Conab Superintendence, and the Program's development is monitored through monthly reports which identify the stage of development of each project. In addition, supervision visits are made to those municipalities that face difficulties in executing the required actions. In these cases, the institution is supported by local Program articulators, normally managing committees and food security committees.

Regarding the Program's impact on the local level, certain aspects stood out, all related to the overall participation process: first, both family farmers and benefited entities were strongly involved in the Program. For the farmers, besides their production not being lost, had an additional sales possibility, potential increasing their income. For the social entities, most facing financial difficulties, the Program helped them save money as well as improve the quantity and quality of the food provided. Second, the Program was apparently able to stimulate local councils to become more involved with public policies. Besides more budget and financial scrutiny, the entities actively discussed mechanisms that could help promote programs of this nature. Third, the administrations were also more involved, especial in the CAEAFs, because of the relevant social role played by PAA. In other words, if the Program did not exist, some other type of social action would have to be implemented, to assist families at nutritional risk. Lastly, the local population has been supportive of the Program, and has requested that it continue, regardless of whoever is in change of the federal government.

One of the aspects most mentioned by the farmers and their associations was the possibility of getting together to plan part of the production, from a local perspective. Local demand was considered in stimulating the production of several types of product not called for by the production units' activity plans. In addition, the farmers assumed the commitment to provide food on a regular basis to the local registered entities, which in turn stimulates them to adopt clear production strategies.

However, the absence of involvement by state agencies was evident, especially the Santa Catarina Rural Extension and Agricultural Research Company (EPAGRI). This company is responsible for family farmer technical assistance and research, and has branch offices in all the municipalities in the state. Their participation in local discussions could have contributed to improve product supplies, and to better coordinate the Program's medium term planning.

This is an issue that must be considered in evaluating the PAA in each location, considering that the regular delivery of food products was one of Program's main problems.

The state government, which was readily willing to sign an agreement with the MDS, was not so willing to implement the actions under its responsibility. By the end of 2005, practically none of the activities to be executed by the state agencies had been implemented, except for the transfer of funds to the Consad in the west, so that the PAA could be executed by the municipalities under its jurisdiction.

In those municipalities where there were organized social movements, and where there was a tradition of democratic dialogue between public agencies and administrations and these movements, the process was a more harmonious one, which stimulated local participation, especially workers' unions and family farmer associations.

Worth mentioning is the important role played by the Consad in the west, and by the local Conseas, with regard to Program implementation in all the municipalities studied. These institutions were quite efficient in establishing links and mediating the interests of the actors involved, especially civil society entities and local public administrations.

5.1.3 Rio Grande do Sul

São Lourenço do Sul[10], Pelotas[11], Tapes and Caxias do Sul were the municipalities chosen for the evaluation of the Program in the state of Rio Grande do Sul. While the first two are characterized by small rural properties, in Tapes, it was the opposite: 53% of the rural properties were over 50 hectares, representing 96.4% of the area of the municipality[12]. Caxias do Sul has an

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10 São Lourenço do Sul is one of the region's largest producers of rice, potatoes, beans, tobacco, corn, and other crops, as well as cattle raising and diary production.

11 In Pelotas, a city neighboring São Lourenço do Sul, the agricultural production transformation industry, the production of rice, beans, tobacco, corn, peaches, and dairy production are the main economic activities. São Lourenço do Sul and Pelotas are characterized by the small and medium sized properties, as a result of their history and environmental characteristics.

12 According to the 1995/96 Agricultural Census, São Lourenço do Sul, 90% of the agricultural establishment were under 50 hectares (3,568 establishments) and comprised an average area of approximately 41.69 hectares. In Pelotas, approximately 93% of agricultural establishments are under 50 hectares (3,844 establishments).

intermediate property structure: 61.73% of the 3,930 rural properties are under 20 hectares, and 12.67% are equal to or greater than 50 hectares[13].

The survey of the municipalities of São Lourenço do Sul e Pelotas, Tapes and Caxias do Sul has mapped out the PAA operational process in the state of Rio Grande do Sul. This survey indicates that the Program assumed three distinct operational formats: the first, in São Lourenço do Sul e Pelotas, mediated by the Conab's Regional Superintendence, the Small Farmers Mixed Cooperative of the South (Coopar São Lourenço do Sul), and the Non-Governmental Organization (NGO) called the Small Farmer Support Center (CAPA), of the city of Pelotas, the last two playing important roles in the operations of the PAA. The second format, the case of Tapes, is a direct relation between the Conab's Regional Superintendence and the beneficiaries. The third and last format, the case of Caxias do Sul, is the result of a direct relation between the MDS and the benefited municipality.

In São Lourenço do Sul, CAEAFs were made to form stocks and for simultaneous donations (DS). For the first, benefited farmers sell their production to the Cooperative, which has a direct relation with the Conab, and farmers are not fully aware of the Program. The CAEAF-DS initiative is coordinated by the Municipal Government of Pelotas.[14] The farmers' main complaint with regard to these acquisitions was the delays in payments. According to the farmers, these delays hamper the availability of products determined by the previously defined schedule. It was stated that the great majority of beneficiaries did not have enough funds to ensure the planting of the products to be sold. As a result, many do not plant, and thus do not sell, in spite of the price and acquisition guarantees. In simultaneous donations, farmer participation in the PAA is greater.

Another problem was verified in these acquisitions, when products are collected or delivered. Most cases are highly perishable fruit and vegetables, and any delivery delays incur considerable losses. Delivery and payment delays mean losses for many farmers, and doubts are cast on the Program.

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13 Land concentration is related to productive activities, such as: irrigated rice and extensive livestock raising. The municipality is known for dairy cattle, and manioc production. Caxias do Sul is one of the South's largest economies, known for its wine production, and as well as for its metal-mechanics industry. Its agriculture is strong in poultry production, and the growing of legumes, grapes, tomatoes, and apples.
14 Farmers from São Lourenço do Sul, Pelotas and Canguçu participated in the CAEAFs DS.

In the opinion of the Pelotas Municipal Rural Development Secretary, the institutional design of the PAA is satisfactory. The Secretary pointed out that functioning of the PAA requires articulation among the various actors, a type of articulation that most municipal governments do not have. The involvement of entities, associations, and NGOs is fundamental. Without the action of these civil society entities, it is very difficult to link the production of food with the respective consumption.

All farmers interviewed in São Lourenço do Sul obtained information on the Program from the Cooperative. From the Cooperative's perspective, through the PAA it was possible to ensure reasonable prices for products, to restructure activities, to strengthen a name for their products, and enter other non-intuitional markets.

In both the CAEAFs in São Lourenço do Sul and Pelotas and the CDLAFs of Caxias do Sul, the main difficulties faced by farmers in joining the PAA were the required documentation and the quality of the products.

There were PAA payment delays also in Caxias do Sul, where the Program was effectively executed for three months. Several differences were observed in relation to the other interviewees, due to the direct involvement of the municipal government in the implementation of the CDLAFs, and to the profile of the benefited farmers. According to the interviewees, during the months the simultaneous donations took place, payments were delayed, and there was not enough time for the supplying farmers to organize themselves in a more adequate manner. This provoked problems in product management, for certain food items were not available at delivery time.

In this municipality, there were interruptions in the acquisitions, and farmers' expectations were not met. Another issue mentioned by the farmers was the lack of information regarding the PAA, which generated doubts.

In Caxias do Sul, the Program's public was heterogeneous, including both family farmers and agrarian reform settlers. However, the PAA mostly benefited farmers who already participated on the market, in open-air markets in the city.[15] The public participating in this study participated in the Program during its short duration.

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15 The diversity of PAA beneficiaries in Caxias do Sul is reflected by the distribution of its agricultural income: 58%, greater than three minimum salaries; 25%, between one and three; 17%, up to one minimum salary.

Despite the difficulties, the perception of the PAA managers in Caxias do Sul is that the Program is important to complement the initiatives previously implemented in the municipality, regarding food supplies and social assistance. It appears to clear in the minds of the farmers that the Program treats them differently, due to the heterogeneous effects. Settlers in the municipality are treated differently than the rest, since the Program represents a means of strengthening commercial ties, and of establishing themselves as producer on the local market.

In Tapes, the PAA benefited a small number of agrarian reform settlers which, to a certain extent, produced a positive effect upon the results of the Program. The Program was responsible for a series of actions, both direct and indirect, that prepared this small group for their insertion on the market[16]. An interesting aspect is that the municipal government had no participation in the project, and many members of the municipal government did not even know of the existence of the PAA in the municipality. There was a direct relation between the Conab in the state of Rio Grande do Sul, through the Rural Landless Workers' Movement.

Regarding the donated food, in the city of Pelotas payment and food delivery interruptions meant that much of the food was thrown away, for being inadequate for human consumption. The interruption in product delivery, due to bureaucratic and even political reasons, strongly affected the desire of farmers to participate in the Program, and had a negative effect on its credibility. The suspension of food acquisitions, after the new government took office, was believed to be, by the farmers, to political issues regarding the continuity of the Program. The Pelotas Municipal Government provides strong support to the Program, transporting, receiving and distributing the food.

For the entities benefited by the donations, the discontinuity of product delivery provoked dissatisfaction. The Program was considered good, for it allowed them to increase the offering and the quality of the meals offered at schools. The entities did not have much information regarding the institutional design of the PAA *per se*, since many of the entities were already involved in food

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16   According to the sample used in this study, in the municipality of Tapes (Lagoa do Junco settlement) the results of the PAA were very positive: 91% of interviewees stated having had an increase in the agricultural income after joining the Program. According to those interviewed, the average agricultural income was approximately R$ 284.00, reached R$ 350.00 after the PAA, an increase of 23%.

distribution, even before the Program. It must be pointed out that the Pelotas municipal government also had a similar food donation program in which many entities were involved. These then joined the PAA. Thus, the CAEAFs and their similar donations supported previously developed hunger alleviation actions.

Food is delivered directly by farmers at a distribution center run by the Pelotas municipal government, from where they are transferred to the municipal schools. Certain aspects stood out with regard to this centralized form of distribution, one of which was the discrepancies between the quantities delivered and those identified in the food delivery statement. Occasionally, the volumes of food received were lower and of poorer quality, or they were old or damaged during transport, as a result of food misappropriations.

This problem could be lessened if family farmers were to deliver their production directly to the benefited entities, bringing producers and end users closer together, which would also act as a social control mechanism (possibly quality). This relation may also promote the exchange of experiences, and the valuing of family farm workers given their recognized social status as food producers.

Another indirect result of the Program, according to the statements made by the members of the entities surveyed, was the starting of handicrafts workshops among members of family benefited by basic food baskets, aimed at stimulating the creation of alternative sources of income.

In Pelotas, the emancipation perspectives of the CAEAF-DS farmers in relation to the PAA are not good. However, the progress made in production and family organization, and consequently in family income, must not be downplayed. Other prospects are still incipient.

In Caxias do Sul, the results are preliminary and difficult to measure because the program only lasted three months. The products were sugar beets, carrots, cabbage, crackers, onions, beans, radishes, arugula, cornmeal, oranges, apples, honey, eggs, cheese and tangerines.

Certain important aspects were noticed during the visits: all the entities pointed out the improvement in the quality and quantity of the food delivered by the PAA, and stressed that the Program was important to increase their coverage,

assisting more families and individuals. The perception is that, with the PAA, entities would have the support to expand into areas other than nutrition, such as: education, vocational training, family planning. As in Pelotas, no link was established between the farmers and the entities, since when the PAA terminated its activities, all the entities returned to the previous system to obtain food, or abandoned their activities in this area.

5.2 Analysis of the Northeast

5.2.1 Bahia

In the state of Bahia, three municipalities were selected for the survey: Boa Vista do Tupim, Tapiramutá and Vitória da Conquista. Information regarding access to the PAA and the Program types implemented in the each municipality, and the number of family farmers were used in the selection. The selected municipalities were covered by the following programs: Boa Vista do Tupim - CAAFs, 2003-2004; Tapiramutá - CDAFs, 2004, and Vitória da Conquista - CAAFs and CDLAFs, both in 2004. In these municipalities, family farming plays an important role with regard to various aspects (i.e., availability of jobs to prevent migration), although production occupies a small portion of the cultivated area, which is justified by the concentration of land[17].

In Boa Vista do Tupim, traditional crops predominate: manioc, beans, corn and *mamona*. The municipality has 28 producer associations, 13 of which are agrarian reform settlements. In Tapiramutá, land concentration is high, and are largely used to raise dairy cattle.

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17 Boa Vista do Tupim comprises 901 family properties, representing 75.8% of the total agricultural area, according to INCRA/FAO (2000). The landowner properties represent only 23% of the total (274), but comprise 79.3% of the area (172,243 hectares), denoting the high concentration of lands in the municipality. The family properties comprise 44,620 hectares or 20.5% of the total. Tapiramutá has 542 of this type of property, representing 75.1% of the total (INCRA/FAO, 2000). The landowner properties represent 24.8%, totaling 179. This small number of landowner properties comprises most of the total area. Of this total (48,567 hectares), 74.8% belong to landowners (36,603 hectares) while only 24.2% (11,738 hectares) is used for family agriculture. In Vitória da Conquista the total number of rural establishments in the municipality reached 2.606, of which 1,886 are of family farmers, corresponding to 71.6% of the total number of establishments. The landowner properties reached 658 establishments, representing 25.2% of the total. The land structure is again reflected here: in spite of the small number of landowner properties, these consist of 71.4% of the total area (132,968 hectares). Family properties occupy only 28.6% of the total area (53,335 hectares).

In Vitória da Conquista, it spite of the growth in third sector activities, agriculture is an important activity. The municipality is known for its coffee production, which was the main economic activity during the 1970s.

In the state of Bahia, nearly 67% of the Program's beneficiaries reside in agrarian reform settlements, whose average number of years living and working in the field was high. The non-benefited farmers are all agrarian reform settlers, but whose average number of years of residence in the municipality was higher, in comparison with the beneficiaries.

In the three municipalities surveyed, Program awareness was higher in those cases where the municipal government was behind the initiative. In Boa Vista do Tupim, the lack of information could possibly be considered an obstacle toward the expansion of the actions; actors linked to the local government were not well informed on the Program's operations[18]. A lack of information was also detected in the interviews with representatives of the financial institutions (BB and the *Banco do Nordeste do Brasil*[19] – BNB, with the local technician of the Agricultural Development Company of the state of Bahia (EBDA), and with the actor linked to the municipality's Food Distribution Center. Program awareness was also low among local eligible entities.

It must be pointed out, however, that there was a municipal initiative similar to the PAA. According to information of the Director of Agriculture, a family agriculture support group was being created in the municipality, where products are bought from the associations to ensure their sale, and other alternatives are sought. The BNB and the BB support the project, and provide funding for the project. The municipality currently buys the production of one of the associations – the *Nova Alvorada* association – and channels it to school lunches.

The dialogue among the various institutions and actors eligible for the PAA in Boa Vista do Tupim was precarious. The actions related with the CAAFs included only the Conab and the actors directly linked to it; the other actors had little knowledge of the Program. On the other hand, municipal initiatives

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18 With the exception of the Social Assistance Secretary, due to the Milk Program. This program however was not an object of this study.
19 Bank of Northeastern Brazil

similar to the PAA may be incentives towards program integration, stimulation the involvement of the other local actors. This favor the dissemination of the PAA and of its modes in the municipality.

As opposed to what was observed in Boa Vista do Tupim, Program awareness was higher among local municipal managers in Vitória da Conquista. There, the PAA, specifically the CAAFs, was divulged through interviews conducted with benefited farmers, through the INCRA, the Landless Workers' Movement (MST), the Municipal government, and the Rural Workers Union. Data were initially obtained through the INCRA, and from Government announcements. In a second stage, the contracts with Conab provided information on certain aspects regarding operation, eligibility and selection of benefited farmers for the Program.

As was observed in other states, the main problems were the payment delays for the CAAFs, the constant demand for documents not presented previously, and the handling and storage of the products in the final stage[20]. Considerations were also made regarding the required standards for the products, which were not made entirely clear at the outset, generating difficulties for farmers who, in certain cases, had their production turned down.

Regarding the CDLAFs in Vitória da Conquista, the Agriculture Secretariat played an important role in the dialogue with farmers, and the Social Development Secretariat in recruiting and registering beneficiary entities. The main concerns mentioned by the farmers were the need for technical assistance, the lack of adequate orientation regarding the norms of the PAA, and problems related to transport[21]. In this mode, it is up to the municipal government to collect the products purchased, and to mediate all relations with the family farmers.

The positive aspects pointed out by the farmers and the municipal government included the guarantee that production would be purchased, the increase in production, the higher prices paid, and possibility of allocating municipal funds

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20 When the study was conducted, the farmers' production was already contracted, but sacks and storage facilities had yet to be made available (the commitments of the Conab). As a result, the production either rotted, or was sold locally at prices below those established in the operation.

21 It must be pointed out that all non-beneficiaries interviewed in Bahia declared that the main difficulty was the quality of the production. Thus, it may be stated that one of the main obstacles has been the Program's quality and quantity standards, indicating the need for better integration with technical assistance institutes, so that the farmers may be adequately oriented.

towards other initiatives. The benefited entities mentioned the increase in diversity, the quantity and quality of food items, enabling an increase in the number of individuals assisted and in the nutritional value of the meals provided.

With regard to social control, the representatives of the municipal government mentioned the Social Assistance Council and the Food Security Council, both comprised of members of civil society and the municipal government. However, family farmers declared that there was no municipal council responsible for the monitoring of the Program. Awareness in this regard was quite low, thus limiting the social control of the PAA in the municipality.

In Tapiramutá, the CDAFs were being set up when the survey was conducted. According to those interviewed, the number of eligible farmers for this mode was limited, and the following problems were mentioned: production quantity and quality, irregular deliveries, differences between the agricultural and commercial calendars, and the lack of information regarding product price quotations.

However, certain facilitating aspects were mentioned regarding the implementation of the PAA: the articulation capacity of local actors; the adequate dialogue between the Tapiramutá Producer Association Central and the municipal government; the existence of the Municipal Rural Development Council, its capacity to represent the local community, as well as the latter's close relation with the Municipal government. Technical support provided by the municipal government was also mentioned as being supportive of possible Program actions.

The elements identified that motivated the implementation of the PAA were the need stimulate local income, social organization, and promote qualitative nutritional improvements among the needy population.

The Municipal Rural Development Council and the Food Security Council were mentioned as possible social control instances.

Despite the references made to the councils in the surveyed municipalities, their involvement with the Program was not observed in any of the cases. In Vitória da Conquista, although the two councils were mentioned, the interviewed farmers declared not being aware of the involvement of these entities in the PAA. In Tapiramutá, the representative capacity of these councils was pointed out,

but they were not involved in the initial stage of operation of the CDAFs – the selection of farmers -, which lessened social controls called for by the Program. It was verified, however, that when the councils existed and were mentioned, their actions and roles proved to be limited. This may lead the municipal government to centralize the overseeing of the PAA.

In summary, from the information obtained from the farmers, a low level of awareness was detected regarding the role of the municipal councils in the monitoring of the PAA. Nearly 92% of interviewees stated that they did not know the members of the councils, and 100% revealed not knowing what the councils did.

These declarations contradict the overall opinions of the local managers, who say that the social control instances are highly organized. In practice, however, it was observed that in no municipalities were there any councils effectively involved.

5.2.2 Pernambuco

In Pernambuco, the study was conducted in the municipalities of Santa Maria da Boa Vista, Catende, Recife, Cabo de Santo Agostinho, Petrolina and Caruaru.

Between 2003 and 2004, the CAAFs were the mode that predominated, concentrating on the following products: rice, manioc meal, *macaçar* beans, and sorghum. In 2004, CAEAFs were implemented to form stocks, CAEAFs for simultaneous donations, and CDAFs for the sale of corn and manioc meal. Between 2004 and 2005, the CAEAFs for stock formation emphasized the acquisition of crystal sugar, mainly in the municipalities of Catende and Palmares.

In Santa Maria da Boa Vista and in Catende, the Conab was the main manager of the PAA. In the area of the first, it carried out its activities together with the regional INCRA Regional (of Petrolina), the BB, the Embrapa of the semi-arid, the MST, the Rural Workers Union, and the settlers associations (PA Safra).

According to the statements given, the involvement of the local Conab, despite the efforts of staff members, was always hampered by its lack of experience in dealing with family agriculture. Some of these staff members pointed out what this learning experience meant for them.

The MDS payment delays undermined the confidence partners and beneficiaries had in the Program, although all recognized its importance and longed for more effective involvement, according to those interviewed.

The involvement of the financial agent, in this case the BB, was also hindered by the lack of knowledge regarding how the PAA operated, and with regard to the nature of family agriculture. As made evident in the interviews, the effectiveness of the financial agents was always subject to the sensitivity of their local management, given the specificities of the target audience.

In the municipality of Catende, the main local mediators, besides the Conab, were the BB, the Rural Workers Federation of the state of Pernambuco (Fetape), and the Rural Workers Union. The Conab was more effective in this case than in other areas of the state were it was involved in the PAA, due to the experience gained for the now extinct *Usina Catende – Associação Harmonia*[22].

In Recife, the main managing entity was the Municipal Government, with the important support of the Fetape, the Cabo Women's Center, and the Cabo Farmers' Association (Coopead), as well as the INCRA.

Given a primary difficulty – the need to implement a program such as the PAA in a capital city where there was practically no family agriculture -, the Recife Municipal Government recruited neighboring municipalities, in order to ensure the regular acquisition of food. The Fetape played a fundamental role in bringing the other mediators together. For the local managers, the logistical problems posed by the lack of an adequate structure, directed exclusively towards the acquisition and distribution of food items, were solved through

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22 In the sugar-alcohol crises during the 90s, a workers' organization was established which was able to find a solution for production, preventing the definite closure of the Plant, the selling off of the property, and the maintenance of 2,800 direct jobs. The Plant recovered with industrial/agricultural diversification, and through a self-management process; currently it is jointly managed by the judiciary and the workers' organization. The organization also enters into partnerships and develops actions aimed at diversifying production and generating income for the workers' and their families.

the creation of a Food Bank. But its effective results may only be measured in future operations.

The Cabo Women's Center was the institution that mobilized the farmers, and has been monitoring the Municipal government's operation in this regard. The Coopead has been important in making the acquisitions feasible, intermediating with the issuance of invoices, and making payments to the farmers. This way, farmers do not have to resort to the issuance of individual invoices. This entity also provided support to farmers in addressing logistical problems, such as the transport of products to benefited entities in the city of Recife, where the food was donated. Difficulties observed regarding the implementation of the PAA in these municipalities included the distance between the farmers and the Conab, the little information provided farmers regarding the various stages of operation of the PAA by other entities; the difficulties in meeting the quality standards established by the Program by the poorer family farmers (target audience of the PAA); the absence of primary processing structures, such as the traditional "*casa de farinha*" (flour houses), for example, hampering the delivery of flour purchased by the Conab, aggravating the problem; insufficient public technical assistance, for the agency having undergone a restructuring process through the merging of the other governmental agencies.

Also, upon issuance of the Pronaf Eligibility Declaration (DAP), delays and oversights were detected, further aggravating farmers' capacity to meet the Program's requirements.

Regarding the involvement of the councils, these appeared to distant from the Program. According to interviewees, after the requirement of the Pronaf B funding analysis was dropped, the council practically stopped functioning. There were practically no actions with regard to the PAA even in the state councils. The Municipal Food Safety Council in the city of Recife was the only one active, but only for the approval of projects; it did not participate in actions, nor did it monitor or supervise the operations of the PAA or the donations.

There was also the perception among farmers that the anticipated acquisition PAA was more of a production cost credit than a commercial program, leading

to doubts regarding values, given the effective costs of the various agricultural practices, from the preparation of the soil to harvests.

Payment defaults were also observed in Pernambuco, with regard to the CAAFs. According to the INCRA Superintendence, defaults were imminent since the beginning of the operations, due to adverse climatic conditions (heavy rainfall between 2003/2004, and a lack of rain afterwards) and the short period of the loans had a significant weight on the results obtained with the respective resources. A case in point was manioc in Petrolina which, due to the excessive rainfall during its development period, resulted in the crop being infested with larvae, which was also confirmed by Embrapa (Brazilian Agricultural Research Corporation) reports. The PAA beneficiaries were visibly upset by the difficulties in meeting their commitments. They, in turn, incessantly sought alternatives to settle their debts, to avoid the consequences. Although they were aware of the coverage provided by the Proagro, farmers were visibly disappointed for not being able to meet their commitments[23].

Another aspect leading to the previously purchased production not being delivered was that the products did not meet the classification standards required by the Conab, especially rice, whose moisture content (40 to 50%) was above the standard. This resulted in the sale of the production to the only purchaser in region, located in the municipality of Cabrobó.

Other difficulties observed in the implementation of the PAA in the state of Pernambuco were problems in the respective institutional arrangement. Federal, state and municipal agencies were not recruited as channels of information, which hampered the access farmers had to the Program.

As in other states, the absence of adequate infrastructure also presented obstacles to the implementation of the Program. Insufficient storage facilities and transportation, and precarious primary processing conditions were issues mentioned by the farmers. These problems could have been avoided if the target audience had been in a better financial situation, and if there had been more of a joint effort.

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23 In interviews conducted in Caruaru, dissatisfaction with regard to defaults was also noted. There was an overall sense of discontentment in the various settlements due to this situation.

This is corroborated by the success of certain cases, such as the CAAFs at the *Usina Catende (Harmonia)* and at the *Colônia de Pindorama* (AL), where sugar is commercialized. In these cases, the organization of family farmers, and the availability of processing and storage infrastructure may be considered the main factors responsible for this success. In the case of the PAA run by the Recife Municipal government, which was also considered a success, the positive result was due to two main factors: the effort of the municipal government, and the mediation by the Cabo Women's Center and the Coopead.

The entities benefited by donation of the PAA CDLAFs in Recife were popular restaurants, hospitals, day care centers, support centers, needy children's protection agencies, churches and shelters. Since the food was delivered directly to the entities by the farmers, some of the opinions were interesting: "*When we arrive and say that the food is family farming donations, they are very satisfied and thank us*". Staff members at the entities receiving the donations also pointed out the quality of the food, and its origin (family agriculture). Based on this, most of those benefited know the food is organic and produced by family farmers.

Apparently, the PAA in Recife has produced positive results. The simultaneous creation of the Food Bank, to facilitate the Program's operation, offered cold storage facilities and transportation. Other initiatives took place in the towns of Cabo de Santo Agostinho and Pombos, where institutional acquisitions were directed towards school lunches and popular restaurants. They stimulated CDLAFs in neighboring municipalities.

5.2.3 Rio Grande do Norte

In the state of Rio Grande do Norte, the municipalities were selected according to the coverage of the all the modes of the PAA. For the CDAFs, the study was conducted in the municipality of Apodi, where the number of formal operations was significant. The municipal government provides support to the Conab, placing staff members and an office with a telephone at their disposal, as well as a food storage facility to keep the food until it was transferred to the Conab warehouses.

For the CDLAFs and CAEAFs, the determining factor in selecting the locations to conduct the interviews was the stage of the operations. However, most of the municipalities were in the initial stage, which limited the gathering of certain information, thus hampering the analysis of the results. Surveys were thus conducted in those municipalities where the PAA had been implemented the longest: for the CDLAFs, Ceará-Mirim, Pau dos Ferros and Umarizal; for the CAEAFs, Currais Novos, Portalegre and Apodi[24].

The CAAFs, which were overseen by the Conab, were more representative in terms of funding and the number of benefited farmers. The acquisitions were directed to agrarian reform settlements, which were more frequent among those located in the Mato Grande region. This PAA was evaluated in four different municipalities which comprised the region: Taipú, João Câmara, Jandaíra and Touros, where the operations concentrated on two products: sorghum and manioc meal.

The municipality of Apodi is the regional center of the Midwest of the state of Rio Grande do Norte, where the CDAFs are concentrated. There, sorghum and rice are bought by the PAA. The acquisition and sale negotiations in the entire state are predominantly conducted by individual farmers with the participation of the BB, acting as the financial agent responsible for payments, and the Fishing, Supply, and Agricultural Secretariat, agency in charge of classifying the products.

With regard to the local participation and institutional arrangements, it was observed that, except for the isolated example of the Municipal government of Apodi which mobilizes personnel and resources to execute the CDAFs, the other modes managed by the Conab do not receive the same support, in spite of the minor involvement of municipal agencies. The situation is different with regard to the CDLAFs. For obvious reasons, in the case of acquisitions managed by the Municipal government, but also in the case of CDLAFs managed by the Rural Extension and Assistance Company (Emater) in the state of Rio Grande do Norte, significant changes were noted. The funds earmarked for the actions of the PAA in the municipality are incremental, and Emater assumed a supportive role, considering the PAA as a supplementary initiative, and not as a substitute

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24   Since the CAEAFs require the formal organizing of beneficiaries, few meet these requirements. In 2004, an operation was carried out with CERSEL; in 2005, six were carried out, with five entities.

for food security actions currently underway – such as school lunches and the supplying of social assistance agencies. As a result, there was an increase in budget funds aimed at the acquisition of food in the municipalities after the arrival of the PAA, exactly equal to its investments.

In Ceará-Mirim – whose agriculture is extensive and where there are a large number rural settlements – the CDLAFs acquire products from informal groups of settlers. The food is delivered the Administration Secretariat, which in turn delivers it to the benefited entities. The farmers themselves transport the food to the Secretariat. The product acquisition list was based on the production of the settlements, and even included shrimp, with prices established by those quoted by the Supply Centrals S.A. (Ceasa). The food purchased goes to school lunches and a large number of day care centers and social assistance entities, which declare the quantities received and report on the quality of the products.

The benefited entities receive the food to complement the menu prepared under the supervision of a nutritionist. When a specialist is not available, Emater carries out the function. In Rio Grande do Norte, as well as in other states surveyed, there were defaults in the CAAFs. In the case of the municipalities of Taipú, João Câmara, Jandaíra and Touros, the deployment of this type of acquisition did not receive the support of the state Technical Assistance and Rural Extension (ATER) nor from the INCRA, so that the PAA be directed toward those settlements receiving this type of support. The consequence of this may be seen in the large number Rural Product Certificate (CPRs), issued for the sorghum production in the settlements. The settlers did not have accumulated knowledge regarding this crop – having never planted it before – nor was there any technical support available. The result was a large number of defaults, mainly to due to weather problems, but also due, in part, to the lack of coordination among institutions and to the lack of the necessary support. It must also be pointed out that ATER, when provided, was provided by outsourced entities, and not by official agencies.

The role of the funding of production, in the case of the CAAFs, was an issue pointed out by the PAA managers in the state of Rio Grande do Norte. The fact that the Program created alternative sources of credit, without the necessary

guarantees for the availability of funds, in the opinion of the managers, ended up turning against the farmers. When production failed, or when products were turned down for not meeting the quality standards, payments could not be met. For the farmers, the required standards were difficult to meet, above all if the factors of production available in the state are taken into consideration. This meant default for many farmers, which restricted their access to other forms of credit. Furthermore, there is the friendly guarantee, which was a form of collateral adopted by the CPR, which proved to be an additional risk for the participants, in light of the high rates of desistance and abandonment of settlers.

One of the problems faced by the PAA was the distance of the federal agency responsible for implementing the CAAFs, CDAFs and CAEAFs in the state. In these modes, the Conab, and state government agencies, such as Emater, are responsible for the provision of technical assistance to farmers, and the Rio Grande do Norte Agricultural Research Company (Empa) is in charge of research, to mention but two important actors in the consolidation of family farming in the state. This had a impact on the execution of the PAA, mainly with regard to decision making processes, and in planning the assistance for participating family farmers, in directing the modes, and identifying regional priorities. The CAAFs, without the effective support of technical assistance for the planting of sorghum in the region of Mato Grande – a crop for which they had no experience -, had a negative effect on harvest productivity and classification.

The ATER has a decisive role in the success of actions aimed at family farmers. However, the degree and intensity of its association with the development of the PAA, especially the CAAFs, were insufficient, which, no doubt, contributed towards the great number of defaults.

Furthermore, the managers pointed out the absence of a PAA national awareness campaign as being one of the Program's main problems. Increased awareness on a national level would surely have had impact on the sustainability of the actions on the local level. It was alleged that without this support there would always initial distrust, which needs to be overcome. Later, this void would not ensure that the PAA had a national identity. On the local level, the Program

is disseminated mainly at meetings, although means of communication such as the radio and newspapers are also used.

Regarding insurance, in cases of anticipated acquisitions, most interviewed farmers were not aware of how this aspect operated, nor were the BB branch offices. As a result, many of them did not seek coverage at the outset, and requests were made much later. When coverage was actually sought, damages could no longer be assessed. There were reports of associations that submitted requests to Proagro more than one year after the occurrence of the climatic event damaging the crop, when only remnants were left. The role played by the Bank was no better; several requests were "shelved" at the branch offices, probably due to the lack of information on how to proceed.

The Proagro, which is the insurance which should protect the family farmers participating in the PAA against adverse weather conditions affecting their production, actually represented a great problem. The more fortunate farmers, who were able to overcome the bureaucratic obstacles and be reimbursed, faced another problem regarding coverage: the total coverage of the insurance could not surpass 70% of the cost of the crop, which represents a value inferior to the value of the CPR, which is based on the value that would be obtained if the product were sold to the PAA.

Concerning social control, the Conab managers categorically affirmed that there were no social controls regarding the actions of the PAA, and that the company the initiative of submitting a report on the Program's actions to the State Food Nutritional and Food Security Council (Conesan). In the view of these managers, the municipalities also did not have social control mechanisms in place, in the case of the CAEAFs. The representatives of the Emater explained that the Conesan monitors the actions carried out by the entity to carry out the CDLAFs on a state level. Since food security councils have not been set up in the municipalities, the monitoring is frequently carried out by the Municipal Sustainable Rural Development Council (CMDRS) – as in the cases of Pau dos Ferros and Apodi – which select the benefited entities, the product to be purchased, and detects irregularities. It was also mentioned that the *Fome Zero* Managing Committee also acted as a social control instance in some municipalities.

Thus, an evaluation of the degree of governance of PAA processes exercised by social control institutions, based on the results analyzed, indicates that it was strongly limited. In the state of Rio Grande do Norte, only one case was detected where a municipal council interfered directly in the definition of benefited farmers and entities, reflecting that the Program was, to a certain extent, socially accepted in the municipalities. Social control is exercised, although in most cases it was simply a matter of protocol. In those municipalities participating in the PAA, this aspect was not an additional stimulus for this participation.

The PAA's nutritional and food functions were mainly conducted through the CDLAFs and the CAEAFs-DS, with products being donated directly to schools and assistance entities. The products ended up comprising an important part of their food intake, increasing diversity and quality. Certain suppliers were eliminated, mainly wholesalers and supermarkets. The money saved with the donations was used to increase the offering of services, and to improve the assistance provided to the entities target audiences.

With regard to the operational aspect, the flexibility in elaborating the list of products eligible for acquisition, where the availability of the products was combined with the institutions' needs, must be pointed out. The quality classification and control were conducted through simplified rules, which were previously established and based on previous records. In the case of the CDLAFs, Emater provided the technical support. The person responsible for the benefited entity attested the quantity received, and then issued a term of acceptance, confirming the quality of the goods received.

The transportation of the CDLAFs to the benefited entities was, in most cases, provided by some municipal agency. To a certain extent, this inhibited the approximation between family farmers and those entities consuming the production, which aimed to strengthen links which could last after the termination of the PAA. This was observed in Ceará-Mirim, where there was no direct contact between producers and benefited entities, as aspect observed in other municipalities as well. But on the other hand, the transportation provided by the municipal agencies relieved the producers of the burden of distribution costs.

Concern was manifested by benefited entities with regard to the continuity of the PAA and the supplying of food. By the way the CDLAFs were conducted, the family farmers did not have direct contact with the entities; they only knew where the production was going. In spite not having direct contact, some entities manifested their intention purchasing the food directly from the farmers, when the PAA is discontinued. This has already taken place in the case of the Seridó Rural Development and Energy Cooperative of Seridó Ltd. (CERSEL) which supplied food to the CAEAFs-DS, and now provides products directly to assistance entities. This may be considered a structuring consequence of the Program, guaranteeing the continuity of the sales channel.

It was also observed that the acquisition of products for school lunches has become promising commercial channel for family agriculture. Resources distributed throughout various municipalities have allowed the participation of family agriculture in the market, and strengthened the relation between family lunches and the modes most strongly linked to nutritional and food security: the CDLAFs and the CAEAFs. In certain municipalities, this relation is still in an initial stage; but in others it has gained importance. In Umarizal, Pau dos Ferros and Extremoz, the amount invested by the CDLAFs in the acquisition of food surpasses the amounts allocated by the National Foundation for Education Development (FNDE) for school lunches, demonstrating that this market, as well as that of day care centers and other entities providing assistance, may count on the significant participation of family farmers.

In summary, it may be said that opportunities are being created for family farmers to participate in the institutional market of school lunches and assistance entities, in spite of the fact that state and municipal funds have not been invested in the direct acquisition of food. But funds have been used for other items which are fundamental for the structuring of this participation on the market, such as human and material resources (production transportation vehicles, storage facilities, product processing facilities etc.).

This has meant important increments in the offering of local social programs, both in quantity and quality. In some cases, the savings for municipal public budgets has been undeniable, brought about by local direct acquisitions. However,

Emater has stressed that the PAA should be a complementary program, and not a substitute for current programs, thus minimizing the substitution effect.

6   Conclusions

Based on the results analyzed above, certain aspects regarding the PAA need to be reviewed and evaluated, so that solutions may be found: the role of farmers' organizations, technical assistance, production transportation and storage, Program awareness, the involvement of local governments, and the participation of councils.

It was also observed, in all the states analyzed, that civil society organizations, cooperatives and entities play an important role in the operation of the PAA. The associations mobilize and orient a large portion of PAA beneficiaries, helping them overcome obstacles related to technical assistance, and production transport and storage. Furthermore, it was verified that when the organized farmers are minimally articulated in an association or cooperative, many of the problems are overcome, such as payments made directly to the entities, which are passed on directly to the farmers; delivery and distribution logistics; and the relations with the financial agent with which the cooperative/association has a business relation. It must be pointed out that the PAA is most successful in places where the articulation described above is more consolidated.

The PAA, by giving priority to family farmers linked to the entities that represent them, strengthens the links among groups of family farmers who already have collaborative ties; however, farmers who are not associated to these types of entities find it more difficult to join. Thus, the Program ends up "marginalizing" this part of rural society.

Two conflicting issues must be addressed regarding the priority given to farmers with ties to entities: first, one of the merits of the PAA is its capacity to promote the organizing of family farmers, by stimulating the forming of cooperatives, and by requiring the proper documentation from farmers. However, for being a recent experience, conclusive remarks may not be made regarding

the contributions of the PAA towards the establishing or strengthening of these organizations and associations; second, the lack of organization should not be considered an obstacle towards the inclusion of farmers, since it is exactly those farmers belonging to weakly organized groups or even those without any form or organization who find it more difficult to establish relations with the market.

Another issue regarding the difficulties faced by farmers in obtaining technical assistance needs to be carefully examined by the Program's central managers (MDS and Conab): the pertinence of the complaints, and the possibility of establishing links with the federal instances, with positive reflections on the local arrangements. Furthermore, institutional recommendations or demands may also be incorporated to agreements aimed at implementing the PAA in the municipalities.

Transportation and storage characteristics varied widely, depending on the program mode. For the CAEAFs and CDLAFs, there were indications that the direct delivery of food to the institutions by the benefited farmers has a greater structuring and sustainability potential than the intermediation of municipal government and other local instances. Besides stimulating this type of link between the farmers and the recipient institutions, the MDS and the Conab could also study mechanisms aimed at stimulating stronger ties between associations and cooperatives and the local instances responsible for Program implementation, with regard to transportation and storage.

Program awareness initiatives also need to be perfected. Based on the statements, the lack of information regarding the PAA was a common issue brought up in almost all the cases studied, especially in relation to its functioning, objectives and means of operation. This lack of information provoked a sense of insecurity among participants, and consequently, in some cases, misinterpretation of the PAA's actions. A joint communication initiative by the MDS and the Conab should be structured and articulated with local instances, in order to increase access, as well as improve understanding of the participation and acquisition mechanisms, quality requirements and prices.

Another aspect observed regarded the participation of city halls in the implementation of the PAA, and in modes overseen by the Conab. In the cases

studied, greater involvement of city halls in the implementation of the PAA contributed to the success of the Program. Some city halls developed actions/ projects similar to the PAA, and others manifested their interest, if the federal Program were to be discontinued, to continue purchasing food from family farmers. Similar actions may be promoted by municipal government agencies, to strengthen the PAA. Overall, the greater involvement of other institutions, such as NGOs, associations, and cooperatives, as in the cases of Recife and Catende, increased the effectiveness of the Program.

Other types of activities generating employment and income (such as handicrafts), carried out in the state of Rio Grande do Sul, as a result of the donation of food to recipient institutions, may be considered a positive outcome of the Program.

The results indicated the need to better define the role of the various councils in the implementation of the PAA, as well as actions aimed at increasing the awareness of beneficiaries and potential beneficiaries regarding these roles. One of these councils may be legitimately selected, on the local level, to oversee the Program, being a formal or informal pre-requisite for the implementation of the Program.

All modes of the PAA should also be submitted to social control, by councils with clearly defined attributions and representation criteria.

Lastly, it must be pointed out that there was an approximation between the PAA and the Pronaf, which generated – as planned – complementarities between the programs, demonstrating the potential for better articulated policies aimed at family farming and its generation of income. On the other hand, it was observed that those not benefited by the PAA, as well as a considerable number of beneficiaries, did not have access to the Pronaf. The former group of individuals has the weakest conditions for productive insertion, and thus need to be given priority by the Program, which in many cases they were. Therefore, it may be stated that the PAA has the potential of reaching target groups that would most benefit from public policies, as is the case of agrarian reform settlers.

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Qualitative Evaluation of the PAA-Milk Program

Photo: Bruno Spada

Qualitative Evaluation of the PAA–Milk Program[1]

Alfredo Soares[2]

1   Introduction

The Food Acquisition Program (PAA), one of the initiatives of the Zero Hunger Program (*Fome Zero*), was created by Law n.º 10,696, of 2 July, 2003. The aim of the program is to promote family agriculture, and is comprised of actions towards the forming of strategic stocks and the distribution of agricultural and cattle products to individuals subject to food insecurity.

The PAA aims specifically to:

:: Ensure the right to food to those segments of the population living in situations of social vulnerability and food and nutritional insecurity;

:: Ensure the acquisition and distribution of products of family agriculture and agrarian reform settlers, with adequate remuneration;

:: Increase, in quantity and quality, the supply of food items to popular restaurants, community kitchens, and food banks;

:: Promote assistance to local social programs and entities, with the donation of food items and balanced meals, in order to improve the nutritional diet of segments of the population in situations of food and nutritional insecurity;

:: Eliminate the nutritional insufficiencies of individuals vulnerable to hunger, respecting regional habits;

:: Train project beneficiaries in associative and cooperative business management;

:: Strengthen the local economy with the generation of jobs and increments in family agri-industry income;

:: Promote nutritional education initiatives aimed at ensuring nutritional security, preserving and recovering gastronomic culture, fighting waste, and promoting health.

The PAA operates through the acquisition of food products produced by family farmers, at a determined annual maximum amount of R$ 2.500,00 (two thousand and five hundred reais) per farmer[3] with no bidding procedure being required. Thus, the Program simultaneously contributes to the development of the agricultural and cattle raising sectors, to the generation of income and employment, and to the strengthening of family agriculture and the mitigation of hunger.

The PAA target groups are the following: a) family farmers and agrarian reform settlers falling under categories A to D of the National Program for Strengthening Family Farming (Pronaf); b) social and beneficiary entities and programs that provide food to the poorer segments of the population (children, expecting mothers, elderly people, handicapped people, sick people, families and individuals with insufficient income); and, c) segments of the population in situations of social vulnerability and food and nutritional insecurity.

The PAA comprises various types of actions[4], among which are the Milk Production and Consumption Initiative (IPCL), which aims at guaranteeing the

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3   After the presentation of the final results of this survey, the maximum value for the acquisition of agricultural and cattle raising products by the PAA was increased to R$ 3,500.00, as determined by Decree n.º 5,873, of 15 August, 2006. In the specific case of the Milk Program, this maximum value, per farmer, is determined every six months.

4   The other types are: Local Direct Purchases from Family Agriculture (CDLAF); Direct Purchases from Family Agriculture (CDAF); Special Anticipated Purchases from Family Agriculture – Simultaneous Donations (CAEAF) and the Family Farm Stock Formation (CPR – Stocks).

consumption of milk among expecting mothers, children, women, breast-feeding mothers, and the elderly, through the direct acquisition of the product from family producers whose production yields a daily average of 50 liters. Implementation of the IPCL is overseen by the Superintendence for the development of the Northeast (SUDENE), covering the states of Pernambuco, Rio Grande do Norte, Ceará, Bahia, Sergipe, Paraíba, Piauí, Alagoas and Maranhão, and the semi-arid region of Minas Gerais.

The PAA-Milk Program Evaluation Project, which was developed by the Ministry of Social Development and the Fight Against Hunger (MDS) and implemented by the Development Support Fund of the Federal University of Pernambuco (FADE/UFPE), comprises a wide range of research, aimed at identifying the Program's social and economic impact, as well as its operational problems, and to propose improvement directives. One of the studies conducted, of a qualitative nature, which involved a sample of rural producers, aimed to hear their opinions regarding the functioning of the Program.

This document presents an analytical synthesis of these testimonies, followed by the conclusions and recommendations submitted to the Program Management Group by the evaluation team. Some of the farmers' testimonies have been transcribed at the end of each section.

2   Notes Regarding the Methodology

In qualitative research conducted with focal groups, statements of the members of these groups provide the researcher a basis upon which to analyze possible divergences between the reality targeted by the programs and that manifested by the farmers' statements. The difference between the results targeted by the program and the perceptions individuals have of its implementation is attributed to various causes, among which are:

:: Poor project formulation: projects that are poorly formulated or that are inadequate to the given reality normally receive poor evaluations;

:: Poor project execution: although well formulated, a project may be poorly evaluated by the population, as a result of problems related to its execution;

:: Deficiencies in the means of communication between the program's coordination and its beneficiaries: a program which is well conceived and well executed may be poorly evaluated because of communication problems. These problems may be associated to the lack, focus and quality of the information passed on to the population.

Lastly, a program may be poorly evaluated, not as a result of the factors mentioned above, but simply due to the bias and personal limitations of the individuals studied. However, this aspect may be generally avoided, or significantly reduced, when a sample which is more adequate to the study's objectives is selected.

From an operational perspective, the reliability of a qualitative study depends fundamentally on the choice of individuals comprising the sample. Besides being identified with the community to which they belong, these individuals must also be minimally able to discern and express their opinions. The following may be considered as inclusion criteria:

a) Personal characteristics: individuals who avoid discussing community problems, who are neither excessively timid or extroverted. Individuals who find it difficult to present their ideas in a logical manner, to manifest opinions or to take stances before trivial decisions should be excluded;

b) Situation with regard to the community: individuals who have recognized political positions or who hold any type of public office, or have any authority or formal leadership positions in the community (for example: city council members, former city council persons, religious leaders, professors, civil servants, association or trade union directors or presidents etc.) should be excluded. People with these characteristics normally centralize the discussions, induce opinions or inhibit the free expression of other members of the group;

c) Knowledge of the issues to be discussed: individuals who do not have the minimum knowledge regarding the issues to be discussed should also be excluded.

It is up to the researcher conducting the qualitative study to analyze the basic impressions the surveyed group has of the program, as well as to verify which of the aspects mentioned above are responsible for such impressions.

Given the time and instruments to gather said information, open discussions held in a meeting may be used, with the respective registry of the individual statements/opinions/testimonies made. A moderator[5] thus becomes necessary, whose role is to maintain the cordial and trustworthy atmosphere of the discussion, so that it may flow in a spontaneous and natural manner. It is also up to the moderator to mediate any possible conflicts between participants and to make sure that the focus of the discussions does not flee from the propose theme. However, the moderator must not give opinions or induce positions.

2.1 The PAA-Milk Evaluation Study

In the case of the PAA-Milk program, a survey was conducted in five of the ten states covered by the program. The selected communities are comprised of small producers typical of the regions and are located along the collection routes of the plants serving the Program. In each of these communities, 30 residential units were randomly chosen to respond a questionnaire, from which 10 individuals were selected (six beneficiaries of the program, and 4 non-beneficiaries) whose profiles met the criteria outlined above (sampling by type).

Following a previously defined set of questions and based on suggestions made the respective State program coordinating groups, the survey was conducted in the municipalities of Queimadas (Paraíba), Quixeramobim (Ceará), Barras (Piauí), Miranda and Bacabal (Maranhão), and Francisco Sá (Mina Gerais), between the last week of September and the end of October, 2005.

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5   The individuals surveyed are assured by the moderator that their opinions will remain anonymous.

3 The Results of the Study

In the following sections, the main image traits of the Program for each of the states surveyed will be presented in a succinct manner. Some of the statements have been transcribed to better understand the researcher's analysis, through the visualization of the content upon which the work is based. Lastly, some conclusions are made and suggestions proposed by the evaluation team.

There are significant differences in the five statements, not only in form, but also in length and content, as a result of the diversity of the issues brought to the attention of the researchers. Some of these issues, for a certain group, were discussed at length and in depth, and thus occupied a significant portion of the report for that respective state. But in relation to the other groups, many times these same issues were not even mentioned, for not having called their attention.

3.1 The PAA–Milk Program Producer Impressions in the States Surveyed

3.1.1 Paraíba

In the state of Paraíba, the Program requires that producers be organized in cooperatives or associations in order to be eligible as milk suppliers. This requirement, besides contributing to organize production, has empowered the small producers on the market and has improved the long-term perspectives of the region's milk production. This has undoubtedly been a positive element with regard to this State, in comparison with the others covered by the Program.

Analyzing the overall opinions of the group, it may be stated that there is, among the producers selected for the survey, an awareness regarding the fundamental importance of the Program for their economic survival. The assurance of a compensating price and a stable demand for milk were explicitly mentioned as the main advantages produced by the Program. Its importance as a factor for economic development, technological modernization, and job creation was widely recognized by the producers.

As opposed to what would be expected, the Program's requirement of sanitary care (vaccination and periodic examinations of the animals) was not considered a burden, but as an advantage.

Because of the benefits wrought by the Program, producers linked to the program felt more assured to invest, expand their businesses and adopt new technology. As a result, their herds are larger and of better genetic quality, which, in turn, has led to an increase in production.

All participants suggested, and rightly so, that if the program were to be terminated, the local situation would be even more critical than before its implementation, for due to the expansion in the supply of milk, the market prices would be sharply affected by the reduction in demand. Furthermore, they correctly argue that the losses would be even greater, because the price of the animals (their main capital) would drop sharply, since everyone would be selling them off and there would be no buyers.

In the state of Paraíba, the Program was effectively able to stabilize the demand and increase the prices paid to the producers. In Queimadas, according to the statements, the small producers did not find it difficult to include themselves among the supplies of the Program. On the contrary, many of them, on their own initiative, gave up as suppliers and currently deliver milk to third parties, for a price slightly lower than that paid by the Government. They consider that, in spite of the lower price, they are paid on time.

These same producers state they can be Program suppliers again whenever they want. They declared being aware of the fact that before the Program, the "*leiteiros*" paid them measly prices and submitted them to 'humiliations' to become suppliers. Today, with the guaranteed price and the increase in demand brought about by the Program, the "*leiteiros*" are obliged to pay decent prices on time if they want to obtain milk. This favorable situation for small local producers is attributed to the presence of a plant in the municipality, set up after the arrival of the Program.

The main complaint the producers interviewed had of the Program regarded the late payments for the milk. These late payments sometimes took up to 60 days,

obliging them to go into debt, thus forcing them to resort to banks and money lenders that took the additional income provided them by the program.

Lastly, it must be pointed out that producers were disappointed and extremely concerned with the news of a reduction in the milk delivery quotas to a maximum of 20 liters per day. As a result, they began to doubt the Program would continue and accused the Government of having induced them to invest, to later leave them on their own.

Segments of the Discussion

Moderator: What good things has the Program provided you?

Participants:

"*The price is very good*".

"*It is good because there are no milk bottlenecks* (no excess supply of milk). *This year there was no milk left over. Each year, when winter comes, there is an excess of milk. This year this did not happen, because of the Program. Because I used to a liter to sell and the guy over there has five or six and he could sell it all. Now, the government buys my milk and distributes it. Now, its all gone* (it has all been taken care of, there are no more problems). *It worked for me, at a good price and it worked for them* (the Government) *which gave milk* (to the needy)".

"*There is more cattle raising. Because* (before) *a guy had two cows and had no one to sell to. He could even raise four or five, but how could he care for the cows if he had no one to sell* (the milk) *to. So, the government buying the milk stimulated him* (the producer) *to produce more*".

"*Another big benefit is that I am being my own employee. I gave myself a job*".

"*Another good thing was that* (the Program) *forced the raiser to take care of his herd. Because before everyone* (the herds of all the producers) *could get contaminated; now, everyone is vaccinated* (the herds)".

Moderator: How many of you here increased the size of your herd after the Program arrived?

Participants:

> *"I think everyone bought more cows. I even bought three myself"*.

Moderator: Are the cows you bought after the arrival of the Program better than the ones before?

Participants:

> *"They're better"* (in chorus).

> *"The cows before produced 6 to 7 liters. Now, is about 10 to 14 liters"*.

Moderator: So your investment was worthwhile?

*"All right, this is what I am worried about. I gathered everything I had, even the goat, and bought four cows; and fixed the gate and everything. Each cow is worth R\$ 1,500.00 (*one thousand and five hundred reais*), but if the government lowers the limit to 20 liters (*which is the daily quota*), the cow will only be worth R\$ 800.00. I won't have anyone to sell the milk to. The buyer will humiliate us. What can we do?"*

> *"If the Milk Program ends, milk will go for R\$ 0.25 (*twenty five *centavos) to R\$ 0.40 (*forty *centavos), for whoever want to sell"*.

Moderator: If the Program offers all the advantages you mention, why wouldn't those who aren't participating participate?

Participants:

> *"The price (*paid by the Program*) is quite good, but it takes too long to get the money"*.

> *"Everyone here that left the Program is because it took too long to get paid. They're selling to the 'leiteiros' "*.

> *"The 'leiteiros' buy their milk and sell it to the plants"*.

Moderator: Do these "*leiteiros*" offer a better price than the Government?

Participants:

> "*No. They pay less. But they pay on time*".

Moderator: What's wrong with the Program?

Participants:

> "*The disadvantage is the payment headache, which is really bad. Sometimes it takes 60 days to get paid – which complicates everything*".

> "*This Government Program is really 100% good, but its got mistakes. Now for them to be really 100% with what they are saying they need to pay on time*".

> "*I put all my savings in my cows. I believed in the Program and now I don't know what to do*".

> "*I never saw the Government do a Program and then have it fail. Why is this happening to the Milk Program?*"

Moderator: You mean that if the Program's quota is kept at 20 liters you'll have no one to sell to?

Participants:

> "*No*" (in chorus).

3.1.2 Ceará

In the state of Ceará, the group surveyed was comprised of ten individuals, all male, whose ages ranged between 25 and 66, who were residents of five districts of the municipality of Quixeramobim. This is the State's largest milk producing region, located 240 km from the city of Fortaleza.

The selection of these producers proved difficult due to an unexpected aspect: when they were contacted, they said they did not know whether they sold milk to the program or not, since they sold their milk to intermediaries.

The intermediaries, together with the processing plants, take advantage of the privileged position they hold on the market and impose prices and conditions, offsetting a portion of the benefits the producers would otherwise be entitled to.

Given this chain of intermediaries, most producers have no idea where their milk goes, whether to the Program or some other destination. They do know, however, that the plant they sell their milk to are also suppliers associated to the Program – what they do not know is whether the milk sold to them is specifically part of the quota that the plants provide the Program with.

Some of these producers, even being able to provide their milk directly, without intermediaries, end up dealing with them. These at least pay on time, as well as provide animal feed which is amortized through the payment in milk.

It may be deduced that each plant, along with its intermediaries, would form its own collection network, in areas where they are the sole buyers, and in others in which they compete with other plants and intermediaries. Depending on the geographical location of the property, producers (who normally act alone, as mere price-takers) would be subject to the competition among the buyers of the region. Those who are located in privileged areas would be paid prices nearer to those offered by the Program. On the other hand, those located in remote and in isolated areas would be penalized in terms of price and sale conditions.

If this, in fact, does reflect reality, the Program would be failing to meet one of its main objectives, namely to "guarantee the acquisition and distribution of adequately remunerated family agricultural products (....)", by passing on to intermediaries and the plants part of the subsidies destined to the producers, due to lack of knowledge of the system.

The situation of dependency of the small producers, in comparison with the intermediaries, would have become even more critical with the adoption of the maximum acquisition limit of 30 liters per day. The mere announcement, by the Program, of said limit per producer would have induced a drop in the local market price, from an average of R$ 0.55 (fifty five *centavos*) per liter, to nearly R$ 0.40 (forty *centavos*). It is well known that the Program today is mostly supplied by producers that provide more than 30 liters a day. Thus, there is the

tacit recognition that if the 30-liter limit is fully enforced, the milk not collected by the Program will be sold on the market, generating an excess supply of the product and consequently a drop in price.

The larger producers (more than 30 liters) say they find it difficult to divide their production among two or more buyers. If they try to sell 30 liters directly to the Program, it would be difficult to find a buyer for the rest. On the other hand, in order to sell all the milk to a single buyer they would have to settle for a single price which, inevitably, would be the market price and not that of the Program.

With the announced drop in the market price, the smaller producers stated that they were willing to abandon the intermediaries and seek a way to sell their product directly to the Program. This will not be easy, however, due to the absence of a collective, alternative structure, which would allow the transportation of the milk production to the plant. The absence of said structure runs against another objective of the Program, namely: "to develop the capacity of the Project's beneficiaries to manage their business in an associative and cooperative manner".

The interviewed producers say that the intermediaries will be doubly benefited by this process, for they will continue to supply milk to the Program. This milk would be bought by them at a lower market price and delivered to the Program, in name of the "30-liter phantom suppliers".

In spite of not having the same conviction and enthusiasm observed in other groups surveyed, the producers nevertheless stressed the importance of the Program. In their opinion, it is a result of negotiations between the Government and plants, which would eventually benefit the poorer segments of the population. They do not consider themselves participants of the Program, but nevertheless perceive that they have a sort of indirect relation with it, and that this relation brings them certain advantages. They know that without the Program they would be worse off, and admitted that the Program has greatly stimulated their investments and has increased the productivity of their herds. On the other hand, the great majority are unaware of the name, the formal structure, the operational details, and even the Government's official milk acquisition price. Lastly, they made criticisms and complaints regarding the Program.

Segments of the Discussion

Moderator: What do you have to say about the Milk Program?

Participants:

"The Program is very good " (chorus).

"*We never had a good milk price from summer to winter. I don't have milk every month. Because I can't put in 30 liters, I call in someone else to put in the other 90 to 100 liters* (in reference to the denounced common practice in the region, which is the supplying of milk to the Program under the name of third parties). *Because the producer is only entitled to 30 liters of milk. It can't be done. Take a head of a family, no matter how small his family is he can't live on 16 to 18 reais a day, because he has head of cattle and all. But the Program is good. Another thing is that we know it* (the Program) *is not better because the Government does not pay the price it sells at, because there are too many intermediaries* (of the price paid by the Government, part of it does not reach the producer, because it remains with the intermediary)".

Moderator: How does the supplying of milk to the Program work?

Participants:

"It's because I produce milk, and I pass it on to you, and you pass it on to someone above; and that someone above passes it on to the government. I mean that there are at least two intermediaries in between. Sometimes there are even three or four".

"The intermediaries' milk all goes to the Government. It's because he gets 30 from one producer, 30 from another, because there is no surveillance. Sometimes people even put goat's milk in".

"I believe mine goes to the Program because a lot of producers don't exist. Or they exist, but they don't produce milk. I don't do that because my conscience doesn't let me, I'm too old".

Moderator: What's the official price the Program pays for the milk?

Participants:

>   *"Nobody knows. There's been a lot of talk, by no one knows for sure".*

Moderator: Is now the peak milk production period?

Participants:

>   *"No" (*chorus*).*

Moderator: So why is the price dropping?

Participants:

>   *"The Government encouraged all owners to produce milk. Now take a look. It stimulated cattle raising, set us up and now is leaving us behind (*by establishing the daily quota of 30 liters*)".*

Moderator: Are the cows you bought better than the one you already had?

Participants:

>   *"Better, much better. They are 12 liter cows. The others produced 3 to 5 liters".*

Moderator: So why aren't you interested in selling directly to the Program?

Participants:

>   *"Because we don't get paid (*the Program takes some time to pay*). I only get paid after 30 days, with no interest. So it's better for me to sell to someone else."*

3.1.3 Piauí

The municipality of Barras, located about 220 km from the state capital Teresina, was chosen for the survey. The group selected was comprised of 10 producers, all male, residing in three different districts. Their ages ranged

between 38 and 61 years of age, and one of the participants had gone to college (Agronomics), while the others had only primary schooling.

As expected, the producers were fully aware of the Program's social and economic importance, for as of its implementation, demand has increased and stabilized. They know there was an increase in the market price, and tend to follow the price offered by the Government. They were also able to go into detail regarding the economic effects the Program had on local reality, either as a factor of economic development, or as a transformer of social habits, as may be verified in the excerpts below.

According to these producers, in the state of Piauí, the signing up of suppliers in the Program is done directly by the plants, and occasionally by the State Company for technical Assistance and Rural Extension (EMATER). According to them, during the time the Program was being set up, the plants would normally get together with the producers to discuss the operating rules and to register the participants. After that, the meetings became less frequent, and now the producers resent the isolation they feel in relation to the plants. EMATER – which is theoretically the institutional link between the Program and the producers – is considered structurally weak, with precarious operations, according to those interviewed.

The statements provided serve to depict, in detail, the logical structure of a problem of great relevance that is occurring not only in the state of Piauí, but also in several other states covered by the Program. From what was said, it may be concluded that the late payments to suppliers ended up impeding the participation of smaller producers in the Program. With no money to hold them over until the payments are made, they were obliged to seek alternatives to sell their product. On the other hand, the larger producers, who are able to cover their maintenance costs during the payment delay periods, not having alternative markets on which to place their production, are attracted by the Program. In other words, the Program is actually playing a role opposite that stated in its objectives by attracting the larger producers and hampering the participation of small family farmers. The longer it takes to make the payments, the more overhead is needed to cover the wait, and thus larger the size of the suppliers who would have the capacity to participate in the Program.

By allowing late payments to its suppliers, the Program annuls one of its fundamental objectives, namely the inclusion of family producers in the food consumption market.

On the other hand, without the supplies of the smaller producers, either the Program accepts the milk of larger producers (against its ultimate objective), or it will not be able to meet the demand of its consumers on the other end. Thus, another of its main objectives will not be met: "to guarantee the right to food for segments of the population living in situations of social vulnerability and nutritional and food insecurity."

In certain communities, the consequences of the late payments to suppliers are lessened by the credit provided by the local shop owners, due to their privileged status as participants of the Program. Aware that the suppliers of the Program have a regular and guaranteed flow of income, which may be late but is nevertheless sure, the shop owners provide credit, although at interest rates that end up reducing the income of the small producers that resort to credit.

This is not the case in the community of Barras. There, say the producers, local credit is only obtained with the approval of the plants or of the Government. But this approval is not given.

Albeit aware of how import a producer cooperative or association would be, and lament the lack of institutions of this nature, the small producers feel culturally hampered to take an initiative in this regard and prefer wait for the Government to 'take care of us'.

Segments of the Discussion

Moderator: Is the Program good?

Participants:

> *"It's excellent"* (in chorus).

> *"The program for us producers is what saved us"*.

"The program has a wide coverage, both is the social part as well as the productive one. Mainly in the social part, the distribution of milk".

Moderator: What the benefits the program brings you all?

Participants:

"It's delivering the milk right there, at the right place, and get paid".

"With the distribution of milk, the habit of consumers drinking pasteurized milk is changing. The population in our municipality doesn't really like drinking pasteurized milk; they say: I'm going to drink natural milk because it's pure and taken straight from the cow".

"With that distribution, the milk is reaching consumers who could never have bought milk".

"The municipality grows with that. The milk is leaving here and going to other places, and the money stays here, the money is used".

Moderator: Is the price of milk out of the Program the same as the Program's?

Participants:

"The price of milk for producers outside the Program is a bit lower, about R$ 0.04 (four *centavos*) *lower, if I'm not mistaken".*

"What we sell on the market, on the street, is better, because the Program, as my colleague said, is R$ 0.70 (seventy *centavos*), *and on the street we sell for one real or even one real and thirty centavos".*

"One real is good (the retail price of milk in the city), *but if we were to sell all our milk for R$ 0.70* (seventy *centavos), or even for R$ 0.64 (*sixty four *centavos), knowing the sale is guaranteed is better than waiting in the city, to see whether we can sell or not".*

Moderator: But do you think that there would be a market, in the city, for all of you to sell your milk?

Participants:

"This is what I was waiting for a chance to say. When we milk the cows in the morning, and the milk is not sold by 10 am, we lose out".

"Those who produce a bit more are in a better position to deliver milk to the program that those who produce less".

"Because we never get paid on the same day, sometimes we wait 30, 40, 50 days".

"Our critical period is now in the summer… Now is when we would like the Government to intervene, regarding our payment, that they pay on time, because now is the time when we need all our capital to buy cattle feed".

"It has taken up to 90 days".

"There's no advantage for those who produce too little to deliver to the Program because they don't have enough structure to hold out until they are paid".

"And those that do produce more milk, not having a market on which to place all that milk, end up giving in to the Program".

3.1.4 Maranhão

In the state of Maranhão, the survey was conducted among producers residing in three districts of the municipality of Bacabal, which is located 230 km from the capital, São Luís. The participating group was comprised of ten individuals, one of which was female. Their ages ranged between 25 and 49 years, and their level of schooling was incomplete primary school.

Some of the individuals interviewed were well acquainted with how the market operated and how this market has adapted to presence of the Program. According to them, the increase in demand (brought about by the Program) "shrunk" the surplus which ended up forcing an increase in the price of milk, up to a "fair" level, paid by the Program.

As may be seen from the statements below, the producers are not only aware of the importance of the Program, but are also keenly aware of how the Program is capable of neutralizing the dependence they, the producers, were subject to, with regard to dairy products.

The State of Maranhão, as opposed to the other states participating in the program, set up a specialized firm to provide services to the small family producers. The *Casa da Agricultura Familiar* (the Family Agriculture House - CAF), acted as an intermediary between the producers and the milk providers, which represents a positive differential with regard to the Program in that state. This increases the chances of these producers becoming suppliers.

A second positive differential verified in the state of Maranhão, probably due to the presence of the CAF, is the credit which, together with the Milk Program, is made available to producers so that they have money to improve their herds, their infrastructure, and the animals' feed.

According to the statements of the farmers participating in the survey, the credit program is working quite well, since practically all the members of the group surveyed have been using funds provided by this source. This evidently also significantly increases the impact of the Program on the productive sector.

In the state of Maranhão, it is up to the CAF to provide technical assistance to the producers who, on the other hand, declared being satisfied with these services. Several initiatives aimed at enhancing the activities of the family farmers were enthusiastically mentioned by those surveyed.

The information obtained indicates that the surveyed group is comprised of genuine small producers who want to grow, but given the characteristics of the market (which would be restricted if it weren't for the Program), find it difficult

to obtain the necessary financial resources to implement new technology, the benefits of which are well known among them.

The main problems and complaints regarding the Program in the state of Maranhão is the milk transport system, from the farms to the dairy plants. This initially was done by the CAF, and all went smoothly. But since this is not the institutional mission of the company, nor are funds available for this purpose, the responsibility was passed on to third parties.

The people chosen for this task were former intermediaries of milk in the region, the so-called "*leiteiros*". They are the only individuals interested because they have the appropriate capital (milk trucks) and the relevant experience. It must be pointed out, however, that the "*leiteiros*" are in no way institutionally subordinate to the CAF. Their commitment to the aims of the Program simply does not exist, each having their own economic objectives and patterns of behavior. Thus, as expected, their relation with producers has become a constant source of dissatisfaction. Because of these intermediaries, the subsidies obtained by the small producers are not used towards their intended purposes, and end up covering milk transport costs, which tend to be abusive.

Another source of dissatisfaction regards the payment to suppliers.

Segments of the Discussion

Moderator: Is the Program important to you? Why?

Participants:

"*For me it's important because I wasn't selling milk by the liter, and I couldn't take it anywhere. I made cheese and delivered a kilo here and another there*".

"*Now I know I will sell and I know I will get paid. They pay a fair price*".

"*Before, we could never sell all the milk, there was always some left over. Nobody would consume it*".

Moderator: And in the good season, the harvest, is there left over milk?

Participants:

> *"Normally there was. I would produce 60 liters and he* (the former buyer) *only took 30".*

Moderator: What kind of difficulties have you been facing to participate in the Program?

Participants:

> *"I think that my problem is the same as every one else. We were selling milk to the Program at R$ 0.55* (fifty five *centavos*) *a liter. But that didn't include the truck.* (of the 'Casa da Agricultura Familiar'). *So that meant that the producers had to pay for the freight* (an intermediary who would pick up the milk to take it to a dairy plant), *and we didn't like that".*

> *"Another thing was that we always delivered the milk between 5 and 5.30 in the morning. Then there was this thing about the sour milk, but it* (the sour milk) *was not given back* (to the producers, who began to suspect that the milk was not really spoiled and that the 'leiteiros' had sold the milk and kept the revenue). *The loss was only the producer's".*

> *"When he* (the intermediary) *delivers the milk* (to the plant) *it's already noon.*

> *"The milk he would sell to him* (to other buyers) *would not spoil, but the producers' milk* (which should go to the Program) *always did".*

Moderator: Are you saying that here each intermediary is free to set the price?

Participants:

> *"Exactly".*

> *"The people (*of the 'Casa da Agricultura Familiar'*) were to pick up our milk. That was at R$ 0.55 (*fifty five *centavos) a liter. But then they gave up, and we have a lot of problems; they charge seven centavos, and we've already lost a lot of milk".*

Moderator: Is payment late?

Participants:

"It's *always late*".

"Let me explain. If you begin delivering milk on day 1, you will only get pay 30 days later; but you have another fifteen days. When that fifteen days is over, then you get the other one. That's normally how it is. Then everything is late".

"What we don't like about the program is that. The late payments and the freight, which they took".

3.1.5 Minas Gerais

The research report for the state of Minas Gerais does not include transcripts of statements made by the individuals interviewed, due to the deterioration of the tapes containing the recordings.

Based on suggestions made by the Program's State Coordination, the survey was conducted in the municipality of Francisco Sá, which is 60 km. from Montes Claros, where the regional office of the North and Northeast of Minas Gerais Development Institute (IDENE) is located. This agency oversees the Program in the state.

The participating group was comprised of 10 individuals, who were chosen according to the methodology outlined above. They were all male between the ages of 29 and 63, with a primary level of schooling. The debate was productive, with everyone participating equally, and the group chosen were well acquainted with the issues discussed.

From the statements given, it may be concluded that there was an general recognition that the Program was appropriate and that its design was acceptable to their reality. In the opinion of these individuals, the presence of the PAA-Milk supplemented the demand for milk in the region, resulting in an increase and stabilizing of the price, including during harvest season. Thus, the local producers

– who before had to accept lower prices or simply lose the milk they produced during the harvest – can now sell their entire production at reasonable prices and, furthermore, have the privilege of being able to choose, among various alternatives, who they would sell to, including the Program.

According to those interviewed, only few of the producers of the region who still operate in isolation, with no connections with cooperatives and associations, would be exploited by a dairy plant. The others, through their associations, depending on the volume that they manage to produce collectively, would be getting market prices equal or higher than those offered by the Program all year long. The local herds are mainly comprised of animals whose production is low (5 to 6 liters a day, on average). This is different than in other states, the program would not have encouraged these producers to increase their herds, nor to invest in the genetic improvement of the animals or the expansion of their physical infrastructure. On the other hand, the production technology and the sanitary care (vaccinations, clean milking procedures etc.) required by the Program, according to their statements, were already known and met by the local producers, and thus there was no significant impact resulting from the Program.

The interviewed group proved to be quite knowledgeable about the Program, and one of the members of the group showed the moderator a letter sent by the overseers to all suppliers. The letter contained information regarding the overall operating conditions of the Program, and the government's stipulated acquisition milk price, as well as the address and the telephone numbers for contacts and to report any irregularities. This is undoubtedly a differential in comparison to the other States surveyed regarding communication between the program coordinators and it beneficiaries.

The selection of suppliers in the State is done directly by the plants and, according to the information obtained, there were not restrictions imposed on small producers to participate in the Program. There was also the absence of intermediaries in the region. Producers who did not supply milk to the Program did so as a matter of choice, since good market alternatives existed, at prices that competed with those offered by the Government. However, the logistics and the transportation of the milk to the plans was the responsibility of each producer.

The relations between producers and the plants, according to the statements, are quite good. There have been no complaints, not even regarding the late payment of milk delivered to the Program.

The only issue the cattle raisers were concerned about and which polarized the complaints was the news that the milk acquisitions would be restricted to a daily quota of only 30 liters. In the opinion of those who deliver up to 100 liters daily, the quota system threatens the stability provided by the Program. This is because the resulting surplus would lead to a drop in price which would mean the "nightmare" there was before. According to them, the quota system would be an unnecessary setback, since the Program would not get all the milk it needed because there would not be enough suppliers at only 30 liters each. Therefore, they stress, the program would penalize not only the producers, but also those who need the milk.

4   Conclusions

In terms of its conceptual framework, the Program was unanimously applauded by the producers, and considered a timely and highly relevant social and economic initiative.

According to the statements transcribed in the survey, the Program, among the other benefits mentioned, has promoted economic development, expanding employment, investment, production and income. It has also promoted an improvement in the sanitary and health conditions of the herds, changing consumption habits and stabilizing the demand for milk, increasing the prices paid to the producers, inducing technological modernization and opening the market to family producers.

However, with regard to the implementation of the program, certain pertinent and well- founded restrictions were pointed out by most of the producers of the groups surveyed.

The following items describe the problems arising from the criticisms made by the producers taking part in the surveys:

:: The transport of milk from the farm to the plant: the Program does not provide for the transport of milk from the farm to the plants' milk reception conveyor belt, being up to each individual producer to provide transportation and cover the cost. It is obvious that the greater an individual's milk production and the closer it is to the plant, the lower the unit transportation cost will be per liter of milk. On the other hand, the smaller and more isolated a producer's property is, the higher the transportation cost. In certain regions, the plant provides the transportation, but deducts the cost from the producers' income. In other regions, as mentioned above, intermediaries end up taking advantage of the situation. In these cases, the transportation costs tend to be quite high, which transfers to the intermediary a great deal (if not all) of the producers' Program subsidies. In other words, the producers, whose production profiles are closest to those the Program seeks to benefit (small family farmers), are exactly those who are obliged to pay higher costs to transport the milk. Therefore, these producers end up receiving the lowest net income for the milk offered and have few reasons to join the Program;

:: Late milk payments: another problem that has strongly affected the Program is the widespread criticism among the surveyed farmers regarding the late payments for the milk. These late payments tend be long and frequent, and end up excluding smaller producers from the Program since they do not have enough money to hold them over until the payments are made. By allowing these late payments, the Program, which theoretically gives priority to purchasing milk from family farmers, in practice ends up restricting the participation of these producers on the market;

:: The establishing of milk acquisition quotas: the establishing of a biannual quota of R$ 2,500.00 (two thousand five hundred reais), as the milk acquisition limit from each producer, shall actually inhibit the supplying of milk to the Program by large producers. In the short run however this measure cannot ensure the supplying of milk by small family farmers. This measure only ensures that smaller producers are given priority

as suppliers, but does not guarantee that this will actually take place. Thus, it is not enough to announce to the small producers that they will be given priority; it is essential that this announcement be backed by concrete measures so that they can actually exercise this right. This will only be possible when the process becomes economically viable for both the producers and the plants. This viability assumes, for example, that the producers be organized in groups and be capable of jointly offering a volume of milk that would justify the transportation cost. Consequently, the transportation will certainly require investments for the installation of refrigerated storage tanks, among others. In concrete terms, the strict compliance with the quotas will mean a sharp reduction in the volume collected by the Program and, consequently, a sharp decline in the supply of milk destined to needy groups that depend on it, as is the case in Bahia. At the same time, there should be an immediate expansion in the supply of milk to be marketed with a subsequent drop in price;

:: Precarious interaction between the Program and its suppliers: this issue has subjective consequences that were not explicitly verbalized, but which nevertheless were conveyed indirectly in the statements of those interviewed. The lack of a systematic means of communication between the Program's coordinators and its suppliers provokes a sense of isolation in the latter. The impression is that, from the supplier's perspective, the Program is some sort of superior well-intentioned being, albeit abstract and distant. There is no interaction between the two, only with the plants, which end up being regarded as hierarchically higher entities. In these circumstances, the producers see themselves as secondary agents in a context governed by a Government-Plants relationship.

As currently set up, the Program only offers economic opportunities to the small producers. This is implicitly founded on the idea that the small family producers themselves would have a positive reaction towards these stimuli, and would seek to take advantage of the opportunity. In reality, however, the small producers have not been able to participate in the Program. There are obstacles between the producers and the Program, which they, on their own, will not be able to overcome. Incentives are not enough; it is necessary to reach out to the small producers, to help them

reach the market. This does not mean adopting a paternalistic stance; it means helping them deal with complex and costly organizational tasks which for them prove difficult for lack of experience and financial resources.

The spatial dispersion and the lack of associative culture are the two main obstacles that need to be overcome so that the small producers may, independently, benefit from the opportunities offered by the Program.

The correction of the distortions mentioned above requires the elimination of certain bureaucratic barriers of the Program, and a new stance with regard to its relation with small family farmers.

From a pragmatic perspective, the following suggestions are made in order to overcome the problems detected:

:: To review the decision regarding the imposition of a biannual quota of R$ 2,500.00 (two thousand five hundred *reais*) for milk acquisitions. In this regard, the suggestion made by FADE must be pointed out, stated in the Program's First Evaluation Report. The suggestion was to maintain a daily maximum acquisition limit of 100 liters per producer, exclusively for farmers duly certified with the Pronaf Eligibility Declaration (DAP), with the following remuneration criteria: up to 30 liters, the price regularly offered by the Program; the remaining milk (up to 70 liters/producer/day), R$ 0.02 (two *centavos*) lower than the price regularly paid by the Program[6]. The R$ 0.02 centavo difference per liter would be used towards a fund, aimed at funding the organizing of groups of family farmers who, in the next stage, would become suppliers. In a State purchasing 100,000 liters daily, if this total were to be purchased from producers providing more than 30 liters daily[7], a daily revenue of R$ 1,400.00 (one thousand four hundred reais) would be generated. This revenue would be enough to install a new refrigerated tank every ten days on average, which is the most crucial investment item needed to support the forming of new groups of suppliers. As a complementary measure, priority would be given to milk supplied by these new groups of small producers;

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6   Two centavos is a randomly chose value. It could also be determined as a result of further analysis, considering the reality of each state.
7   In cases in which all suppliers offered 30 liters or less, the fund's revenue would be null, since all the criteria established by the Program would be met in full.

:: To conduct a survey of the geographic location of small producers potentially willing to participate in the Program, also aimed at preparing a feasibility study of new groups of suppliers. The establishing of these groups would be funded by the resources proposed in the previous item;

:: To demand a more aggressive attitude by the States regarding the promotion and support of the organizing of small producer associations;

:: To channel resources of correlate programs in order to increase the collective impact of the Program's objectives. Toward this end, the availability of credit to cover investments and costs of the Program's milk suppliers would offer new opportunities so that many of these producers may become participants of the Program;

:: To adopt measures that ensure that strict timely payments are made of the milk purchased by the Program;

:: To set up a direct means of communication between the Program and its suppliers, to increase the awareness of the latter regarding the importance of their role and the true dimension of the former, and to be continuously informed and integrated to the entire process.
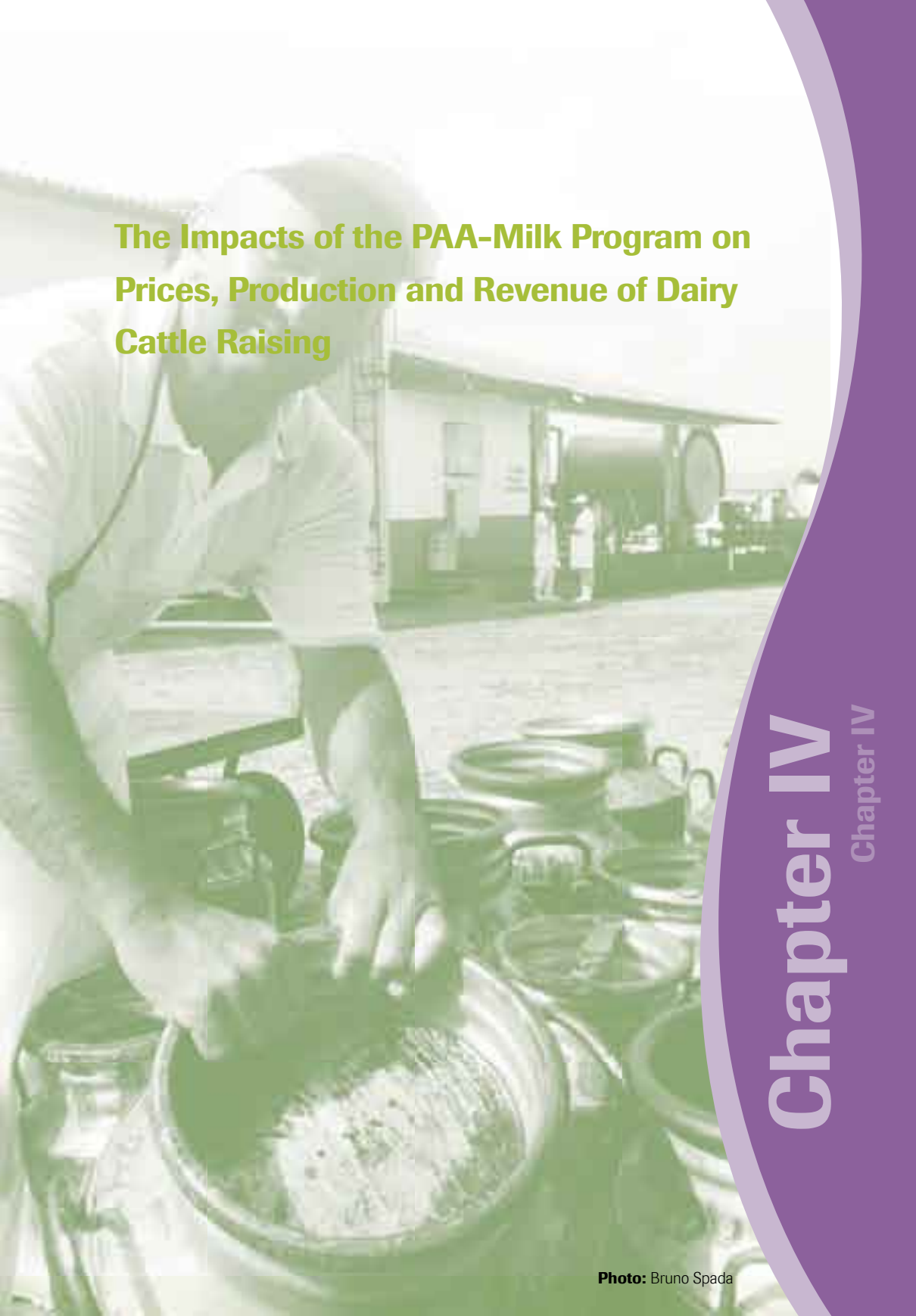
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The Impacts of the PAA–Milk Program on Prices, Production and Revenue of Dairy Cattle Raising

Photo: Bruno Spada

The Impacts of the PAA-Milk Program on Prices, Production and Revenue of Dairy Cattle Raising[1]

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1   Introduction

The structuring of the Food Acquisition Program – Milk version (PAA-Milk) was based on the concept of nutritional security. In a wider sense, this concept aims to develop initiatives to ensure that all citizens, especially the poor, have access to daily food intake, in quantities, quality and regularity for adequate health and well-being. This Program aims to promote the consumption and family production of milk, and to reduce social vulnerability through the alleviation of hunger and undernutrition. It also contributes towards the strengthening of family production, through the purchase and distribution of milk at guaranteed prices.

The objectives of the PAA-Milk include:

::   The alleviation of hunger and undernutrition for individuals in situations of social vulnerability and/or of nutritional or food insecurity, through the distribution of one liter of milk per day to beneficiaries with per capita family income of up to one half minimum salary, limited to two liters/day per family;

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1   Study carried out by the Federal University of Pernambuco, in the period between June, 2005 and February, 2006, in the following states: Piauí, Rio Grande do Norte, Ceará, Paraíba, Pernambuco, Sergipe, Bahia and Minas Gerais. It was coordinated by the professors André Matos Magalhães and Alfredo Soares.

2   Professors of the Federal University of Pernambuco.

:: The monitoring of the nutritional status and health of beneficiaries;

:: The strengthening of the family agriculture production sector;

:: The guarantee, to family farmers, of the purchase of milk at prices compatible with regional costs.

In this regard, the PAA-Milk program represented a large share of the demand for milk in those states and regions where the program was implemented. As a consequence, a significant impact on the equilibrium price of the milk market was expected, as well as on the quantities produced. In some cases, as in Pernambuco for example, the expectation that the Program would be able to affect the price of milk was one of the main motivating factors for its implementation. At that time, the price was excessively low due to competition with imported powdered milk, and there was hope that the Program would increase the price of fresh milk. Therefore, this would be a possible solution towards the recovery of an important sector of the local rural economy, adversely affected by European and American subsidies, making powdered milk cheaper than Brazilian production costs[3].

Price increases would thus have consequences for the entire productive chain. Even those not directly benefited by the Program, for not qualifying as suppliers would be indirectly benefited, due to the increase in the price of milk on the market. Expectations regarding the capacity of the Program in increasing the price of milk, and the subsequent impact upon the expansion of regional supplies, justify thus the aims of this study, which were to quantify the impact.

It was initially determined that the price impact would be based on data collected through a quantitative survey, conducted among cattle raisers in the region. However, it was verified that this type of survey presented limitations regarding the evolution of the process in time. After examining the issue in more detail, it was decided that a more robust and comprehensive alternative methodology should be adopted, to substitute the one called for by the initial project.

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3   The exchange rate at the time was highly unfavorable, due to the appreciation of the *Real*. This had a negative impact on the competitive edge of milk produced in Pernambuco.

In the new proposed model, time series were used for each one of the states where the survey was conducted, considering the various levels of participation of the Program in the demand for milk. A scenario in which the PAA-Milk program purchases were zero, was simulated in order to determine the probable price and production of milk, in the event the Program were not implemented.

However, the new methodology was not totally immune to problems. Although there were monthly price series available for producers, the production series were annual. This limitation imposed new restrictions to the proposed model, which was subsequently altered, as outlined in its final version, and by the econometric results presented below. In order to avoid information losses, prices were estimated based on monthly data, in situations with and without the Program. However, production estimates were based on annual data, and the final equation was adapted to allow a flexible model that would be able to determine the PAA impact.

By combining the impacts on prices and the quantities produced, it was possible to obtain an estimate of the revenue gains generated by the Program for the overall set of rural producers in the several states surveyed.

As may be verified by the figures and graphs presented below, the PAA-Milk program did affect the price and the production of milk in most of the benefited States. The effect upon prices was more intense in certain states in comparison to others, and tended to be greater in those states where the Program offered higher prices and where production shares were higher.

2   Relation Between Prices and Production

Dairy cattle raising is a peculiar economic activity, whose operational logic differs from those prevailing in other types of business, where supplies vary directly according to market prices. In the case of cattle raising, the direct link between supply and price does not always take place, since the main component of the productive capital (the cows) multiplies in a vegetative manner, i.e., through the natural reproduction of the herds, which follows a supply expansion trend, regardless of market price increases.

In reality, when dairy cattle are raised in inhospitable regions, such as in the vast areas of Brazilian territory covered by the PAA-Milk program – where economic alternatives are scarce, due to soil or climatic restrictions –, the vegetative growth of production is more persistent, and producers are obliged to remain in this area of activity, even when profits drop and remain practically zero.

As is publicly known, the Brazilian Gross National Product (GDP) has not grown significantly in the last 25 years, and the country's income has become increasingly concentrated. Consequently, the demand for milk has increased at rates that are lower than those of the vegetative growth in production, which ultimately increases idle capacity, leading to drops in market prices.

The data obtained in this study, regarding prices and production of milk in Brazil, in particular the Northeastern states participating in the Food Acquisition Program (PAA-Milk), are proof of this theory, as may be seen the graphs presented below. The graphs present the real prices paid to producers and the total milk production in various states, between 1990 and 2004. These series were converted into indexes, the baseline being 1990. With the exception of the state of Paraíba, whose production growth trend is not as clear as in the other states, there has been a gradual growth in supply, with significant drops in real prices.

The trends in production growth and price decreases, however, are not linear, nor are they exclusively due to the vegetative growth of herds. There are other contextual factors that have contributed towards the isolated development of each one of these phenomena. The productivity gains resulting from the systematic improvements in the genetic stock of the animals, for example, have significantly helped explain the positive evolution of the supply. The appreciated rate of exchange, and the subsequent increases in powdered milk imports which took place in the 90s, were undoubtedly responsible for the price decreases observed throughout the country. These factors, however, do not justify the simultaneous and persisting downturns of the two trends.

The only sharp drops in production, in 1993 and 1998, were related to droughts in the Northeast, and not to the unfavorable behavior of market prices. In 1993, for example, the drought affected all the Northeastern states and the Northern

part of the state of Minas Gerais. According to data from the Superintendence for the Development of the Northeast (SUDENE), more than 1,800 producers lost their harvests and were enlisted in the so-called "emergency fronts".

Graph 1: Milk production and price indexes in
Ceará – 1990 to 2004 (1990 = 100)
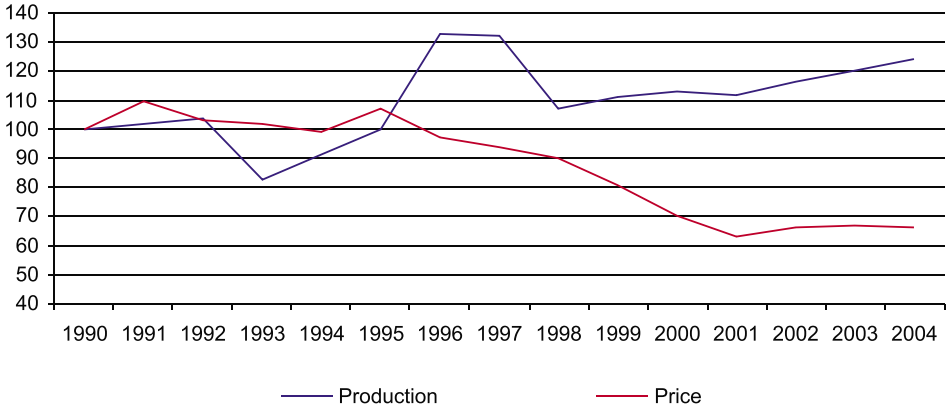
Source: Getúlio Vargas Foundation (FGV), and the Brazilian Institute
of Geography and Statistics (IBGE)

Graph 2: Milk production and price indexes in Rio
Grande do Norte – 1990 to 2004 (1990 = 100)
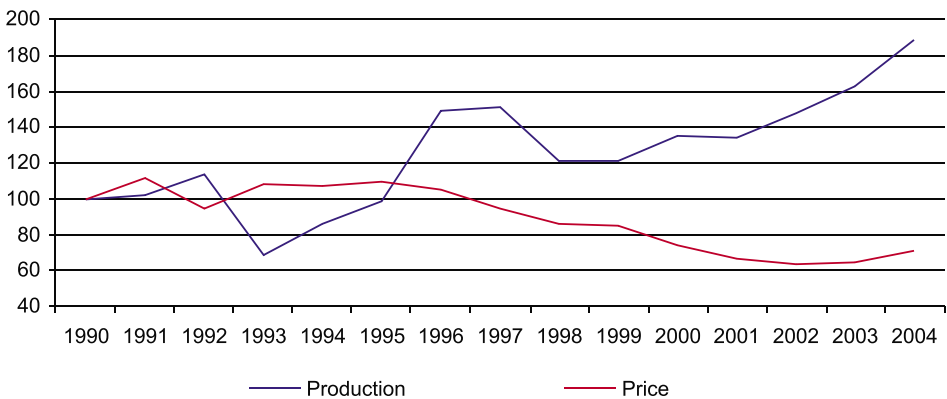
Sources: FGV, for the price series; IBGE for the production series

Graph 3: Milk production and price indexes in
Paraíba – 1990 to 2004 (1990 = 100)
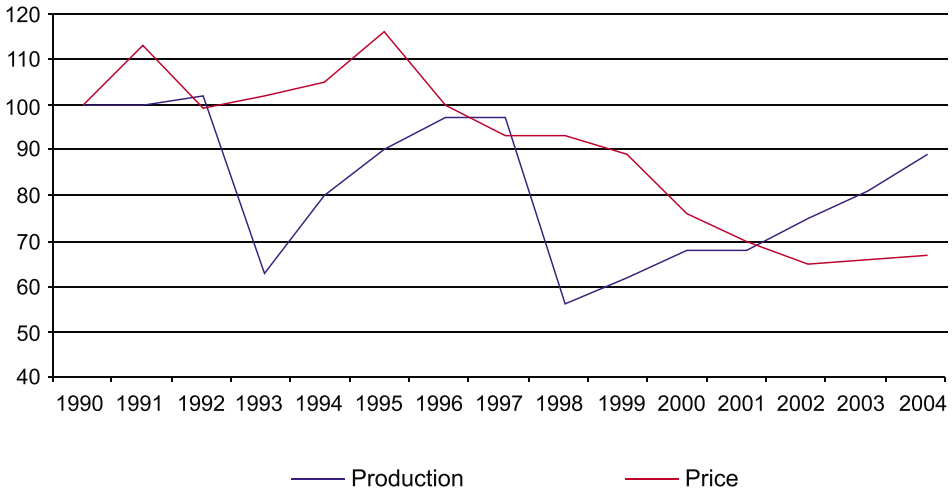
Sources: FGV, for the price series; IBGE for the production series

Graph 4: Milk production and price indexes in
Pernambuco – 1990 to 2004 (1990 =100)
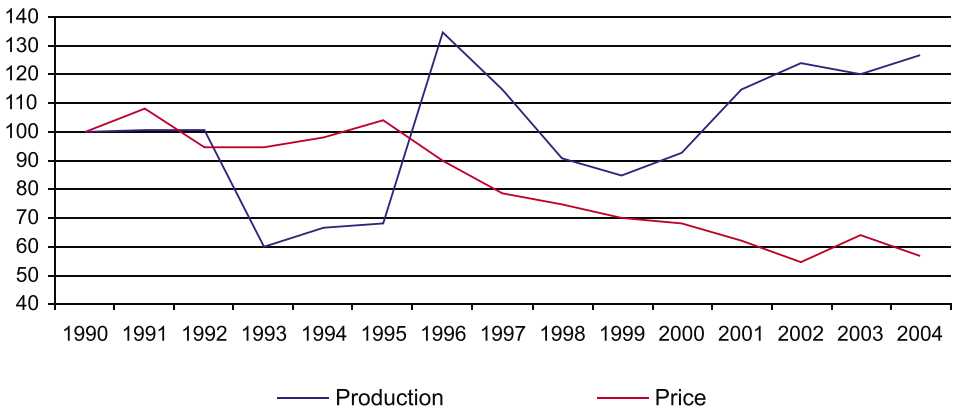
Sources: FGV, for the price series; IBGE for the production series

Graph 5: Milk production and price indexes in
Sergipe – 1990 to 2004 (1990 =100)
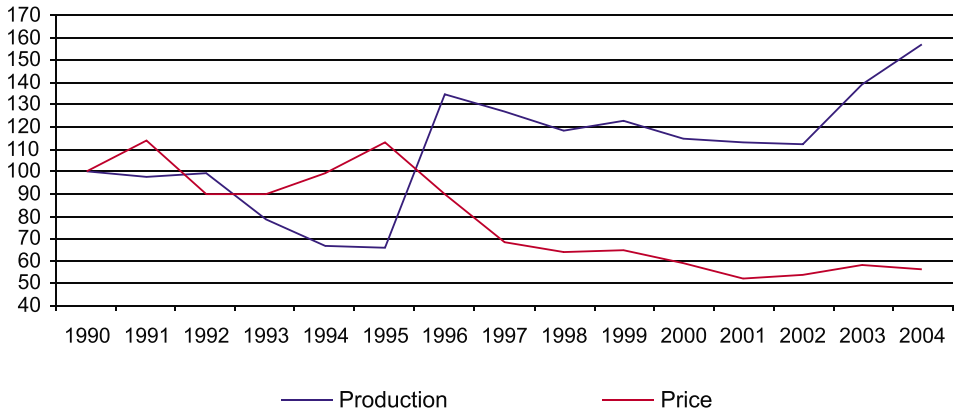
Sources: FGV, for the price series; IBGE for the production series

Graph 6: Milk production and price indexes in
Bahia – 1990 to 2004 (1990 = 100)
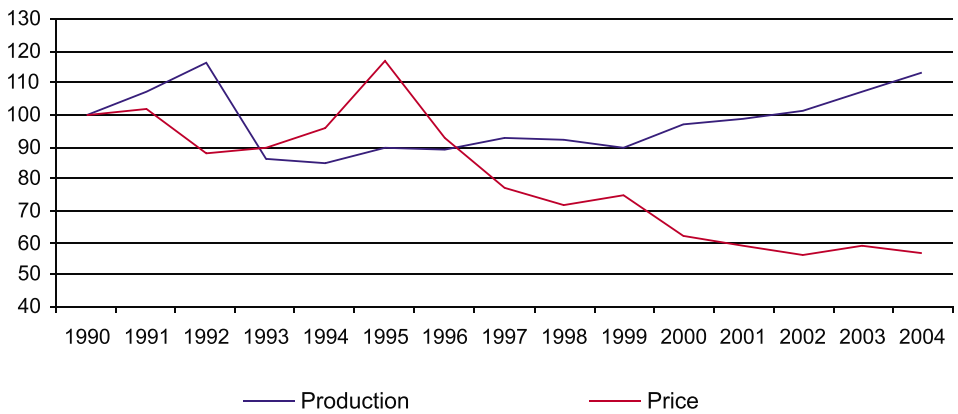
Sources: FGV, for the price series; IBGE, for the production series

Graph 7: Milk production and price indexes in
Minas Gerais – 1990 to 2004 (1990 =100)
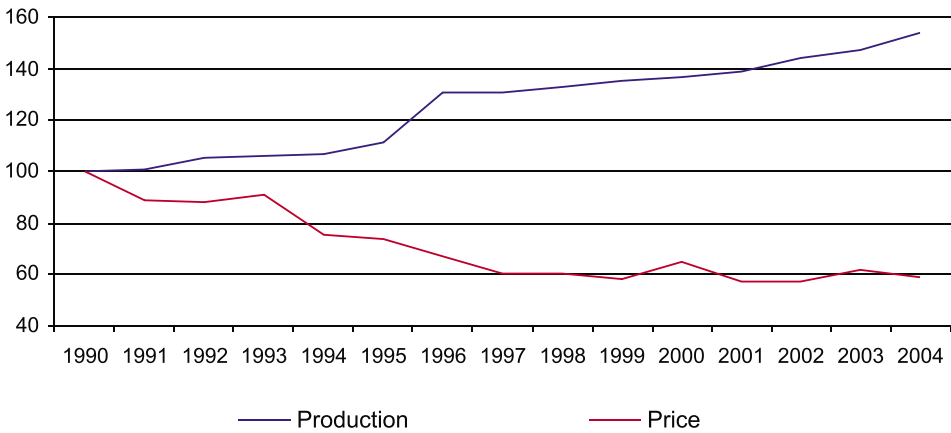
Sources: FGV, for the price series; IBGE for the production series

3 Relation Between the Price Determined by the PAA–Milk Program and Market Prices

The presence of the PAA-Milk program involves the systematic purchase of a significant share of the milk produced in areas where the Program was implemented, at prices arbitrarily higher than those prevailing previously on the market. In this regard, the Program imposed itself on the market, and priority was given to meetings its demands, by subtracting from the market supply a volume of milk equal to its purchases. Since the milk purchased by the Program was distributed among those in need, who were excluded from consumer market, there was no retraction in demand, making it reasonable to expect an immediate increase in the price of milk and, consequently, net revenue increases for producers. These increases in revenue would subsequently promote more investments in the sector, accelerating an increase in supply and, as a result, the resumption of the historic decreasing price trend.

Since the nominal prices offered by the Program tend to remain stable for extended periods, inflation would then responsible for a decline in real prices, in step with drops in market prices, as may be seen below.

The following charts present a comparison, in real terms, of the prices offered by the PAA- Milk in the states of Pernambuco, Paraíba, Rio Grande do Norte, Ceará, Bahia and Minas Gerais. The states of Maranhão, Piauí and Alagoas were excluded from this analysis, due to a lack of information.

As may be observed, with the implementation of the PAA-Milk program, the aim was to establish nominal prices above those practiced on the market, which would be maintained for extended periods of time. During these periods, inflation corrodes values, and market prices tend to converge and surpass, in real terms, the reference prices established by the Program. In all states, except for Paraíba, all prices are currently equal to or higher than those of the Program.

3.1 Pernambuco

In Pernambuco, as may be seen in Graph 8, real prices have recently had a strong and consistent decreasing trend. In 1997, producers received, in real terms, approximately R$ 0.90 (ninety *centavos*) per liter of milk. In 2005, this value dropped to less than R$ 0.60 (sixty *centavos*) per liter.

In 2000, the state milk distribution program was implemented. This program fixed a nominal price for milk of R$ 0.48 (forty eight *centavos*) per liter, which then increased to R$ 0.52 (fifty two *centavos*) per liter, as a result of the partnership with the federal government to implement PAA.

As may be observed, at the outset of the state program, the price was higher than the market price. But as of 2003, the real price paid by the Program had dropped to a value below the one freely paid by the market.

Graph 8: Price of milk paid to producers and the price of milk purchased by the Program in Pernambuco – January, 1997 to June, 2005 (R$/liter)

——— Price of milk paid to producers ——— Price of milk in the Program
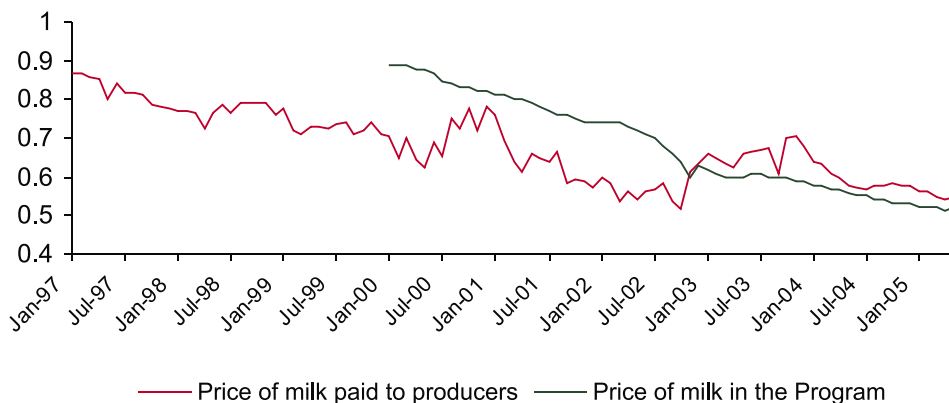
Source: FGV and the Agricultural Secretariat of the State of Pernambuco

3.2 Paraíba

As in Pernambuco, the state of Paraíba also set up a state milk acquisition program in 2000, subsequently strengthened by the Federal government at the end of 2003. Starting out with a nominal value of R$ 0.60 (sixty *centavos*) per liter, the state program, in 2002, increased this price to a real price of R$ 0.70 (seventy *centavos*) per liter (as per Graph 9) at 1990 prices.

Overall, the real market milk price dropped from more than R$ 1.00 (one *real*) in 1997, to less than R$ 0.70 (seventy *centavos*) in 2005. Notwithstanding the drop in the real value, the price paid by the Program was greater than the price paid by the market, according to Getúlio Vargas Foundation (FGV) data. It must be pointed out that this difference, favoring the price of the Program, has dropped in recent years, indicating a trend that has been observed in the other states.

Graph 9: Price of milk paid to producers and the price of milk purchased by the Program in Paraíba – January, 1997 to June, 2005 (R$/liter)
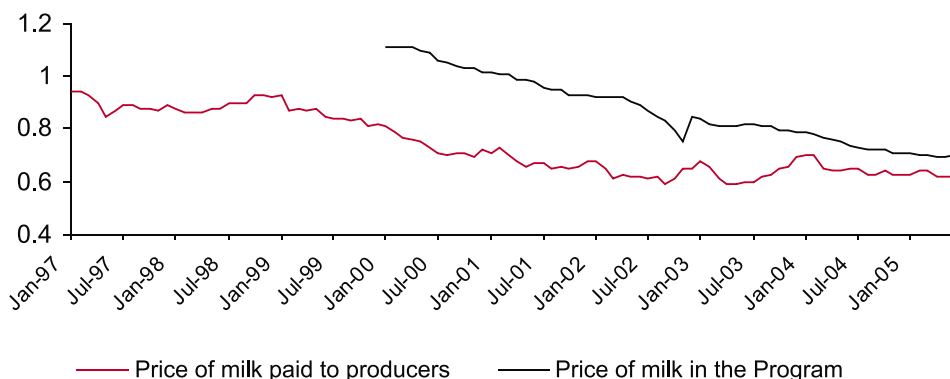
Source: FGV and the Agricultural Secretariat of the State of Paraíba

3.3 Rio Grande do Norte

As in the cases of Pernambuco and Paraíba, a state milk distribution program was also set up in the state of Rio Grande do Norte in 2000. Graph 10 below presents the real market prices and those determined by the state program, between 2000 and 2005. Initially, this price was R$ 0.48 (forty eight *centavos*) per liter, a price which remained stable until the beginning of the federal program. As of January 2004, with the implementation of the PAA-Milk program, the price increased to R$ 0.70 (seventy *centavos*) In real terms, in spite of the increase which took place in January, 2004, the price paid by the federal program is now practically equal to that paid by the market.

Graph 10: Price of milk paid to producers and the price of milk purchased by the Program in Rio Grande do Norte – January, 1997 to June, 2005 (R$/liter)

Price of milk paid to producers —— Price of milk in the Program
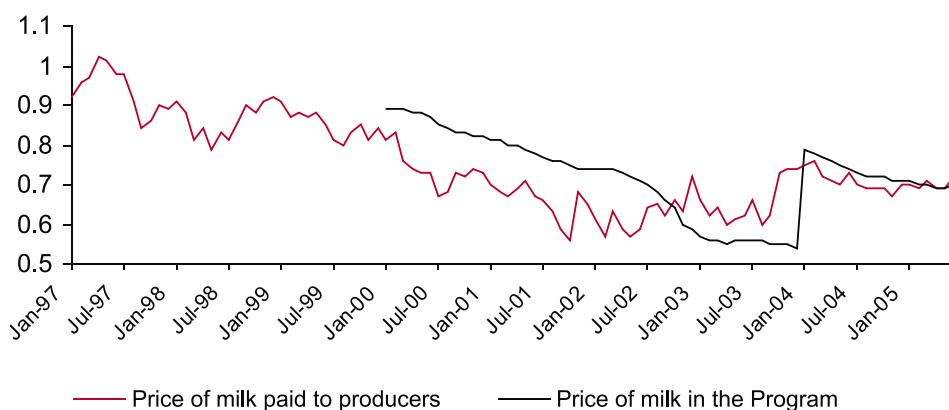
Source: FGV and the Agricultural Secretariat of the State of Rio Grande do Norte

3.4 Sergipe

The PAA-Milk program was set up in Sergipe in January, 2004. The priced determined for milk was R$ 0.55 (fifty five *centavos*) per liter, which has dropped in real terms since then. The market price paid to producers also dropped during the period the Program was effective, as may be seen in Graph 11. In spite of the fact that this same trend has been observed in the other states surveyed, in Sergipe there was a relatively lesser decrease in prices paid to producers, dropping from R$ 0.70 (seventy *centavos*), in 1997, to nearly R$ 0.50 (fifty *centavos*) in 2005.

Graph 11: Price of milk paid to producers and price of milk purchased by the Program in Sergipe – January, 1997 to June, 2005 (R$/liter)

Price of milk paid to producers ——— Price of milk in the Program
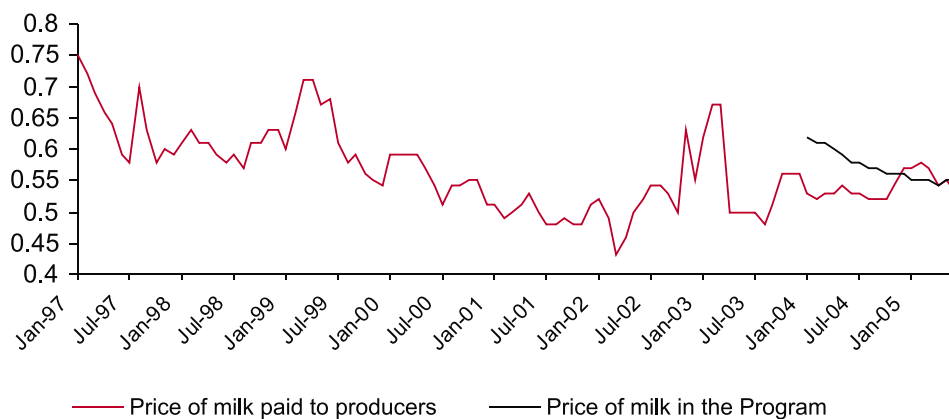
3.5 Bahia

In the state of Bahia, the PAA-Milk program was initiated in January, 2004. In nominal terms, as of the first month of activity, the price of milk paid by the Program was established at R$ 0.50 (fifty *centavos*) per liter, and did not change during the time this study was conducted. In real terms, this meant a decrease during the period, as may be seen in Graph 12.

Another series presented in the same Graph indicates the real prices paid by the market in this state, which dropped from almost R$ 1.00 (one *real*) per liter in 1997, to little less than R$ 0.60 (sixty *centavos*) in 2004.

Graph 12: Price of milk paid to producers and price of milk purchased by the Program in Bahia – January, 1997 to June, 2005 (R$/liter)

Price paid to producers ——— Price paid by the Program
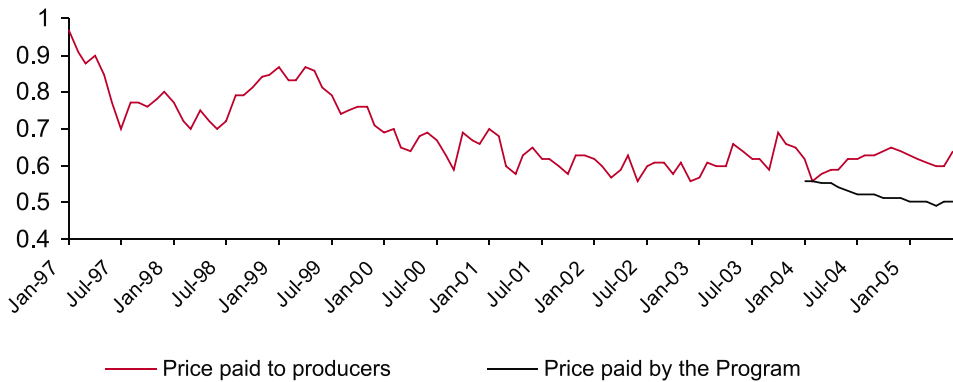
3.6 Ceará

In the state of Ceará, the nominal price paid by the PAA-Milk program was fixed at R$ 0.60 (sixty *centavos*) per liter, and did not change during the period analyzed. The real price paid to producers dropped significantly between 1997 and 2005, as may be seen in Graph 13.

In the second half of 2002, the price presented an upward trend, but a downward movement followed immediately afterward. As of 2004, the market price and Program price series followed similar behaviors, with the price of the former always above the price of the latter.

Graph 13: Price of milk paid to producers and price of milk purchased by the Program in Ceará – January, 1997 to June, 2005 (R$/liter)


——— Price of milk paid to producers   ——— Price paid by the Program
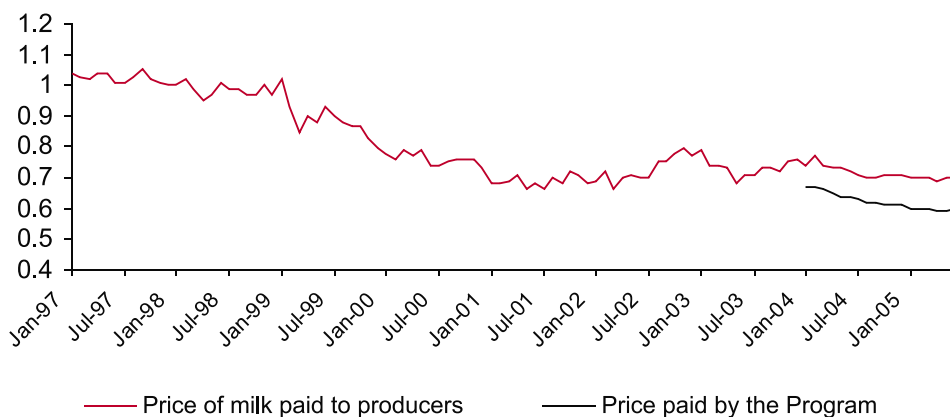
3.7 Minas Gerais

In Graph 14 below, presented is a comparison between the prices of milk purchased by the PAA-Milk program and of the milk destined to the market. Different than the other studies, the reference prices for the state of Minas Gerais were not provided by the FGV.

The data presented are in real August, 2005 values, and were provided by the Agricultural and Livestock Federation of the State of Minas Gerais (FAEMG). These data followed the same trends observed in the other states.

Graph 14: Price of milk paid to producers and price of milk purchased by the Program in Minas Gerais – January, 1997 to June, 2005 (R$/liter)


Price of milk paid to producers —— Price paid by the Program
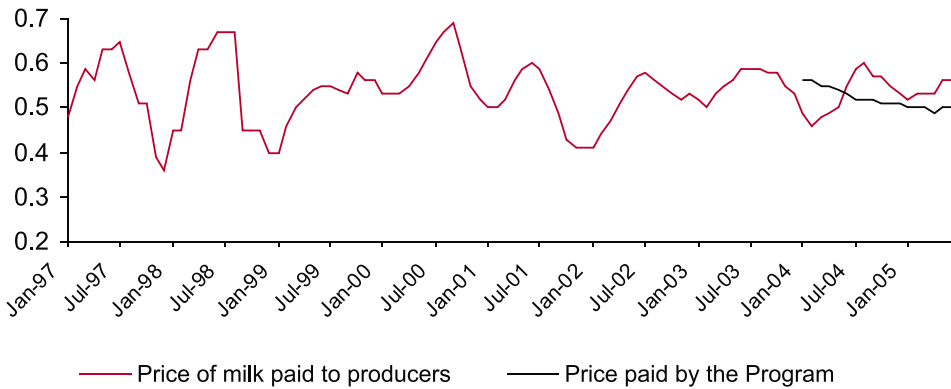
4   Impacts of the PAA-Milk Program on Prices

In this section, the results of the estimates of the impacts of the PAA-Milk program on market prices are presented. As may be seen, impacts varied from state to state due, among other factors, to the volume of milk purchased by the Program, in proportion to total production (of the state). In order to evaluate these impacts, an equation derived from the demand and supply models was used (described in the annex), which included the quantity of milk purchased by the Program as an explicative variable.

Graph 15 depicts the participation of the Program in annual milk purchases in the states surveyed for 2004. The annual production data were obtained from the Brazilian Institute of Geography and Statistics (IBGE); the volumes purchased were provided by the state coordinating committees. From the figures, it was estimated that the Program had a more significant impact in the states of Paraíba and Rio Grande do Norte, for example, in comparison to the state of Minas Gerais.

Graph 15: Share of purchases in total production in the states - 2004
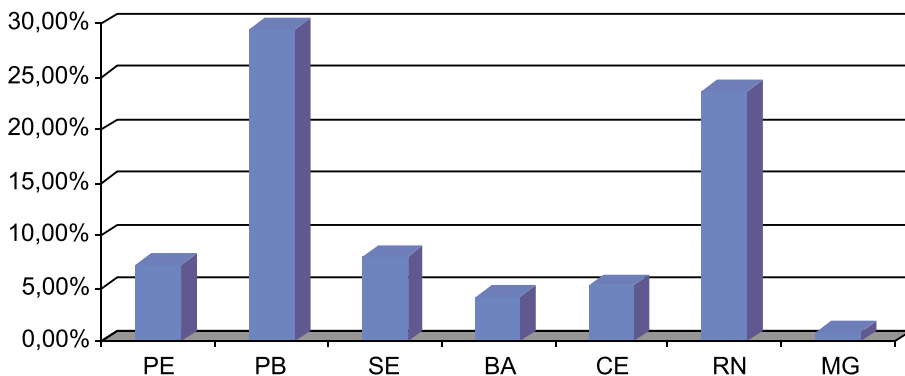
The econometric model mentioned above used monthly data provided by the FGV for the period between January, 1997 and June, 2005. This institution, however, does not gather information on the price of milk in the states of Alagoas and Piauí, which is why these two states were excluded from this study. The state of Maranhão was also excluded from this study due to the fact that the Program was only initiated there in 2005.

The states of Pernambuco, Paraíba and Rio Grande do Norte had already been benefited by state milk acquisition programs as of the year 2000, and thus the surveys of these states were based on Program data for this period.

4.1 Results

Based on the model's results, the price series were estimated for the various states, under the hypothesis of the absence of the PAA-Milk program. The difference between the real and estimated series provided the indicators of the Program's impacts, which are described below.

4.1.1 Paraíba

In the state of Paraíba, where the Program purchased, in 2004, 29.5% of all the milk produced in the state, the results indicated significant impacts. Graph 16 presents a comparison between the prices actually received by the producers in this state, and the corresponding price series that, according to the estimate, would be in effect if the Program were not implemented.

Graph 16: Price of milk paid to producers and estimated price of milk without the milk program in Paraíba – January, 1998 to June, 2005 (R$/liter)
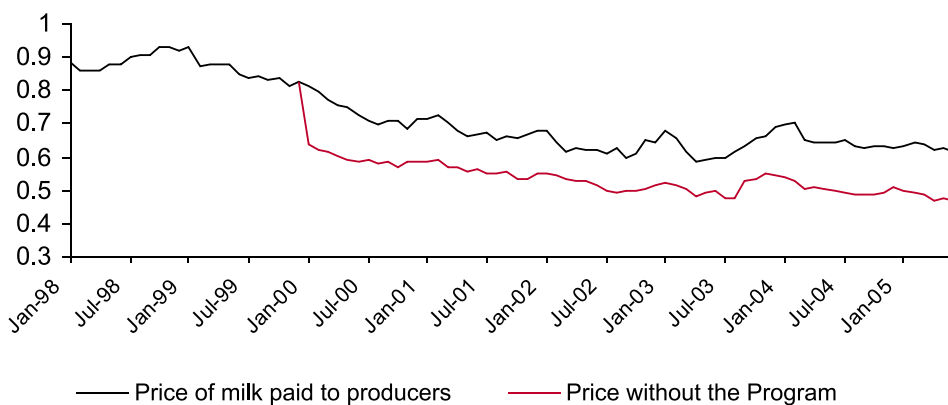
Source: FGV, authors' simulation

As may be seen in the graph above, the price of a liter of milk would be lower without the Program. Considering only the period the PAA-Milk was operational, the average difference in price converged towards approximately R$ 0.14 (fourteen *centavos*) per liter, reaching R$ 0.16 (sixteen *centavos*) a liter in February, 2004. For this period, the average percentage reduction in the market price was 22.4%. These results indicate that the PAA-Milk program was effective in the state of Paraiba, with an increase in the price of milk paid to producers.

4.1.2 Rio Grande do Norte

Repeating the procedure describe above for the case of the state of Paraíba, and with the use of the same equation, the situation depicted in Graph 17 was obtained.

Graph 17: Price of milk paid to producers and price of milk purchased by the Program in Rio Grande do Norte – January, 1999 to June, 2005 (R$/liter)


As may be observed in this graph, with the implementation of the PAA-Milk program the average difference between prices, with and without the Program, converged towards nearly 0.15 (fifteen *centavos*) per liter, reaching 0.18 (eighteen *centavos* per liter) in April, 2005.

As in the state of Paraíba, the results indicated that the PAA-Milk program in Rio Grande do Norte was effective, as a result of the increase in the price paid to producers. The effect was felt previously during the state program, and was intensified with the implementation of the federal Program.

4.1.3 Sergipe

The hypothesis of whether the PAA-Milk program had an impact on prices paid to producers in the state of Sergipe was tested with the same equations used for the other states. The results indicate that the Program altered the market price.

Graph 18: Price of milk paid to producers and price of milk purchased by the Program in Sergipe – January, 1997 to June, 2005 (R$/liter)
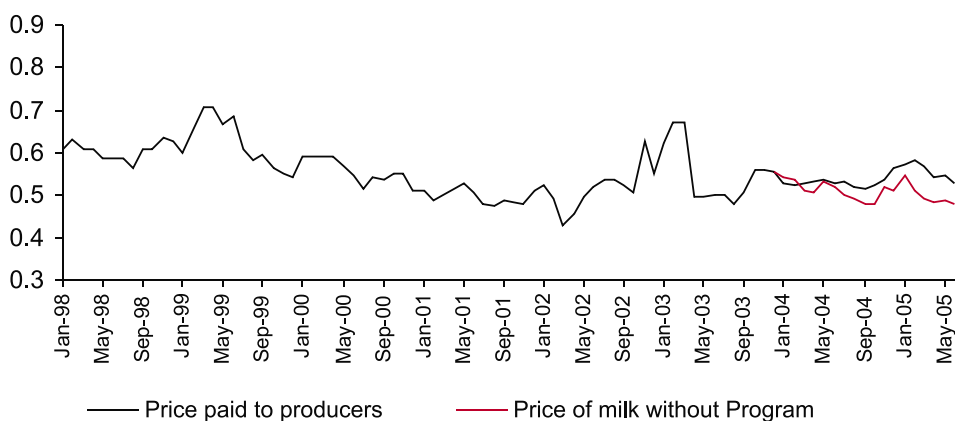

Source: FGV, authors' simulation

According to Graph 18, the absence of the Program implicated a reduction in the price of milk paid to producers. The average reduction, between 2004 and 2005, was nearly R$ 0.03 (three *centavos*) per liter, representing a 6% reduction in the average price of a liter of milk.

4.1.4 Bahia

The same calculation procedure used for the states mentioned above was utilized to obtain the price series for a liter of milk in the state of Bahia, under the hypothesis of the absence of the PAA-Milk program, as indicated in Graph 19 below.

As may be observed, the absence of the Program would have led to a significant reduction in the price of milk paid to producers. This reduction reached approximately R$ 0.10 (ten *centavos*) per liter in June, 2005. In average terms, however, this reduction was R$ 0.04 (four *centavos*) per liter, representing a 6.7% reduction in the average price of milk in the period. These results indicate that, as in the states analyzed above, the PAA-Milk program had a significant impact on the price of milk paid to producers in the state of Bahia.

Graph 19: Price of milk to producers and estimated milk price without the milk program in Bahia – January, 2000 to June, 2005 (R$/ liter)
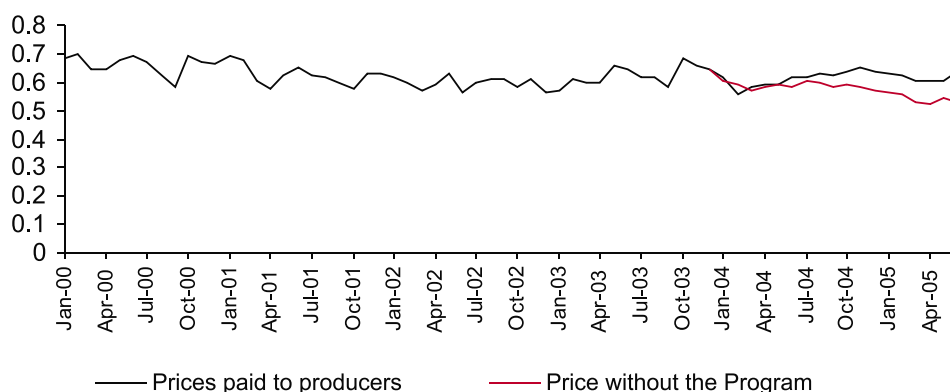
Source: FGV, authors' simulation

4.1.5 Ceará

According to Graph 20, the application of said methodology led to the conclusion that the absence of the PAA-Milk program would implicate a significant reduction in the price of milk paid to producers. This reduction would reach R$ 0.11 (eleven *centavos*) per liter on average, equal to R$ 0.08 (eight *centavos*) per liter, representing a 11% reduction in the average price of a liter of milk for the period. These results indicate that the program had a significant impact on the price of milk for producers in the state of Ceará.

Graph 20: Price of milk to producers and estimated milk price without
the milk program in Ceará – January, 2000 to June, 2005 (R$/ liter)
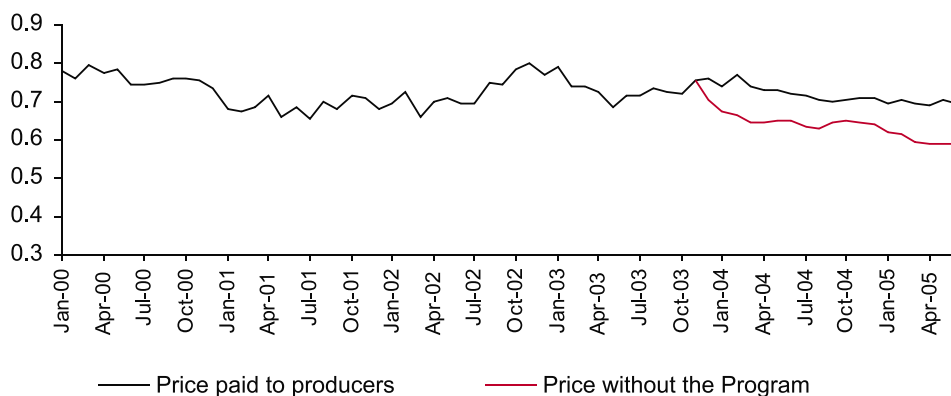
4.1.6 Minas Gerais

The econometric analysis did not indicate positive impacts of the PAA-
Milk Program on the market prices in the state of Minas Gerais. This result was
technically expected, since the Program only covered a small portion of the state,
and the volume of milk purchased by the Program represented less than 1% of the
global production of the state.

4.1.7 Pernambuco

As in the case of the state of Minas Gerais, the PAA-Milk program also did
not have a significant impact on the market prices in the state of Pernambuco. The
volume of milk purchased by the Program in this state, however, represented nearly
7.2% of the overall state production. Interestingly, the volume purchased surpassed
states such as Bahia and Ceará, where the Program's impact was significant.

However, the small impact of the Program on the market price of milk
in the state of was due to another reason. It is reasonable to suppose, given this
state's tradition in livestock raising, that in terms of production, that the relation

between the installed capacity and market demand would be equal to or greater than that of the neighboring states of Paraíba and Rio Grande do Norte. If this were the case, its idle capacity would be relatively great and, consequently, its milk supply would be sufficiently elastic to absorb the Program's demand (which is relatively small, in comparison to neighboring states), but not sufficient to have an impact on the market price. In the states of Paraíba and Rio Grande do Norte this impact exists but, in each one of these states, the volume of purchases made by the Program, as a share of overall production, was three to four times greater than in the state of Pernambuco. On the other hand, the prices offered by the PAA in these states was nearly 40% greater than in the state of Pernambuco. In other words, given the idle capacity of the livestock sector of the state of Pernambuco, it would be necessary to increase the Program's volume of purchases substantially, if the aim were to have an impact on market prices.

5   Impacts on Revenue

Besides the impacts on the price of milk paid to producers, the impacts on production and overall revenue of the producers were also estimated. To calculate the impact on production, the hypothesis used was that the absence of the PAA-Milk program would represent a reduction in production equal to the total purchased by the Program. Implicit in this calculation is the idea that the milk purchased by the PAA-Milk is delivered to a public that does not participate in the current demand for milk, for not having enough income to do so. If the PAA-Milk program were to be terminated, this demand would cease to exist, and production would tend to drop. This production was determined based on the average real price paid by the Program in 2004. Lastly, the variation in revenue corresponded to the total variations in price and production generated by the Program. These results are presented in Table 1.

This table presents the total purchases of the PAA-Milk program in 2004, the total produced in that year, the average market price paid to producers, the average real price paid by the Program, the simulation of a decrease in production

and in the product market price – in the absence of the Program – and the drop in revenue for producer, by state.

It may be observed that the greatest relative impacts took place in the states of Paraíba and Rio Grande do Norte where the Program had a higher participation. In the state of Paraíba, there would have been a 56% drop in revenue for producers if the Program had not been implemented, and in the state of Rio Grande do Norte, this reduction would be 45%. In the remaining states, producers were greatly benefited by the PAA-Milk program. In the state of Ceará, the absence of the Program would bring about a 15% decrease the revenue of producers of this state; in Sergipe, this drop would be 13%. The revenue of the producers of the region in the state of Minas Gerais benefited by the Program would drop by 29 million reais per year. This figure would represent 18% of the average revenue of these producers, in 2004. The states in which the impacts would have been lesser are Pernambuco and Bahia. In both cases, the reduction would be less than 8% of the total average revenue.

Table 1: Summary of the results per state surveyed – Impacts in 2004

States	Annual purchases of the PAA (1,000 l.)	Total produced in the state (1,000 l.)	Average real price paid to producers on the market	Real price paid by the PAA
MG[c]	54,900	297,601	R$ 0.53	R$ 0.53
BA	36,600	842,544	R$ 0.61	R$ 0.53
SE	12,554	156,989	R$ 0.53	R$ 0.58
AL	19,581	243,430	Data not available	R$ 0.53
PE	28,731	397,551	R$ 0.56	R$ 0.55
PB	40,468	137,322	R$ 0.65	R$ 0.74
RN	47,672	201,266	R$ 0.71	R$ 0.74
CE	19,215	363,272	R$ 0.72	R$ 0.64
PI	11,346	75,757	Data not available	R$ 0.74

States	Variation in production (1,000 l.)	Price variation	Revenue variation (thousand *reais*)[a]	Share in total revenue[b]
MG[c]	-54,900	R$ 0.00	-R$ 29,124.25	-18.4%
BA	-36,600	-R$ 0.02	-R$ 40,093.18	-7.8%
SE	-12,554	-R$ 0.02	-R$ 10,576.63	-12.7%
AL	-19,581	Data not available	-R$ 10,387.65	Data not available
PE	-28,731	R$ 0.00	R$ 15,851.36	-7.2%
PB	-40,468	-R$ 0.15	-R$ 49,997.67	-56.1%
RN	-47,672	-R$ 0.14	-R$ 64,481.22	-45.2%
CE	-19,215	-R$ 0.08	-R$ 39,551.15	-15.1%
PI	-11,346	Data not available	-R$ 8,426.61	Data not available

Notes: a) The variations represent reductions in the prices, production, and revenue associated to the absence of the PAA. The variation in revenue corresponds to the total variation in price, determined by the total produced in the year, plus the quantity reduction (equal to the quantity purchased by the Program), based on the price paid by the Program. b) Ratio between the variation in producer revenue, and the total producer revenue in 2004. The total revenue was calculated based on the average price for 2004 in each state. c) The production data for the state of Minas Gerais regard only those municipalities benefited by the Program.

Source: Prepared by the researchers

6   Conclusions

This study presented the results of the estimates of the impacts of price, production and revenue of producers in those states benefited by the PAA-Milk program. In this chapter, graphs were prepared presenting the relations between price, production and simulations of prices in scenarios in the absence of the Program. The model used and the results of the regressions have been presented in the annex to this publication.

The results indicated that the greatest impacts took place in those states where the relative participation of the Program was higher: Paraíba and Rio Grande do Norte. In these states, the absence of the Program would represent a loss of approximately 50% in the revenue of the milk producers. These impacts would also be significant in the states of Ceará and Sergipe, as well as in those municipalities in the state of Minas Gerais benefited by the PAA. The smallest impacts would be in the states of Bahia and Pernambuco.

Due to the lack of data, it was not possible to estimate the importance of the Program for the states of Alagoas and Piauí. However, based on the results obtained for the other states, it would be reasonable to suppose that the PAA-Milk program would also contribute significantly towards the revenue of producers in these states.

According to the results, it may be concluded that the Program attenuated the downward trend in prices paid to producers in benefited states, and added an extra demand to the market which, in the absence of the Program, would otherwise would not have taken place. In summary, the PAA-Milk program represents a significant share of the revenue of milk producers. The higher the purchases of production are in a state, the greater the program's importance. Therefore, the Program is an effective policy instrument in supporting output in this sector.

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Annex

Econometric model used to calculate the impact of the program on prices, production and revenue.

1 The Model

The estimated price equation is based on the following model:

$$S_t = f\left(P_0, \Delta r, \Delta c, S_{t-1}, S_{t-2}\right) \qquad (1)$$

$$D = D\left(P_{C,} \Delta r, \Delta Y, L\right) \qquad (2)$$

$$P_C = \alpha_0 + \alpha_1 P_{0_t} + \alpha_2 \Delta O_t + \alpha_3 \Delta r_t + \alpha_4 \Delta E_t \qquad (3)$$

Where:

S = Milk supply;

D = Milk demand;

P_0 = Price of milk paid to producers;

P_c = Consumer price;

L = Volume of purchases by the milk program in the state;

r = Interest rate;

y = Revenue (represented by industrial production and retail sales);

c = Monthly rainfall in the dairy region;

O = Price of diesel fuel;

E = Exchange rate;

Δ = Variation of the variable.

The first equation represents the supply on the state market. It is a function of the price paid to producers, and consequently represents the greater effort the producer would be willing to put in, whenever the rewards (sale price) were higher.

It is also a function of the interest rate, since for a given increase in the rate, there would be an increase in production costs, and thus some of the producers would be forced to reduce the supply offered, due to the lower capacity of producing positive returns. Rainfall also has a strong effect on the supply of milk, since it determines the productivity of the cows, and the availability of feed. In spite of the relation between rainfall and productivity not being strictly monotonic – excessive rainfall may reduce cow productivity -, the fact that milk is normally produced in dry regions in the Northeast indicates that the impact of rainfall on supplies is positive. Certain supply lags were included in the model, due to the fact that each producer's herd is not totally adjusted at each moment; it is affected by the inertia of decisions made previously.

Demand equation (2) is standard, and is presented as a function of total revenue, the rate of interest, the *ad hoc* demand for the PAA-Milk program, and the price of milk paid to producers. In the third equation (3), there is an arbitrage relation depicting transportation costs. The price of milk for consumers tends to reach an equilibrium with the prices paid to producers. The equilibrium may vary as a result of fuel prices – represented by Ot- and of the stock loading costs, in turn represented by the interest rate and by the exchange rate which, to a certain extent, may depict the variation in competition with imported milk.

A linear version of the natural logarithm of the variables may written as:

$$S_t = \gamma_0 + \gamma_1 P_{0t} - \gamma_2 \Delta r_t + \gamma_3 \Delta c_t + \gamma_4 S_{t-1} + \gamma_5 S_{t-2} + e_t \qquad (1')$$

$$D_t = \beta_0 + \beta_1 \Delta Y_t + \beta_2 P_{ct} - \beta_3 \Delta r_t + \beta_4 L_t + v_t \qquad (2')$$

$$P_{ct} = \alpha_0 + \alpha_1 P_{0t} + \alpha_2 \Delta O_t + \alpha_3 \Delta r_t + \alpha_4 \Delta E_t + u_t \qquad (3')$$

A solution for these three equations may generate:

$$P_{0t} = \left(\frac{1}{\gamma_1 - \alpha_1 \beta_2} \right) \{ (\beta_0 - \gamma_0 - \beta_2 \gamma_0) + (\gamma_2 - \beta_3 - \beta_2 \alpha_3) \Delta r_t - \gamma_3 \Delta c_t - \gamma_4 S_{t-1} - \gamma_5 S_{t-2} \} +$$

$$+ \left(\frac{1}{\gamma_1 - \alpha_1 \beta_2} \right) \{ (\beta_1 \Delta Y_t + (\beta_4) L_t - \beta_2 \alpha_2 \Delta O_t - \beta_2 \alpha_4 \Delta E_t \} + \frac{v_t - e_t - \beta_2 u_t}{\gamma_1 - \alpha_1 \beta_2}$$

A reduced version of this equation was estimated with ordinary least squares in order to obtain the impact of the Program on the price paid to milk producers. Lt reflects this impact. Since all the variables on the right side of the equation are exogenous in relation to the development of the milk market, there are no endogeneity or model identification problems.

The impact of the PAA program on the prices paid to producers was estimated based on a simulation of the above model, assuming Lt = 0, and comparing the results with those actually obtained. A time series of this impact was created, with an impact value for each period included in the estimates.

The data used were monthly, covering the period between January 1997 and June 2005. The various series were obtained from the sources listed in Table A1[4]. In some cases, the period of analysis was reduced, since the series were not available for the entire period. For example, this was the case for the price series for fuel for years prior to 1999. Overall, however, data were available for the entire period.

In order to estimate the impact of the PAA program on the quantity of milk produced in each state, it was necessary to substitute equation (4) in equation (1'), to the obtain the quantity produced as a function of the exogenous variables. This new equation, in a reduced form, was considered similar to equation (4), with the same data base. A simulation similar to the one used to estimate the impact of milk purchases on the respective prices was also made in this case. The real data were compared with the simulated data, under the hypothesis of zero purchases (L=0) for the entire period. Thus, the impact for each month the Program was effective was obtained.

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4   In this Annex, the tables have been indicated with an "A", followed by the corresponding number.

Table A1: Variables – description and identification of their sources

Variables	Description of the variable	Source
L = Volume of purchases by the milk programme in the state	The variable will be represented by the amount of monthly purchases of milk declared by the managers of PAA-Milk	Administration of the Program at federal level. State Secretariats for Agriculture
S = Supply of milk	The variable will be represented by the production of milk per state, recorded by the IBGE [T.N.]. The series in existence at the IBGE is called total of milk acquired in the state	IBGE – Milk Research
P_0 = Price of milk for producers	Price received by milk producers, according to IBGE estimates	FGV, Price surveys of the states
r = Interest rate	SELIC rate, calculated by the Central Bank.	Central Bank
Pc = Consumer price	Index of consumer prices for milk, which is included in the calculations of the consumer-price indexes for the different states	FGV, Price surveys of the states
Y = Income (represented by the industrial production and by retail sales)	First main component among commercial sales and industrial production for the states for which there are the two series, or only commercial sales when only this series is available	PIN-PF[5] or Monthly Employment Survey
c = Monthly volume of rain in the milk-producing region	Measurement of average rainfalls in the state in the month	INPE[6], State bodies
D = Demand	The variable will be represented by the production of milk in each state, recorded by the IBGE	IBGE, Milk Research
O = Price of diesel	Average price of diesel in the state, according to data provided by ANP	ANP[7]
E = Exchange rate	Exchange rate for purchase, as publicised by the Central Bank	Central Bank

Source: Prepared by the researchers

T.N. Brazilian Institute of Geography and Statistics.
5   Physical Industrial Production (PinPf), of IBGE.
6   National Institute for Space Research (INPE).
7   National Oil Agency (ANP).

2   Results

The theoretical model outlined above is the focus of this section. Evidently, in being a time series analysis, certain concerns must be addressed. The estimation of a level model, when the series are not stationary, may produce spurious regressions, if the variables are not cointegrated (ENGLE *et al.*, 1987; GREENE, 2000; ENDERS, 1995). Therefore, it was necessary to perform stationarity tests for the series (DICKEY & FULLER, 1979; PHILLIPS & PERRON, 1988; JOHANSEN, 1988). The tests indicated that the variables for market milk price, price paid by the program, milk bought by the program, total milk purchased in the state, and rainfall are all stationary. The first four variables presented structural breaks, resulting from the existence of the Program, but not unit roots. The variables exchange rate, interest rate, price of fuel and revenue presented a unit root, being thus stationary in the first difference. These results were found for all the states surveyed. Thus, it was possible to estimate a version of the model which was closer to the one specified (4), with the addition of only a few lags in some of the variables. All the residuals of the regression were tested to ensure stationarity, and the results were not generated by spurious regressions. The results are presented in the next section.

2.1 Impacts of Program on Prices

The estimation of the milk program's impact on market prices was performed with model (4) outlined above. As mentioned earlier, after equation (4) was determined, a series for each state was created, assuming the absence of the Program. The difference between the real and estimated series indicates how much higher or lower the price would be without the Program. These series were prepared only for those cases in which the coefficient for the PAA program was statistically different than zero. The graphs provide a clear notion of the Program's impact in each state.

Two points must be made before we initiate the analysis: the first regards how state milk programs, which had been set up in certain states, were considered

when evaluating the PAA program's impact in the selected states. The Federal milk program was initiated in December, 2003. However, state programs were effective as of 2000 in the states of Pernambuco, Paraíba and Rio Grande do Norte. In these cases, the total impact of the milk programs was considered, in spite of the possibility of observing only the impact of the Federal program, when analysing the period after December, 2003. The second point regards the lack of information on market prices in the states of Piauí and Alagoas, making it impossible to estimate the Program's impact on prices in these states. The FGV does not collect milk price data in the state of Alagoas, and only data on certain years in the mid 90s were available for the state Piauí.

In order to verify the robustness of the results for the PAA program, the estimates were presented by six different equations. New independent variables were added to each, until the model proposed by equation (4) was reached. For example, equation (1), in Table 2, included only the total supply of milk in the state, and the quantity purchased by the Program; in equation (2), in the same table, variables related to rainfall were included (quantity and dispersion of rain in the state); in equation (3), besides the previous variables, revenue variables were included, and so on. This procedure was followed for all states surveyed in this study.

The advantage of presenting the results as described above is that we are able to observe how the Program' coefficient behaves, with the addition of the other variables. Little variation between the equations would indicate that the result is robust, for not being sensitive to small alterations. The model used to simulate the price series without the Program was always equation (6).

Before proceeding with the presentation of the analysis, it must be pointed out that all series were tested for the presence of unit roots, and that the final model is not spurious. The regression residuals were also tested, to verify the respective stationarity.

2.1.1 Pernambuco

The analysis of the results observed for the state of Pernambuco indicated that the Program did have significant effect on prices paid to producers in that

state. The PAA coefficient presented the correct sign, as well as a value of 0.003 in the final model. However, this coefficient was not different than zero at acceptable levels of significance.

Also noteworthy is that the model presented a good explicative capacity (the final regression's R2 was 0.70). The following also contributed to the determining of the price of milk in the state: revenue, the price of diesel fuel, the *dummy* for structural breaks in the series, and tendencies. The last two were omitted, along with the constant.

Table A2: Residues as regressions in the price of milk – Pernambuco

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of the amount of milk acquired in t-1	-0.023	-0.022***	-0.020	0.020	0.024	0.025
	(0.014)	(0.013)	(0.013)	(0.029)	(0.030)	(0.030)
Logarithm of the amount of milk purchased by the Program	0.008	0.008	0.008***	0.004	0.004	0.003
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Logarithm of the volume of rain in the month		-0.020	-0.017	-0.013	-0.012	-0.012
		(0.019)	(0.019)	(0.022)	(0.022)	(0.022)
Logarithm of the variation of the rain among municipalities		0.025	0.026	0.020	0.019	0.019
		(0.029)	(0.028)	(0.033)	(0.032)	(0.032)
Variation of the logarithm of income			0.011	0.013	0.003	0.011
			(0.040)	(0.058)	(0.066)	(0.070)
Variation of the logarithm of income in t-1			0.105**	0.171*	0.183*	0.179**
			(0.045)	(0.053)	(0.064)	(0.069)
Variation of the logarithm of the price of diesel				-0.363**	-0.344**	-0.353**
				(0.169)	(0.165)	(0.172)

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Variation of the logarithm of SELIC[8]					-0.058	-0.045
					(0.056)	(0.061)
Variation of the logarithm of SELIC in t-1					-0.076	-0.059
					(0.055)	(0.077)
Variation of the logarithm of the rate of exchange						-0.012
						(0.140)
Variation of the logarithm of the rate of exchange in t-1						-0.077
						(0.145)
Variation of the logarithm of the rate of exchange in t-2						-0.028
						(0.123)
R2	0.837	0.839	0.841	0.758	0.765	0.767
Number of remarks	100	100	99	77	77	77

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by the researchers

2.1.2 Paraíba

Table A3 presents the results of the regressions for the price of milk in the state of Paraíba. The structure of the table is similar to that used for the case of Pernambuco. The R2 of the regressions varied between 0.92 e 0.95, indicating the good adjustment of the model. The results indicated that the milk Program had a significant impact on the price received for production. The Program's coefficient, in the model's complete model, was 0.032, statistically significant at 1%. The value of this coefficient varied little in the models' estimates. Other statistically significant variables were total milk purchased in the state and fluctuations in revenue.

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8   Special System of Settlement and Custody (SELIC)

Table A3: Results of the regressions of the price of milk – Paraíba

Independent variables	Dependent variable : logarithm of the price of milk in the state					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Logarithm of the amount of milk acquired in t-1	-0.007	-0.005	-0.011	-0.015	-0.016	-0.022***
	(0.017)	(0.016)	(0.012)	(0.012)	(0.012)	(0.012)
Logarithm of the amount of milk purchased by the Program	0.025	0.028	0.029**	0.030*	0.031*	0.032*
	(0.018)	(0.017)	(0.011)	(0.011)	(0.011)	(0.011)
Logarithm of the volume of rain in the month		0.019***	0.005	0.005	0.004	0.002
		(0.010)	(0.009)	(0.009)	(0.009)	(0.009)
Logarithm of the variation of the rain among municipalities		-0.036**	-0.018	-0.016	-0.017	-0.015
		(0.015)	(0.015)	(0.015)	(0.015)	(0.014)
Variation of the logarithm of income			-0.185*	-0.195*	-0.163*	-0.142*
			(0.049)	(0.049)	(0.056)	(0.051)
Variation of the logarithm of income in t-1			-0.124**	-0.148*	-0.183*	-0.189*
			(0.049)	(0.052)	(0.058)	(0.057)
Variation of the logarithm of the price of diesel				0.181***	0.165	0.171
				(0.102)	(0.105)	(0.113)
Variation of the logarithm of SELIC					-0.025	0.002
					(0.035)	(0.039)
Variation of the logarithm of SELIC in t-1					0.027	0.063
					(0.032)	(0.043)
Variation of the logarithm of the rate of exchange						-0.001
						(0.088)
Variation of the logarithm of the rate of exchange in t-1						-0.124
						(0.086)
Variation of the logarithm of the rate of exchange in t-2						-0.064
						(0.085)
R2	0.923	0.929	0.943	0.946	0.947	0.951
Number of remarks	78	78	78	78	78	78

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by the researchers

2.1.3 Rio Grande do Norte

Table A4 presents the results of the regressions for the price of milk in the state of Rio Grande do Norte. The table is structured as in the previous cases. The R2 of the regressions varied between 0.88 and 0.89, indicating the strong adjustment of the model. The results indicated a significant influence of the PAA program on prices received by producers. The Program's coefficient, in the complete version, was 0.028, statistically significant at 1%. In the final version, this was the only statistically significant variable observed. As in the other models, the equations included a dummy variable capturing the structural break in the price series and the tendency. Both were statistically significant at 1%.

Table A4: Results of the regressions of the price of milk – Rio Grande do Norte

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of the amount of milk acquired in t-1	0.018	0.029	0.018	0.057	0.065	0.129
	(0.068)	(0.072)	(0.089)	(0.152)	(0.152)	(0.170)
Logarithm of the amount of milk purchased by the Program	0.023*	0.022*	0.021*	0.030*	0.030*	0.028*
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Logarithm of the volume of rain in the month		0.020	0.016	0.013	0.014	0.015
		(0.013)	(0.014)	(0.014)	(0.014)	(0.014)
Logarithm of the variation of the rain among municipalities		-0.033***	-0.027	-0.025	-0.026	-0.029
		(0.019)	(0.020)	(0.022)	(0.022)	(0.022)
Variation of the logarithm of income			-0.080	-0.025	-0.021	-0.023
			(0.086)	(0.086)	(0.096)	(0.091)
Variation of the logarithm of income in t-1			-0.042	-0.066	-0.077	-0.101
			(0.085)	(0.089)	(0.103)	(0.108)

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variation of the logarithm of the price of diesel				-0.010	-0.018	-0.044
				(0.112)	(0.122)	(0.132)
Variation of the logarithm of SELIC					0.028	0.047
					(0.048)	(0.050)
Variation of the logarithm of SELIC in t-1					0.037	0.038
					(0.050)	(0.060)
Variation of the logarithm of the rate of exchange						-0.030
						(0.112)
Variation of the logarithm of the rate of exchange in t-1						-0.182
						(0.116)
Variation of the logarithm of the rate of exchange in t-2						0.116
						(0.144)
R2	0.890	0.892	0.890	0.882	0.883	0.890
Number of remarks	100	100	99	77	77	77

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by the researchers

2.1.4 Sergipe

Table A5 below presents the results of the regression for the price of milk paid to producers in Sergipe. As may be observed, the R2 varied between 0.55 and 0.60. As in the previous cases, the coefficient of the Program was positive, statistically significant at 5%. The value of the coefficient for Sergipe was 0.009 in the complete model. Together with the Program, the following also had an impact on the price of milk: rainfall, variation in income, price of diesel fuel, and the exchange rate.

Table A5: Results of the regressions of the price of milk – Sergipe

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of the amount of milk acquired in t-1	-0.031	-0.021	-0.016	0.031	0.028	0.027
	(0.023)	(0.025)	(0.025)	(0.028)	(0.029)	(0.028)
Logarithm of the amount of milk purchased by the Program	0.008***	0.008***	0.008***	0.009**	0.010**	0.009**
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Logarithm of the volume of rain in the month		-0.035	-0.029	-0.034	-0.035	-0.041**
		(0.022)	(0.021)	(0.022)	(0.022)	(0.020)
Logarithm of the variation of the rain among municipalities		0.041	0.033	0.033	0.035	0.046
		(0.034)	(0.032)	(0.035)	(0.034)	(0.031)
Variation of the logarithm of income			-0.167	-0.177	-0.112	-0.176
			(0.102)	(0.124)	(0.142)	(0.128)
Variation of the logarithm of income in t-1			-0.154	-0.251***	-0.306***	-0.308**
			(0.118)	(0.149)	(0.168)	(0.144)
Variation of the logarithm of the price of diesel				0.512**	0.479***	0.468***
				(0.250)	(0.245)	(0.249)

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Variation of the logarithm of SELIC					-0.051	-0.112
					(0.096)	(0.095)
Variation of the logarithm of SELIC in t-1					0.046	-0.017
					(0.105)	(0.101)
Variation of the logarithm of the rate of exchange						0.016
						(0.179)
Variation of the logarithm of the rate of exchange in t-1						0.341***
						(0.184)
Variation of the logarithm of the rate of exchange in t-2						0.152
						(0.192)
R2	0.558	0.575	0.579	0.563	0.567	0.609
Number of remarks	101	101	100	78	78	78

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by the researchers

2.1.5 Bahia

Table A6 below presents the results of the regression for the price of milk in Bahia. The coefficient of the Program was statistically significant at 1% in all the models, reaching a value of 0.009 in the final model. Noteworthy is that there was a significant reduction in the coefficient between the simple version of the model and the final version. Another variable having a significant impact on the price was income, as well as the structural break dummy and the tendency.

Table A6: Results of the regressions of the price of milk – Bahia

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of the amount of milk acquired in t-1	-0.116*	-0.056	-0.0594	-0.0472	-0.0516	-0.0405
	(0.035)	(0.045)	(0.045)	(0.047)	(0.047)	(0.047)
Logarithm of the amount of milk purchased by the Program	0.018*	0.019*	0.016*	0.013*	0.014**	0.009*
	(0.005)	(0.005)	(0.004)	(0.005)	(0.005)	(0.003)
Logarithm of the volume of rain in the month		-0.015	-0.014	-0.015	-0.015	-0.012
		(0.024)	(0.024)	(0.024)	(0.024)	(0.026)
Logarithm of the variation of the rain among municipalities		0.001	-0.002	0.0003	-0.0003	-0.004
		(0.033)	(0.031)	(0.030)	(0.031)	(0.032)
Variation of the logarithm of income			-0.220**	-0.239*	-0.225**	-0.265*
			(0.087)	(0.088)	(0.102)	(0.099)
Variation of the logarithm of income in t-1			-0.111	-0.137	-0.155	-0.169
			(0.104)	(0.107)	(0.118)	(0.115)
Variation of the logarithm of the price of diesel				0.204	0.186	0.227
				(0.210)	(0.189)	(0.192)
Variation of the logarithm of SELIC					-0.003	-0.003
					(0.081)	(0.075)
Variation of the logarithm of SELIC in t-1					0.036	0.011
					(0.098)	(0.095)
Variation of the logarithm of the rate of exchange						0.019
						(0.155)

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Variation of the logarithm of the rate of exchange in t-1						-0.062
						(0.169)
Variation of the logarithm of the rate of exchange in t-2						0.206
						(0.171)
R2	0.792	0.684	0.703	0.709	0.710	0.718
Number of remarks	101	77	77	77	77	77

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by t he researchers

2.1.6 Ceará

Below, Table A7 presents the results of the regressions for the price of milk in Ceará. The model's final R2 was 0.70. The coefficient of the Program was statistically significant at 1% in all the models, reaching 0.017 in the final model. Other variables having a significant impact on the price of milk were the price of diesel, as well as the structural break *dummy* and the tendency.

Table A7: Results of the regressions of the price of milk – Ceará

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Logarithm of the amount of milk acquired in t-1	0.024	0.002	0.004	0.015	0.018	0.010
	(0.030)	(0.032)	(0.033)	(0.037)	(0.036)	(0.040)
Logarithm of the amount of milk purchased by the Program	0.016*	0.018*	0.018*	0.017*	0.016*	0.017*
	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
Logarithm of the volume of rain in the month		-0.014	-0.013	-0.011	-0.010	-0.010
		(0.016)	(0.017)	(0.023)	(0.024)	(0.021)

Independent variables	Dependent variable: logarithm of the price of milk in the state					
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Logarithm of the variation of the rain among municipalities		0.009	0.008	0.006	0.006	0.004
		(0.026)	(0.028)	(0.037)	(0.038)	(0.034)
Variation of the logarithm of income			-0.059	-0.058	-0.045	-0.031
			(0.057)	(0.070)	(0.073)	(0.077)
Variation of the logarithm of income in t-1			0.020	0.006	0.026	0.037
			(0.061)	(0.072)	(0.089)	(0.087)
Variation of the logarithm of the price of diesel				0.206	0.226	0.261***
				(0.134)	(0.137)	(0.141)
Variation of the logarithm of SELIC					-0.067	-0.059
					(0.057)	(0.056)
Variation of the logarithm of SELIC in t-1					-0.087***	-0.067
					(0.045)	(0.055)
Variation of the logarithm of the rate of exchange						0.020
						(0.179)
Variation of the logarithm of the rate of exchange in t-1						0.042
						(0.140)
Variation of the logarithm of the rate of exchange in t-2						-0.145
						(0.110)
R2	0.900	0.913	0.913	0.747	0.761	0.766
Number of remarks	101	101	100	78	78	78

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by the researchers

2.1.7 Minas Gerais

Table A8 presents the results of the regression for the price of milk in the state of Minas Gerais. The R2 of the final model was 0.26, thus explaining a limited portion of price variations in the state. The coefficient of the Program was not statistically significant in the model. Important variables: milk purchased in the previous period, rainfall and income.

Table A8: Results of the regressions of the price of milk – Minas Gerais

Independent variables	Dependent variable: Logarithm of the price of milk in the state					
	(1)	(2)	(3)	(4)	(5)	(6)
Logarithm of the amount of milk acquired in t-1	-0.136***	-0.116	-0.147	-0.232	-0.248	-0.309**
	(0.076)	(0.117)	(0.136)	(0.141)	(0.151)	(0.154)
Logarithm of the amount of milk purchased by the program	0.004	0.003	0.004	0.006	0.007	0.006
	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)	(0.005)
Logarithm of the volume of rain in the month		-0.031	-0.034	-0.059**	-0.059**	-0.058*
		(0.024)	(0.025)	(0.023)	(0.024)	(0.022)
Logarithm of the variation of the rain among municipalities		0.039	0.043	0.084*	0.083*	0.085*
		(0.033)	(0.035)	(0.029)	(0.030)	(0.029)
Variation of the logarithm of income			-0.146	-0.609*	-0.609*	-0.633*
			(0.226)	(0.214)	(0.210)	(0.222)
Variation of the logarithm of income in t-1			-0.086	-0.465**	-0.523**	-0.535**
			(0.218)	(0.198)	(0.255)	(0.234)
Variation of the logarithm of the price of diesel				-0.052	-0.075	-0.102
				(0.181)	(0.185)	(0.198)
Variation of the logarithm of SELIC					0.004	0.034
					(0.093)	(0.091)

	Dependent variable: Logarithm of the price of milk in the state					
Variation of the logarithm of SELIC in t-1					0.059	0.071
					(0.098)	(0.107)
Variation of the logarithm of the rate of exchange						-0.335
						(0.205)
Variation of the logarithm of the rate of exchange in t-1						-0.078
						(0.190)
Variation of the logarithm of the rate of exchange in t-2						-0.202
						(0.170)
R2	0.028	0.034	0.040	0.166	0.170	0.237
Number of remarks	101	89	89	78	78	78

Notes: Monthly data of January, 1997, to June, 2005; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

3 Impacts of Program on Production

In this section, we present the results of the analysis of the impact of the milk Program on the production of the states surveyed. However, before these are presented, certain limitations regarding the data need to be discussed. Up until this point in our analysis the price study was based on monthly data on the variables included in the model (4). Since the municipal milk production data is provided by the IBGE on an annual basis, the proxy used to capture the states' monthly milk production was the one appearing in Table A1, from the monthly milk survey of the IBGE, which is the total milk purchased in the state. This series was collected at establishments that purchase crude or refrigerated milk and then industrialize it. Examples of these establishments include dairy product plants operating under the control of municipal, state and federal sanitary authorities.

Thus, a significant quantity of milk produced in the states, used in other dairy activities, does not appear in the purchased milk statistics. A comparison between the data for purchased milk and the data on annual milk production, also gathered by the IBGE, indicated that the former represented no more than 20% of the total of the latter in the states.

Although the use of the variable milk purchased may be justified in the price equation, for representing the quantity of milk officially sold in the states, which in turn has an impact on market prices, its use in evaluating the impact of the Program on production may lead to inaccurate conclusions. This point is better illustrated by the trend in the series for Paraíba, shown below (Graph A1). Similar situations took place in other states.

Graph A1 presents the volume of milk purchased monthly by both the federal and state programs, in the state of Paraíba. Between January, 2000 and December, 2002, the volume purchased daily from producers was 20 thousand liters. As of January, 2004, with the Federal program, the volume of milk purchased daily reached 110 thousand liters. The respective values, multiplied by the number of days in each month, may be found in the graph above. During the state-sponsored phase of the program, an average of 600 thousand liters of milk were purchased. With the implementation of the federal Program, the volume purchased reached 3.3 million liters per month.

The impact of the volume of milk purchased by the Program was observed in the trend in the total volume of milk purchased in the state, also presented in the same Graph. In 2000, when the state program was initiated, there was a redirectioning of milk produced towards the goal of the program; in other words, the milk purchased by establishments included in the IBGE survey was almost completely channeled to the milk Program. There is no reason to believe that there was an increase in production during this first period, at least not in those establishments under sanitary control. With the arrival of the federal Program, there was an increase in the milk purchased in the state, but, as in previous years, the total amount purchased equaled the goals established by the PAA. As of 2005, practically all the milk purchased in the state was purchased by the federal Program.

Graph A1: Total milk produced in the state and total milk purchased by the Program in Paraíba – January, 1997 to June, 2005 (thousands of liters)

Total milk purchased in the state   Total milk purchased by the Program
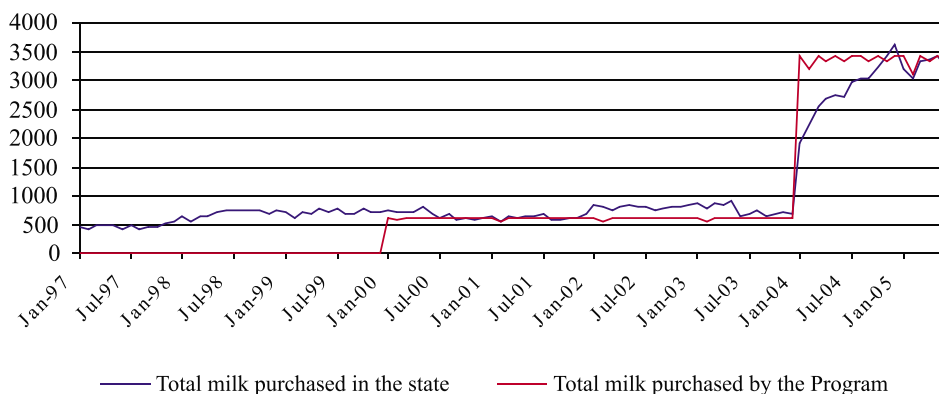
Source: IBGE and Paraiba State Agriculture Secretariat

The question at this point is the following: does the increase in the milk purchased represent an increase in the production of milk in the state? A simple comparison of the variations may help answer this question. The variation in the volume of milk purchased between 2003 and 2004 was approximately 270%. On the other hand, the volume of milk produced varied only 9%, according to the IBGE. In other words, besides the variation in milk purchased meaning a high supply elasticity which does not correspond to actual milk production, the variation in production during that period was within 3% of the variation in milk purchased in the state.

The explanation for the large difference in the behavior of the two series may be related to adaptations that took place on the local milk market. Even without an equivalent significant increase, part of the milk production in the state went to the plants which, with the introduction of the Program, paid more attractive prices. In other words, in response to the higher price, more producers offer milk to the plants. The consequence of using purchased milk series, a production proxy, as a dependent variable is clear: the impact of the milk program in the states may overestimated.

3.1 An Alternative Method

We propose a modification of the previously presented model. Since the production of milk in the state is available only on a yearly basis, the model was then estimated for years and not months. Furthermore, the available data regard the period between 1990 and 2004. The data for 2005 are only available for the second quarter of 2006. Due the short period of the series, which affects the degrees of freedom of the regressions, only certain variables proposed in the initial model were maintained. In spite of the relevance of monthly rainfall, the maintenance of this variables does not make much sense when the data area annual. The simple model proposed is thus given by:

$$\Delta S_t = f\left(\Delta r_t, \Delta p_t, \Delta p_{t-1}; \Delta S_{t-1}; e_t\right) \qquad (5)$$

Equation (5) represents a supply equation as a function of price and of other explicative variables. Thus, the aim is to estimate the supply equation and use the estimated impacts in the price equation in order to determine the impacts on production. For example: if the impact of the Program on the price of a liter of milk is 10% in Bahia, this variation is used in the supply equation, multiplying the price coefficient by the variation. Since the models were estimated in logarithms, the coefficients of (5) are the elasticities, and may be used in this manner. The results are presented below. The equations were estimated in difference, to avoid the appearance of spurious relations.

3.2 The Production Series

The following graph presents the annual milk production series in states benefited by the Program. As mentioned above, the data cover the period between 1990 and 2004. It must be pointed out that the series for the state of Minas Gerais only covers those municipalities benefited by the milk Program. Of the states considered, the largest production was in Bahia, with approximately 700 million liter per year, followed by the states of Pernambuco, Alagoas and Minas

Gerais (municipalities covered by the Program). In spite of the sharp difference in the quantities produced in the states, certain overall trends were observed. The first was the drop in production in 1993, due to the extreme drought that affected the Northeast and part of the state of Minas Gerais; the second was the increase in production as of 2002. In certain states, such as Piauí, there was a significant increase in the production of milk in 2004, which may be an indication of the impact of the Program. However, due to the lack of price data for this state, it was not possible to test this hypothesis. The following econometric analysis attempted to identify the states where the Program had an impact.

Graph A2: Total milk produced in the states benefited by the Program - 1990 to 2004 (thousands of liters)
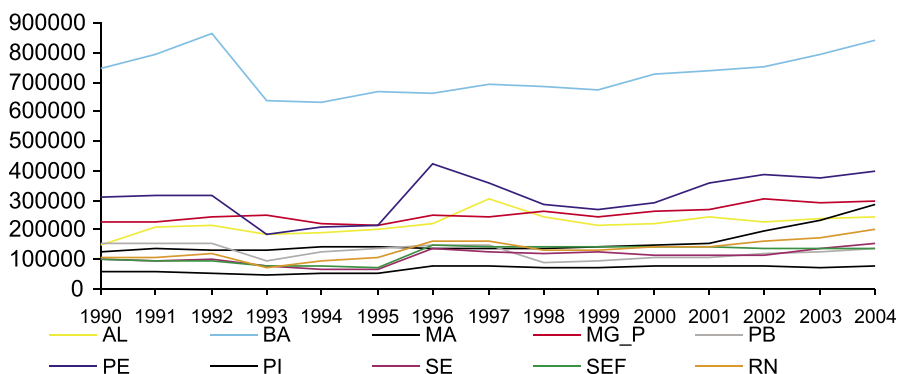
3.3 The Results

The table below presents the result of the regressions for the production of milk in the selected states. The equations followed the specification of equation (5) outlined above. All the production series presented unit roots, but were stationary in the first difference. Thus, the equations were estimated using the first difference of the variables. A productivity variable, measured as the average production per milk cow, was introduced in the equation to determine the gains obtained during the period analysed.

The models have good explicative power, as indicated by the R2 of the regressions. In most cases, the statistically significant coefficients demonstrated the expected signs. With regard to the relation between supply and demand, the results indicated statistically significant coefficients for all states, with the exception of Minas Gerais and Bahia. The fact that the data did not confirm a positive response of the supply to the price did not necessarily indicate that this response may not have taken place in these states. A possible explanation for the model's weak performance in relation to these states may be associated to short period of the series and the use of annual data. Other factors which may have contributed to the results were the high productivity gains obtained in the 1990s, and the vegetative growth of the herds, an argument presented in the beginning of the chapter.

Table A9: Results of the production regressions

Independent variables	Dependent variable: Variation of the logarithm of the production of the milk in the state						
	(BA)	(CE)	(MG)	(PB)	(PE)	(RN)	(SE)
Variation of the logarithm of the production in t-1	-0.065	0.068***	0.044	0.124	0.331***	0.100	0.121**
	(0.042)	(0.016)	(0.222)	(0.134)	(0.132)	(0.085)	(0.014)
Variation of the logarithm of the price received in t	-0.030	0.129	0.041	1.871**	1.768***	0.113	0.255**
	(0.023)	(0.071)	(0.086)	(0.475)	(0.714)	(0.916)	(0.042)
Variation of the logarithm of the price received in t-1	0.009	0.858**	-0.153	-0.884**	0.226	0.979***	0.173**
	(0.039)	(0.113)	(0.189)	(0.221)	(0.233)	(0.469)	(0.023)
Variation of the logarithm of SELIC	-0.009	0.007	0.004	0.077	0.012	0.029	0.059*
	(0.006)	(0.007)	(0.018)	(0.065)	(0.103)	(0.033)	(0.004)
Variation of the logarithm of productivity	1.435*	0.316**	0.317*	3.179*	2.042*	1.453**	1.296*
	(0.235)	(0.035)	(0.035)	(0.218)	(0.174)	(0.384)	(0.023)
R2	0.970	0.999	0.840	0.988	0.994	0.917	0.990
Number of remarks	11	12	11	11	11	11	11

Notes: Annual data from 1990 through 2004; * statistically significant at 1%; ** statistically significant at 5%; *** statistically significant at 10%. Standard deviation given in brackets.

Source: Prepared by the researchers

Technical Evaluation of The Program for Implementation of Rainwater Cisterns in the Brazilian Semi-arid Region

Photo: Bruno Spada

Technical Evaluation of The Program for Implementation of Rainwater Cisterns in the Brazilian Semi-arid Region

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I   Introduction

This evaluation was carried out by the Foundation for Support to Brazilian Research and Agribusiness (FAGRO), in partnership with the semi-arid and environment divisions of the Brazilian Agricultural Research Corporation (Embrapa) and under the auspices of the Ministry of Social Development and the Fight Against Hunger´s Secretariat for Evaluation and Information Management (MDS/SAGI) and the United Nations Food and Agricultural Organization (FAO) in the framework of the 1st Cistern Agreement Charter (FAO-UTF/BRA/064/BRA)[4], with the title "Environmental Performance Evaluation of the MDS Cisterns Program in Partnership with the Brazilian Semi-Arid Network (ASA): Environmental Sustainability Index".

Given the scope of the evaluation and the difficulty of producing a summary of all topics studied without compromising the quality of this text, it was decided to present a general view of the Cisterns Program and the evaluation methodology used. However, for purposes of research data analysis, emphasis was placed solely

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on the technical evaluation of the Program, which deals with topics related to fulfillment of the demand for supply of water for families, to the catchment area for proper cistern performance, to cistern water management and to stored water quality analyses.

2   Importance of the Brazilian Semi-arid Region and the Cisterns Program

Northeastern Brazil covers 1.54 million square kilometers, corresponding to 18% of the national territory, having 44.8 million inhabitants, which are 28% of the Brazilian population. The semi-arid region is within this area, extending from northern Piauí state to northern Minas Gerais state (Figure 1), covering 969,589.4 km², with a population of 20,858,264, of whom 9,085,266 live in the rural areas (BRASIL, 2005).

Figure 1: Map of Northeastern Brazil showing boundaries of the semi-arid region

Source: Embrapa Semi-Arid, 2005

The criteria adopted for identifying the Brazilian semi-arid region were:

:: Average annual rainfall under 800 millimeters;

:: Dryness index of up to 0.5, determined by the outstanding balance of water relating rainfall to potential evapotranspiration, between 1961 and 1990;

:: Drought risk in excess of 60%, for the period between 1970 and 1990.

Based on these criteria, there are currently 1,133 municipalities in this region (BRASIL, 2005).

The region is characterized by a vast diversity of natural and socio-economic situations. Comprehension of the diversity of natural and agro-socio-economic resources present in the Semi-Arid has been the object of Embrapa studies, which have identified 172 geo-environmental units in the Northeast, 110 of which are located in the semi-arid (SILVA *et al.*, 1993).

Edaphoclimatic and hydrological characteristics in the Semi-Arid are similar to those of other hot and dry semi-arid regions worldwide. There are constantly long droughts interspersed by flooding of temporary rivers and high evapotranspirometric rates, averaging 2,000 millimeters/year, creating a humidity deficit in the soil throughout most months.

Soil in this region is largely shallow, low in natural fertility and with sparse vegetation, called *caatinga*, presenting a large variety of adapted species with high potential for use. This diversity provides native fresh fruit and/or raw materials for food processing, both for human consumption and animal feed. Furthermore, in the area with crystalline substract, the aquifers are low in productivity, with throughput values under 3,0 m^3h^{-1}, high total dissolved solid contents averaging 3,0 gL^{-1}, with chlorides predominating (LEAL, 1999).

The study area is not homogenous. According to Silva *et al.* (1993), there are 110 different semi-arids, i.e., there is a "large mosaic" represented by 110 distinct Geo-environmental Units (UGEA). The current study used UGEA as the concept for "territory".

The UGEA concept involves different realities, according to the field of knowledge taken into account, e.g. hydrology, ecology, agronomy, computer science, information science, geochemistry, geography, pedology, among others. According to these studies, the field of knowledge which best adapts to the goals of rural development is a spatial entity in which the substract (material from which the soil originates), the natural vegetation, the landform and nature of soil distribution in the landscape make up a set with minimum variability according to the cartographic scale (SILVA *et al.*, 2000).

In the digital Agro-ecological Zoning of the Brazilian Northeast (ZANE), natural vegetation was used as a climatic indicator, due to its reflection of water availability conditions in the environment under study.

Soil classes and their distribution in the landscape make up the basic UGEA elements. In effect, soil characteristics and distribution, especially in the semi-arid climate context, are fundamental in regard to water dynamics (drainage, retention, response to type of rain, volume of soil used by the root system etc.) and enable or limit introduction of technological innovations or changes to the production systems.

In the context of water resources, of all the water present in the country, only 3% is in the Northeast, 2/3 of which is in the São Francisco river basin. According to data from the Seacoast and Water Network of Brazil (RMCH-BR), the Parnaíba River basin contains 15% of the water available in the Northeast. These two basins hold 78% of the water in the region, while intermittent river basins hold a mere 22%, concentrated around 450 dams with capacity in excess of a million cubic meters – which, due to high evaporation and bad management, use only 25% of their full capacity – and in deep aquifers, approximately 100 thousand tubular wells – although a third is not in use. 50% of these wells are estimated to be brackish or salty, and therefore inappropriate for most social and economic uses (ABDL, 2005).

Access to water is important. Simple, low-cost and decentralized techniques for rainwater collection and storage (underground dams, cisterns, stone tanks, *in situ* collection) exist and already contribute to life under the natural conditions of the Brazilian semi-arid region (BARBOSA, 2003).

Given the size of this region and location of the permanent springs, which are distant from millions of families, it is safe to say there is colossal need for use and access to water resources by the families living in the region.

In the rural areas, springs are used for basic needs and productive purposes. In the former case, water is used for human consumption (drinking, cooking, hygiene), while in the latter, activities are related to food production. Families depend on safe and reliable supply of water and food.

Most research at the rural domestic level is focused on water for human consumption, excluding water used for economic purposes. Systems have been developed for supply of high quality water for intake, often at high costs. Water used for economic purposes is hardly taken into consideration in the planning stages of rural domestic water supply. Thus, the need to fill gaps in information related to models for domestic use of water has become a primary goal in the preparation of rural development policy, for at least two main reasons:

    :: The understanding of domestic water use and demand models, under a broad perspective (both for basic needs and economic activities), will improve the capacity to fulfill the demand and is an important step toward sustainability;

    :: As users, communities previously in a disadvantageous position will have to compete with other sectors to insure access to water for their basic needs.

The study undertaken in this evaluation project encompassed the entire Brazilian semi-arid region and part of the state of Espírito Santo. The methodology applied analyzed and integrated information acquired *in loco*, for 3,517 families who were benefited by the MDS/ASA Cisterns Program, in 83 rural communities.

In essence, the study aimed at characterizing and mapping technical information about:

    :: Evaluation of the use of rural rainwater cisterns and program grantee living conditions, in the various environments in the 110 UGEAs making up the Brazilian semi-arid region;

:: Analysis of the potability of water stored in rural rainwater cisterns for human consumption. Quality measurements of water from traditional springs used for human consumption by families before implementation of the Cisterns Program.

3   ASA and the MDS/P1MC Rainwater Cistern Program

In November 1999, during the The Third Session of the Conference of the Parties to the United Nations Framework Convention on Climate Change (COP3) to the United Nations Convention to Combat Desertification (UNCCD), organized civil society active in the Brazilian semi-arid region promoted the Parallel Civil Society Forum, as was done during the Rio-92 Conference, with attendance by several organizations from all continents in its events.

The process was coordinated by Brazilian Semi-Arid Network (ASA), a network of civil society and community-based organizations with activities in the Brazilian semi-arid region, which started its work in July 1999, with actual constitution in February 2000, during its first Annual ASA Meeting – The Brazilian Semi-Arid Network Biennial Meeting (ENCONASA), held in Juazeiro, Bahia (ASA, 2004). ASA's mission is to "strengthen civil society in the construction of participative processes for sustainable development and livelihoods in the semi-arid, based on cultural and social justice values" (COEP[5], 2005).

ASA is a coordination organization with no political affiliations, no juridical personality and ruled by its own mandate. Its management takes place wherever there is one of its affiliates, i.e. all over Northeastern Brazil, including Northern Minas Gerais and Espírito Santo. One of the main technologies diffused by ASA – and which took into account the accumulated work of civil society organizations, as well as experiences socially validated by farmers – was a plaque cistern for collection of rainwater.

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5   Committee of Organizations in the Fight Against Hunger and for Life.

The rainwater cistern is an attempt at solving one of the main problems faced by families in the Semi-Arid, which is scarcity of water for human and domestic consumption, particularly in the dry season. Insufficient water supply in the Semi-Arid forces families to walk vast distances in search of water, which is generally improper for consumption by humans and small animals. Such activity is often carried out by women and children, the main victims of a lack of water supply: women due to their responsibility to transport and make rational use of water, and children due to diseases carried by water, which may even lead to death, as in the case of diarrhea.

Hundreds of rainwater cisterns in existence in the dry areas of the Northeast served as inspiration for creation of the Social Mobilization Program for Coexistence with the Semi-arid Region: One Million Cisterns Program (P1MC). The proposal, drawn up by ASA, seeks to guarantee access to water appropriate for human use to all rural families in the Brazilian semi-arid Northeast, through capacity-building, social mobilization and construction of plaque rainwater cisterns.

In order to implement P1MC, ASA created a Public Interest Civil Society Organization (OSCIP) and the One Million Cisterns for the Semi-arid Program Association (AP1MC), in 2002. AP1MC is a non-profit, private juridical organization with charitable, educational, environmental and philanthropic characteristics, with the following objectives:

:: Implementation of a program for sustainable coexistence with the semi-arid, based on mobilization and construction of home cisterns for rainwater collection, as well as providing structure for associated cultural and institutional processes aimed at promotion of development, capacity-building for this coexistence and for the fight against the causes and effects of poverty;

:: Promotion of strengthened citizenship and civil society organizations for formation of networks and partnerships seeking these objectives; comprehend the semi-arid region in the states of Alagoas, Bahia, Ceará, Espírito Santo, Maranhão, Minas Gerais, Paraíba, Pernambuco, Piauí, Rio Grande do Norte and Sergipe.

P1MC management is carried out by the Integrated Audit and Management System for the One Million Cisterns Program (SIGA), which provides information and reports related to its execution. The system is fed by the Micro-regional Management Units (UGMs) in each state. In order to ensure safe and reliable data, the system maintains a direct connection with the Federal Revenue Service site, enabling immediate consultation of all records in the Corporate Taxpayers Registry (CNPJ) and Individual Taxpayers Registry (CPF).

4 The P1MC Rainwater Cistern

The rainwater cistern is built by bricklayers in the rural localities, who receive training and capacity-building from authorized P1MC organizations, which render overall excavation, acquisition and sand and water supply services, as well as the construction itself. Of the various cistern models the several Non-Governmental Organizations (NGOs) participating in ASA have dealt with, the model using pre-fabricated cylindrical plates is adopted the most frequently.

Cistern construction was originally carried out by families and/or communities with support from local organizations, creating a reference which inspired similar experiences and served as the basis for public policy designed and executed by civil society.

A partnership established between ASA and the Ministry of Environment in 2001 enabled the development of a pilot P1MC project for construction of the first 500 rainwater cisterns. A methodology was developed with activities aimed at community and governmental and non-governmental institution sensitization and mobilization, in an attempt to involve more stakeholders in the process. Until then, cistern construction had been experimental to find the best models and promote of technical expert and brick layer capacity-building in institutions and families that would benefit from the Program. Another benefit was the direct impact on local economy and income of the grantee families, in addition to the time saved due to reduced time spent in search of water, allowing local dwellers to use this extra time in other activities.

Later, the National Water Agency (ANA) financed construction of 12,400 rainwater cisterns, resulting in 12,750 cisterns built, thanks to co-financing (ANA, 2005). In late 2003, ASA established a partnership with the Extraordinary Ministry for Food Security and the Fight Against Hunger (MESA), currently MDS, which in that same year financed 17,140 cisterns. The Brazilian Federation of Banks (FEBRABAN) financed another 10,000 units, including the infra-structure for implementation of 48 management units in the 11 states in which the Program was implemented (BRASIL. Programa Fome Zero, 2005).

In April 2004, the goals met by P1MC were: 42,345 families mobilized to solve the problem of access to good quality water; 31,778 families received capacity-building in water resource management; 1,789 trained brick layers and 33,597 rainwater cisterns built in 565 municipalities (COEP, 2005). Two years later, the MDS/ASA Cisterns Program had built 107,989 cisterns, while the grand total implemented by ASA in the semi-arid with MDS and other funds reached 135,876 cisterns.

5   Objectives of the Evaluation

Evaluation of the Rainwater Cisterns Program had the following objectives:

5.1 Overall Objective

Quantify and qualify decentralized access of P1MC grantee families to potable water stored in rural rainwater cisterns, built according to technical standards specified by the Program, as well as verify the capacity for permanent maintenance of the aforementioned cisterns.

5.2 Specific Objectives

:: Analyze whether rainwater cisterns meet technical requirements of the Program;

:: Evaluate grantee access to sustainable water resources;

:: Assess reduction in effort and time spent by grantee families, with emphasis on women;

:: Identify if there was improvement in living conditions for grantees due to increased quantity and quality of available water.

6   Evaluation Methodology

The methodology used in this study was made up of three distinct and simultaneous steps: integration of the data bases, definition of the sample size and field work.

6.1 Data Base Integration

The following data bases were initially integrated: a) ZANE data used to define the 11 stratified sample regions (Figure 2), i.e., the Landscape Units (SILVA *et al.*, 2000); b) the data base provided by MDS/SAGI (2004), containing information about 42,345 rural cisterns built between late 2003 and December 31, 2004 (Figure 3). This base was used to determine the size of the sample in the eleven regions under study and to select the families within each rural community to participate in the evaluation, to insure that the entire semi-arid was represented; c) the bases from the digital municipal grid from the Brazilian Institute of Geography and Statistics (IBGE) (2000), from which regional and municipal boundaries used in the selection of municipalities was gleaned. Communities in these municipalities were evaluated in the scale of the map of Brazil on the millionth scale (1:1,000,000).

The following information referring to location was obtained from IBGE data bases:

:: Municipal seats and other locations;

:: Hydrographic network (permanent and intermittent rivers, perennial and intermittent springs) and the road system (paved or non-paved highways and other roads);

:: Municipalities included in the Federal Government's Zero Hunger Program;

Lastly, the concept of UGEA was used as the geographical reference unit or territory (as previously mentioned), which, according to Silva *et al.* (2000), is the spatialized unit best adapted to the goals of rural development. In this unit, the substrate (material originated from the soil), natural vegetation, landform and nature of the distribution of soils in the landscape make up a set with minimum variation, according to the cartographic scale.

Figure 2: Location maps for the eleven studied regions and GUs
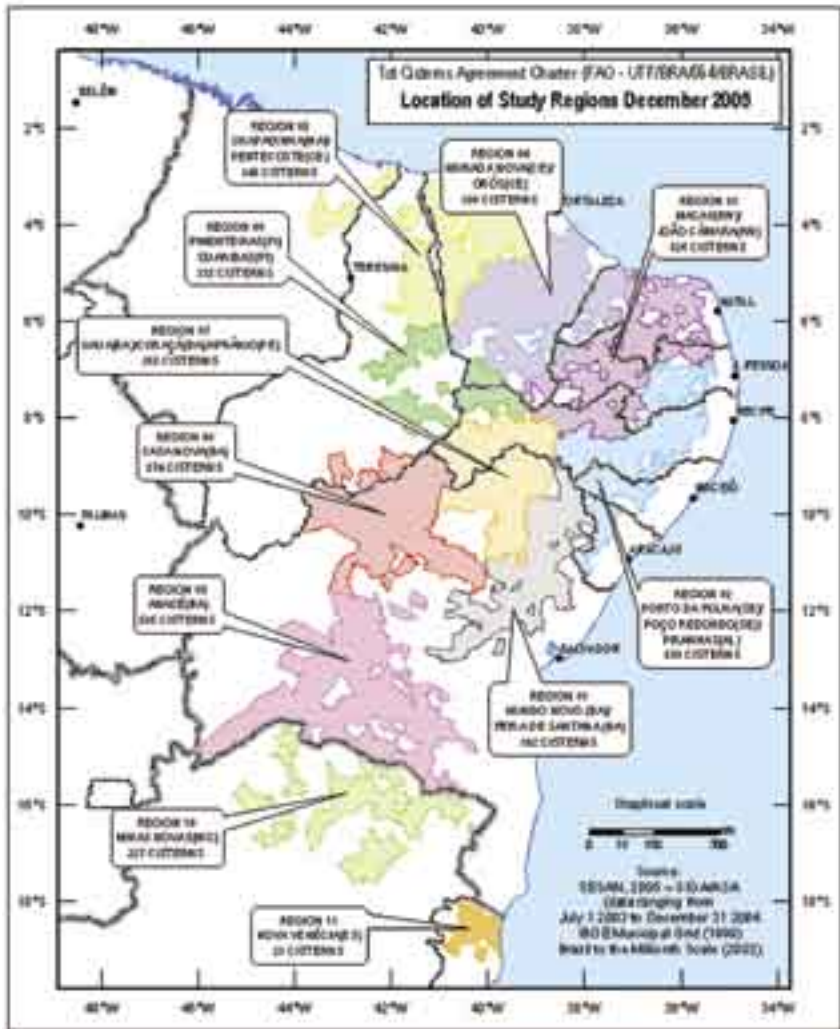
Source: Embrapa Semi-Arid, 2005

Figure 3: Spatialization of municipalities in the semi-arid region, including 42,345 MDS/P1MC-ASA Program rural cisterns
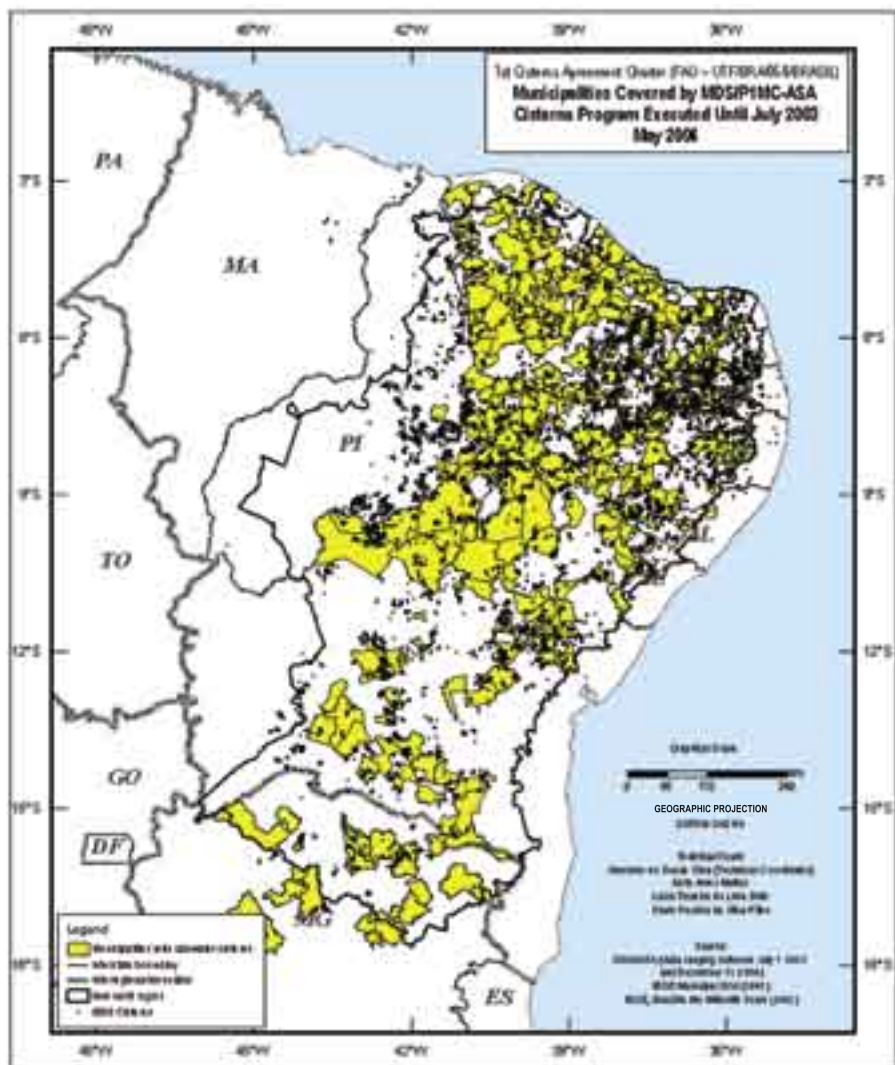
6.2 Definition of the Sample Size

The target population analyzed was defined according to SAGI/MDS data processed, taking into consideration all states in the Northeast, northern Minas Gerais and part of the state of Espírito Santo, for a total of eleven regions under study.

In order to define the sample size, within the stratified sampling frame the sample size was initially determined with no specification of allocation with a maximum admissible error e and a k coefficient corresponding to the level of confidence P_k.

$$n = (\Sigma \frac{W_h^2}{W_h} S_h{}^2) / (\frac{e^2}{k^2} + \frac{\Sigma \ W_h \ S_{h\,2}}{N})$$

:: $N_1, N_{2...}, N_L$ strata size yielded $W_h = N_h / N$;

:: Fixated precision represented by the highest admissible error was e;

:: The level of confidence P_k was represented by the coefficient K;

:: Variability within each stratum represented by the estimated variance S_{h^2};

:: The weight $w_h = n_h / n$ corresponded to each stratum in the sample.

Since each geo-environmental region was considered a stratus to be studied, calculation of the size of the sample (n) with proportional allocation was carried out according to the following equation, given $N_h / (N_h - 1) = 1$.

$$n = (\Sigma w_h{}^2 \frac{P_h \ Q_h}{W_h}) / (\frac{e^2}{k^2} + \frac{\Sigma W_h P_h Q_h}{N})$$

6.3 Field Work

Data collection took place by means of a questionnaire applied to 3,517 families located in 83 municipalities in the Brazilian semi-arid (Figure 4), corresponding to 83 rural communities which use cisterns for collection and storage of rainwater for consumption. The questionnaire was built and validated with the use of field pre-tests, containing 113 questions, some sub-divided in order to allow for evaluation of the cistern and its surroundings, according to the following aspects: domicile, characteristics of the inhabitants, rural establishment income indicators, cistern, women, use of water before the MDS/P1MC-ASA Program, grantee living conditions and inventory of technical itineraries about the cistern and analysis of the quality of the water.

Figure 4: Map of the GUs in the evaluated municipalities
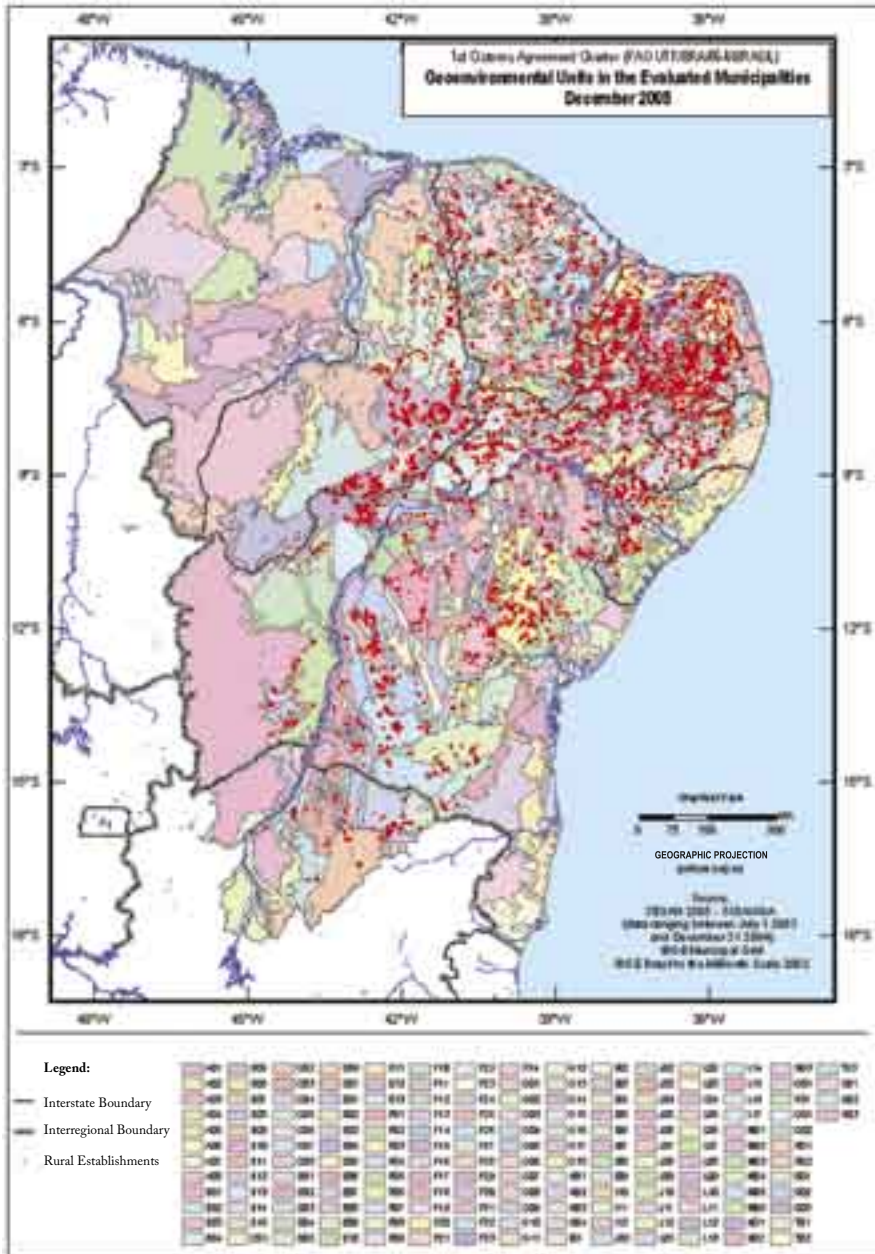
Source: Silva *et al.* (2000)

Embrapa Semi-Arid put together six regional courses, held at several of their research centers in the Northeast and in the Luís Eduardo Magalhães

Model School, in Vitória da Conquista, Bahia, in an attempt to train and qualify consultants-inspectors, with community health agents, NGO and Embrapa Semi-Arid technical experts as the target public. In order to achieve the proposed objectives, three field studies were defined:

:: Field study 1, for technical evaluation of the cisterns, quality of the water and family living conditions;

:: Field study 2, aimed at evaluation of alternative water sources for rural communities with MDS/P1MC-ASA cisterns;

:: Field study 3, targeted at georeferencing potential pollution risks for community springs.

7 Technical Evaluation of MDS/P1MC-ASA Rainwater Cistern Usage

7.1 Water Volume (V)

The amount of water needed for one person to drink and carry out basic activities – cooking and minimum hygiene, e.g. washing one's face – is 14 liters per day (SILVA *et al.*, 1985), represented in the equation below by the consumption by the family or people using cistern water (c). Thus, in order to determine the amount of water for the family, the total number of people (n) who will use the cistern water must be known, as well as the dry season for each region.

"Critical events" must always be taken into consideration when determining the size of a water structure. One such event, in the case of rainwater cisterns, is the longest stretch of time without any rain in the region, during which families still need to use water in order to survive. To determine the dimension of the total volume of water for families, an eight-month period (p) was considered, corresponding to 240 days a year with no rain. Therefore, the total volume (V) was calculated according to the following equation:

$$V = n * c * p \qquad (m^3)$$

Where:

V = volume of water for the family (m³);

n = total number of family members (unit);

c = average daily consumption per person, estimated at 14 liters in the rural areas (L);

p = dry period, considered to be 240 days per year (days).

Based on these considerations and data collected during the field study, it was observed that the total number of family members varied between 1 and 14 people, which corresponds to a need for water stored in the cistern varying between 3.36 m³ and 54.60 m³, in order to fulfill family needs during the dry season.

A joint analysis of these results showed that the estimated collected water volume, currently 16 m³ per family, i.e. 16,000 liters, is enough to supply 1,809 families, or 51.44% of the total 3,517 families studied in 83 municipalities of the Brazilian semi-arid region.

In theory, the current estimated volume of water (16 m³) fulfills the basic needs of families with four members at most, taking into consideration a 240-day consumption period, the average dry spell in the region. In practice, the above value meets the needs for drinking and cooking water of families with up to five members, for the same amount of time.

It can be thus observed that for families with more than five members, two or more rainwater cistern units with storage capacity of 16 m³ of rainwater each will be needed to meet their basic needs. Families whose basic water needs are not met remain dependent on other sources of water that are located far from their dwellings, are poor in quality, and at certain times of the year are transported by tank trucks for unaffordable prices.

Furthermore, many families with five or fewer members change their livelihoods, introducing new uses for water. When asked about these aspects, small families with new water consumption habits claimed that the volume of water available in the cistern, albeit appearing to be enough, was no longer sufficient for the needs of the family.

7.2 Catchment Area (AC)

In addition to the volume (V) of water to be stored in the cistern to meet the needs of families, it is also necessary to know the amount of rainfall (P) for the municipality and the efficiency of superficial water drainage (C) for determination of the size of the catchment area (Ac). For areas covered by ceramic shingles, this value corresponds to 0.70. The catchment area (Ac) was calculated using the equation:

$$A_c = \frac{V}{P * C} \quad (m^2)$$

Where:

V = volume of water for the family (m³);

P = average rainfall during the driest years (mm);

C = Superficial drainage coefficient.

Average rainfall in each municipality during the most critical years within a given series was taken into consideration for determination of the catchment area (Ac), which varied according to each municipality, i.e., the average of the years falling into the first quartile (25th percentile). This criterion was adopted in order to insure greater security in the analysis concerning rainfall, as well as to make sure that even scarce rainfall during dry years will be enough to fill the cistern and meet family needs.

In general, only three out of every ten years are considered to have normal pluviometric precipitation in the Brazilian semi-arid region (PORTO *et al.*, 1983). Hence the importance of taking this variable into consideration in determination of the size of water structures. In this perspective, municipalities with higher average annual pluviometric precipitation will need smaller catchment areas for the same mount of water to be stored.

In order to collect the current estimated volume of water (16 m³), the rooftops of the households themselves were used in the MDS/P1MC-ASA Program. During analysis of catchment area (Ac) data, residence roofs with one and two slopes were taken into consideration, as well as the number of eaves

(downspouts) installed. In the rainwater cistern whose Ac had a two-sloped roof and only one eave, this area was halved, as shown in Figure 5.

Based on the data collected, it was observed that the catchment areas in family household roofs in communities under evaluation varied between 5.12 m² and 479.25 m² and that 67.16% of families included in the evaluation are fully supplied. Overall, the catchment area needed for the current volume of 16,0 m³ varied between 17,37 m² and 80,80 m².

Figure 5: Rainwater cistern with one eave connected to catchment area despite roof with two slopes

Source: Embrapa archives

Due to size constraints for current catchment areas in some residences, many rainwater cisterns may not be filled due to low annual rainfall in their regions. In order to increase the efficiency of the catchment area size, there are two alternatives:

:: Improve quality of rooftops in houses presenting problems, although "roof quality" was not a parameter taken into account in this study;

:: Maximize use of the rooftop area.

In the sample studied (3,517 families), 78.76% of the houses have two eaves connected to the roofs of the houses. Rainwater cisterns are fully connected to two eaves in only nine municipalities.

Of all rainwater cisterns covered in the study (3,517), 21.27% (747 cisterns) have limited catchment areas, be it due to having only one eave connected to two-sloped roofs, be it due to roofs with one slope and one eave. This percentage becomes more critical and significant in years with below-average rainfall, resulting in dire consequences for families which depend on that water.

The São Mateus community, in the municipality of Castelo do Piauí, Piauí state, is worthy of note because in spite of high precipitation (835.8 mm) in the dry years (25th percentile), residences have considerably small rooftop areas compared to other municipalities in the Brazilian semi-arid region, 13.3 m^2 on average, with only one eave due to having only one slope. All rainwater cisterns have a catchment area deficit in this case, resulting in the need for significant increase to the catchment areas of these residences. In other words, the rooftop area must be increased to at least 27.35 m^2, enough to collect the 16 m^3 volume estimated by MDS/P1MC-ASA.

If taken into consideration, these cistern and catchment area parameters will insure adequate supply of the necessary volume of water for the family by the cistern, even during the drier years, as long as no water is wasted. Capacity-building for families is thus paramount.

For a better understanding of this discussion, two municipalities having extreme precipitation values were considered: Casa Nova, with 59 families analyzed, and Teofilândia, with 43 families analyzed. Both municipalities are in Bahia state, the former with average annual rainfall of 282.9 mm and the latter with 1,316 mm during the dry years (25th percentile).

Table 1 shows that rainfall data corresponds to periods of 22 and 18 years, being 5 and 11 years, respectively in the first quartile (25th percentile). Average annual rainfall was 384.95 mm and 1,564.35 mm in each municipality. The number of family members varied between 1 and 11 in Casa Nova and between 2 and 13 in Teofilândia. Thus, the needs for water, i.e. the necessary volume to meet

the families' needs may not show significant differences, varying between 3.36 m^3 and 36.96 m^3 and 6.72 m^3 and 43.68 m^3 per family.

Nonetheless, the current volume (16 m^3) meets the basic needs of 55.67% and 18.6% of families in these municipalities, respectively, i.e. families with up to five members. Regarding current catchment areas, it may be observed that these varied between 26.68 m^2 and 205.02 m^2 for Casa Nova, and between 14.52 m^2 and 109.20 m^2 for Teofilândia. However, the necessary catchment areas for the estimated 16 m^3 of water are, respectively, 80.80 m^2 and 17.37 m^2 in these municipalities.

In Casa Nova, only 20 cisterns or families (33.3%) are well supplied by this area, i.e. for 39 cisterns (families), the catchment area is not enough, because eight households have only one eave. On the other hand, in Teofilândia, only three cisterns (families) need expansions of their catchment areas, due to elevated rainfall in that municipality.

Table 1: Comparative example between the municipalities
of Casa Nova and Teofilândia (Bahia)

State	Municipality	Community	Number of Cisterns
BA	Casa Nova	Lago	59
Average Rainfall (mm)			
Series (years)			22
Dry years			5
Number of days without rain per year			240
PAnnual average (mm)			384.95
PAnnual average dry season: 25% (mm)			282.93
PAnnual average normal: 50% (mm)			348.85
PAnnual average humid: 75% (mm)			456.40
Water Necessity			
Number of family members	Average		4.59
	Maximum		11.00
	Minimum		1.0
Current Cistern Volume (m³)			16.00
Current families supplied			34 (56.67%)
Volume of water needed/family (m³)		Average	15.23
		Maximum	36.96
		Minimum	3.36
Catchment Area (Ac)			
Current Ac variation (m²)	Average		76.23
	Maximum		205.02
	Minimum		26.68
Minimum Ac needed: Ps (m²)			80.80
Current Ac with 2 eaves			52 (86.7%)
Current Ac (Ps) meets family needs			20 (33.3%)
Ac per necessary Volume (m²)	Average		76.92
	Maximum		186.64
	Minimum		16.97

Source: MDS/ASA, 2004

State	Municipality	Community	Number of Cisterns
BA	Teofilândia	Pedra Grande	43
Average Rainfall (mm)			
Series (years)			18
Dry years			11
Number of days without rain per year			240
P Annual average (mm)			1,564.35
P Annual average dry season: 25% (mm)			1,316.00
P Annual average normal: 50% (mm)			1,595.30
P Annual average humid: 75% (mm)			1,737.45
Water Necessity			
Number of family members	Average		6.84
	Maximum		13.00
	Minimum		2.00
Current Cistern Volume(m³)			16.00
Current families supplied			8 (18.6%)
Volume of water needed/family (m³)		Average	22.97
		Maximum	43.68
		Minimum	6.72
Catchment Area (Ac)			
Current Ac variation (m²)	Average		43.36
	Maximum		109.20
	Minimum		14.52
Minimum Ac needed: Ps (m²)			17.37
Current Ac with 2 eaves			34 (79%)
Current Ac (Ps) meets family needs			37 (86%)
Cisterns with 2 eaves in all Ac			37 (86%)
Ac per necessary Volume (m²)	Average		25.17
	Maximum		47.42
	Minimum		7.29

Source: MDS/ASA, 2004

7.3 Cistern Water Management

7.3.1 Basic Components

Water is crucial to life. Nevertheless, in order to effectively contribute to sustainability of life, it is necessary that it be quantitatively enough and qualitatively adequate, in addition to being available for human consumption whenever the need arises. The cistern, when planned based on family needs, may insure quantity, quality and the opportunity for the potable water necessary for family consumption in rural communities. Some basic components and maintenance are essential, as reported by Silva *et al.* (1985):

Location: the location for construction of the rainwater cistern must be separated from garbage depositories, corrals, septic tanks or other sources of pollution which may compromise the quality of the water and/or the structure of the cistern. It must be near to the household, in order to facilitate catchment of water from the rooftop;

Wire fencing: the cistern should be fenced in in order to prevent small animals (chickens, goats) from climbing on the cistern and bringing debris into the cistern, in addition to avoiding accidents with children;

Paved outer rim: the cistern should be surrounded by a paved rim in order to avoid infiltration of rainwater through the sides of the storage tank, which may compromise the structure;

Bleed valve: insertion of a bleed valve in the tank is essential, allowing for drainage of excess water stored;

Aerators: the walls of the cistern should have tubes which will renew the oxygen dissolved in the water. One such aerator may be the bleed valve itself. On the end of the tubes, a grate or screen should be installed to keep out insects, small animals and rough materials which may contaminate the stored water;

Manual pump: in order to avoid direct contact with water, and in some cases, the use of inappropriate containers for its removal, a manual pump should be installed. Thus, water can be directly pumped into a smaller reservoir in the kitchen;

Eaves: every cistern must have eaves to lead water from the catchment area, usually the rooftops of the houses, into the storage tank. Some precautions are necessary to maximize collection with no loss. Due to frequent high temperatures in the region, PVC eaves may lose their original shape, making collection of water difficult, especially when rains are stronger;

First rain: water from the first rain must be eliminated or used for other purposes, since it may contain small animal feces, dust, dry leaves and remains of animals which may have died on the rooftop, contaminating the cistern water. Currently, simple, low-cost devices are available which connect easily to the cistern pipe system;

Door: the cistern should have an access hatch or door for cleaning. This door should be kept closed at all times, in order to avoid accidents with children and animals;

Cistern cleansing: the cistern should be washed once a year, always before the start of the rainy season, in order not to mix old water with new water. However, it is important not to leave it empty, which may cause infiltration and cracks.

Figure 6 shows a rainwater cistern built in the training area of the Regional Institute for Appropriate Small Farming (IRPAA), with many of the characteristics described above.

Figure 6: Rainwater cistern with some essential characteristics

Source: Embrapa archives

7.3.2 Treatment of Drinking Water

Water quality standards vary according to the use the water is intended for. For human consumption, Brazilian law, through Directive number 518, of March 25, 2004, issued by the Ministry of Health (MS), states that "all water to be used for human consumption must comply with the potability standard and is subject to vigilance of quality of the water". This document defines potable water as "that which has microbiological, physical, chemical and radioactive parameters within the potability standard, and which does not present health risks" (BRASIL, 2004). To insure quality, water must be filtered and treated, as in the following recommendations:

:: Filtering: cistern water destined for human consumption must be filtered. Common filters found in the local markets or homemade filters are suitable. Cartridges should always be kept clean and be exchanged whenever necessary;

:: Treatment: water must be treated in a small reservoir located in the kitchen, such as the filter, a jar, or pot.

The cheaper drinking water treatment processes requiring less technology are simple, such as boiling the water (seldom done), sand-filtering or using a homemade filter, exposure to the sun and addition of liquid chlorine to the water. In rural areas of the Brazilian semi-arid region, the most common drinking water treatment techniques are filtration and chlorination, especially for rainwater stored in cisterns.

The chlorine used in the water disinfection process is found in the gaseous, liquid (sodium hypochlorite) and solid (calcium hypochlorite) states; it is the most common biocide employed in water disinfection. The choice of product to be used should be made according to factors such as: efficiency, cost, reagent quantity needed, ease of handling, safety and others. After treatment, residual chlorine remains in the water, as well as disinfection by products.

The World Health Organization (WHO) and Ministry of Health Directive 518 of March 25, 2004, consider 0.5 mg/L of residual chlorine in the water as enough to satisfactorily disinfect water after at least 30 minutes of contact. WHO

emphasizes that no harmful effects to health are observed when free chlorine concentration is below 5 mg/L. This concentration is taken as a reference rather than a target (OPAS/OMS, 1999; BRASIL, 2004).

Table 2 contains differentiated dosages of the chlorine-based product (sodium hypochlorite) to be employed according to the volume of water to be disinfected. A warning is due that a minimum period of thirty minutes is necessary before consumption of the water after application of the chlorine. It is recommended that small volumes of water be disinfected at a time, enough to meet family needs during one or two weeks.

Table 2: Amount of liquid chlorine for disinfection of
water to be used for human consumption

Product	Amount	Volume of water (Liters)	Minimum waiting period
Sodium hypochlorite (10%)	20 mL (2 tablespoons)	1.000	30 minutes
	1.0 mL	50	30 minutes
	0.5 mL	25	30 minutes

Source: Amorim and Porto (2001)

Chlorine should be added to water at a pH lower than 8.0. Otherwise, community health care agent recommendations should be followed for water treatment.

Table 3 contains a summary of the global analysis of some variables related to water management in 3,517 rainwater cisterns, analyzed by the MDS/P1MC-ASA in 83 municipalities of the Brazilian semi-arid region. This total corresponds to 3,517 families, who were asked various questions about several topics. It can be observed from the table that 48.37% of the cisterns were built less than one year ago, and 37.99% between one and two years ago. It was also concluded that all families received information about the rainwater cistern through courses or training, booklets, posters, meetings and other documents. Information included the cistern construction process, water removal, frequent cleansing and storage of cistern water

in the household. In general, this information was not only passed on by the bricklayer or constructor, but also by NGOs, workers' unions, churches and associations. When asked about the use made of the water, 87.94% of families answered it was always for drinking, but 52.83% also use it for hygiene and 76.77% for cooking.

Table 3: Summary of variables related to the process of construction, management, cleansing and treatment of cistern water, carried out by the families

States:11	Municipalities/Communities: 83		Number of Cisterns: 3,517	
Time built (%)		< 1 year	1 - 2 years	> 2 years
		48.37	37.99	5.57
Information passed on:	Bricklayer and/or NGO and/or Workers' Union and/or Church			
Medium for transmission:	Meetings, courses, printed material (booklet, newsletter, leaflet, poster)			
Type of information (%):	Removal	Construction	Cleansing	Storage
	87.43	74.67	88.68	82.74
Water use (%):	Drinking	Hygiene	Cooking	Others
	87.94	52.83	76.77	25.33
Management (%):	Washed	Dry days	Rain only	Eliminate 1ª rain
	92.69	11.83	69.01	82.31
Cistern water treated (%):	35.80			
Water stored in residence (%):	Jar/Pot/Bucket	Cartridge filter	Non-cartridge filter	
Water removal (%):	68.04	20.64	0.91	
	Pump		Manual	
	36.93		58.17	
Water treatment in the residence (%):	Chlorine	Boil	Filter	Untreated
	35.12	0.51	22.01	38.56
Problem with cistern: 16,89%	Constructor	Family	Other person	Not repaired
	3.30	1.99	0.71	10.09
Satisfaction level families (%):	**97,31**			

Source: MDS/ASA, 2004

In the water management context, 92.69% of the cisterns were washed after construction, and 82.31% of the families eliminate the water from the first rain. However, only 36.93% of the families have pumps for removal of water from the cistern. The pump, in addition to making the water removal process easier, also reduces its contamination when compared to the use of buckets or cans on a rope, which are normally exposed to the environment and may occasionally be used for other purposes.

Regarding treatment of water for family consumption, 35.80% of the families treat the water directly in the cistern. Inside residences, 68% store the drinking water in jars, pots or buckets; 20.6% use cartridge filters, and 0.91% non-cartridge filters (Figure 7).

Figure 7: Water storage alternatives within the household
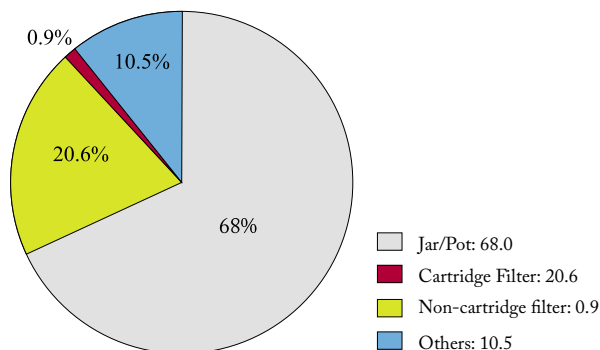
Source: Embrapa archives

Figure 8: Water storage alternatives within the household

Source: Embrapa archives

Confirmation of the water filtering process came with the answers to questions posed to families about the type of treatment given to drinking water: (i) 22.01% claimed to filter drinking water; (ii) 35.12% said they use chlorine; and (iii) 38.56% do not treat water before drinking it. For these families which do not treat water before using it, it is imperative that health secretariats provide guidance about the relevance of this practice, which can be done through community health care agents.

Only 16.89% of cisterns were said to have problems of different types. Of this total, 10.09% still had not been repaired at the time of this study (August 2005). The most common problems found were: cracks in the walls and water leakage; never held water; does not meet family needs; problems with the pump; family prefers water from the well; cistern water is not clean; cistern was not filled due to insufficient rain; cistern will not fill because the spout is lower than the cistern.

7.3.3 Physical, Chemical and Bacteriological Water Analyses

396 samples were collected for physical, chemical and bacteriological analyses of water from the cistern, filters and pots inside the households, as well as the community's main water source. The water source withstanding long periods of drought and meeting family demands was considered as the main source, e.g. small and large dams, wells, springs, rivers, fountains, tubular wells, canals and cisterns. Water collection was undertaken in accordance with recommendations of the São Paulo Water Control Laboratory (COHESP-LAG), responsible for analyses and issuing potability statements. The variables analyzed refered to:

:: Organoletic chracteristics: appearance and odor/taste;

:: Presence of several characteristics: Color (Pt/L), Turbidity (NTU), pH, Total Dissolved Solids – TDS (mg/L), Consumed Oxygen (mg/L), Ammonium (mg/L NH_3), Nitrate (mg/L N), Nitrite (mg/L N), Hydroxide Alkalinity (mg/L $CaCO_3$), Total Alkalinity (mg/L $CaCO_3$), Total Hardness (mg/L $CaCO_3$), Iron (mg/L Fe), Carbon Dioxide (mg/L CO_2), Chlorides in Chlorine (mg/L Cl-), Free Residual Chlorine (mg/L Cl), Sulphates (mg/L SO_4), Fluoride (mg/L F-) and bacteria related to Total Thermotolerant (NMP) and Heterotrophic (UFC/mg) Coliforms.

Data obtained led to the observation that in some cisterns, the TDS grade, which expresses water salinity, was high, while rainwater usually has low salinity. As an example, two cisterns in Teofilândia, Bahia, had TDS levels of 817.0 mg/L and 875 mg/L. These cisterns were found to have received untreated water from tank trucks. Another highly important variable in water quality determination is its hydrogenionic potential, i.e. pH. All samples had pH levels within the accepted range recommended by MS Directive 518 (BRASIL, 2004), which establishes water quality standards for human consumption, i.e., between 6.0 and 9.5. The remaining variables analyzed were likewise found to have acceptable values, with the exception of bacteriological examinations.

Water potability in bacteriological terms was compared in the presence and absence of treatment carried out in the households by use of chlorine, boiling or filtering, as well as untreated water. According to the results of 396 analyses carried out with samples from cisterns and household filters in different communities, 219.0 samples are potable, corresponding to 55.3% of the total examined; 177 (44.7%) are contaminated. The percentage of cisterns with contaminated water was higher than that of families claiming not to treat drinking water (38.56%); 35.12% said they used chlorine.

It is worthy of note that of the 119 main water supply sources for rural communities (underground and superficial waters) analyzed, 68 (equivalent to 57.14%) indicated contamination, i.e., fall outside recommended potability standards.

8   Conclusions and Recommendations

There is no doubt that the rainwater cistern is a relevant technology for sustainability of rural families in the Brazilian semi-arid region, due to guaranteed water for human consumption in a region in which water availability is a critical factor.

The high level of satisfaction shown by families toward the Program, expressed by 97.13% of interviewees, reveals the importance of rainwater cisterns

for sustainability of the "*sertanejo* lifestyle", in their efforts for "co-existence with the semi-arid". Therefore, no recommendation is more relevant than to try to expand construction of household cisterns in the Brazilian semi-arid region, mainly to benefit its most vulnerable social groups.

However, factors for sustainability of domestic water management in rural communities of the semi-arid region are not yet fully internalized, due to the short period of time between implementation of the MDS/P1MC-ASA Cisterns Program and this evaluation.

Some limitations were found, regarding volume of water made available in rainwater cisterns for family consumption. It was concluded, for example, that for families with more than five members living in the same household, the volume collected by the cistern may be insufficient to insure consumption by the entire family during the dry season. This matter, nevertheless, may be adjusted by the Program by means of increased storage capacity in the cisterns or construction of more than one cistern per family. Evidently, any technical reprogramming choice will need more in-depth *ex-ante* studies, which were not the object of this study.

Regarding water catchment, the evaluation has come to the conclusion that improvements to the quality of household rooftops which presented problems, as well as maximized use of current rooftop areas, through implementation of two eaves, for example, are important factors to insure proper catchment for the cistern, with direct impacts on availability of water for the family.

Problems found in 44.7% of quality and potability analyses may indicate a need for improvements in the capacity-building process for families regarding rainwater cistern management and treatment of water for consumption. Some methodological limitations to this preliminary assessment must, however, be taken into consideration, such as the size of the sample (only 396 cisterns) and the fact that cisterns under study had been constructed a short time before the study. Most had only been built for a few months and had not even received their first supply of rainwater; they were supplied with water from other sources (tank trucks, small dams, clay pits etc.).

At any rate, cistern water quality, especially water for human consumption must be considered a priority by the Program. Capacity-building for the families should reinforce the need to filter drinking water, management and treatment of stored water, in addition to avoiding the use of water from other sources to fill the cistern, since it is a technology made for rainwater collection. Evidently, given the water supply restrictions in the semi-arid region, this topic remains a great challenge to be faced by MDS and ASA in their perfection of the Program.

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Assessment of the Social Impact of the Cisterns Program

Chapter VI

Photo: Bruno Spada

Assessment of the Social Impact of the Cisterns Program[1]

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1   Introduction

The Brazilian semi-arid region encompasses the northern region of Minas Gerais and the dry savannahs of Bahia, Paraíba, Sergipe, Alagoas, Pernambuco, Rio Grande do Norte, Ceará and Piauí, totaling 1,133 municipalities, with an area of 969,589.4 km² and a population of 20,858,264 inhabitants, out of which 43.56% live in rural areas.

The semi-arid is one of the most vulnerable and poor regions of Latin America. Millions of families live there, farming land that either is theirs or belongs to third parties, under extreme weather conditions. Dry season occurs for more than six months and for this reason water is an invaluable asset. Draught brings about serious consequences for agricultural production, increasing poverty, hunger and other social problems.

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5   Master's degree in Agribusiness Management, analyst of the Conab.
6   Master's degree in Nonprofit Management from Boston University.

The Northeast Region – in which a large part of the semi-arid is located – holds but 3% of the water in the country. The *per capita* water availability in this region is below the critical index of 1000m^3/inhabitant/year, indicated by the United Nations as the minimum necessary to ensure human life and to preserve the environment. In the basins of rivers São Francisco and Parnaíba, it is estimated that this index will be of about 2000 m^3/inhabitant/year, in 2025. For intermittent rivers, currently at a threshold below the critical minimum, it is estimated that the index will be reduced to 500 m^3/inhabitant/year, during the same space of time (SILVA *et al.*, 2006).

Currently, most of the population of the semi-arid has access to water coming from multiple-use traditional sources, without quality control and with harmful consequences for their health. This way of procuring water also interferes with the region's productive activities and with the access of its population to schooling (SILVA *et al.*, 2006).

Envisioning to secure the right of the inhabitants of the semi-arid to water, at least as far as the basic human consumption is concerned, the Brazilian government put in place The Cisterns Program (MDS, 2006). The Program's main actions highlight the support to the Training and Mobilization Program for Co-existence with the Semi-Arid – One Million Cisterns Program (P1MC), designed and implemented by *Articulação no Semi-Árido Brasileiro* (Brazilian Semi-Arid Network)[7] (ASA).

Beyond social impact dimensions of the Program, the selection of beneficiaries and their training/guidance were assessed, as carried out by the P1MC implementers.

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7   Coordination in the Brazilian semi-arid.

2 Conceptual Framework

2.1 Training and Mobilization Program for Co-existence with the Semi-arid – A Million Cisterns Program (P1MC)

The overall goal of the P1MC Program is:

"To contribute, by means of an educational process, to social change, with focus to the preservation of, the access to, the management and the valuation of water as an essential right of life and citizenship, by increasing the understanding and the practice of sustainable and solidarity-based co-existence with the semi-arid ecosystem" (ASA, 2005).

The P1MC singles out communities and families as its **primary beneficiaries**. However, it has only defined somehow clearer criteria for the selection of families, as shown below (ASA, 2005):

:: **Communities:** the primary identification of the locations, based upon the secondary data consulted, starting from sources such as the Human Development Index (HDI), the IT Department of the Unified Health System - SUS (Data SUS), Brazilian Institute of Geography and Statistics (IBGE) etc.; children and adolescents in situations of risk, infant mortality etc.;

:: **Families:** female heads of family; number of children from zero to six years of age; children and adolescents attending school; adults aged 65 and more; and the physically and mentally handicapped (ASA, 2005).

The P1MC has the following lines of action (ASA, 2005): mobilization, social control, training, communication, institutional strengthening of civil society, and the construction of cisterns. The focus of this article is the construction of cisterns, although basic aspects that are inherent to the respective process – such as mobilization, the selection of beneficiaries, their training and the results of communication – have also been assessed, as already mentioned.

It is believed that the objective of "construction of cisterns" will bring about the benefits described in Chart 1, according to the ex-*ante* assessment of the Program (ASA, 2005). For this reason, these benefits are a relevant focus of this impact assessment.

Chart 1: Benefits of the Program pointed out in
the ex-*ante* assessment of the P1MC

Benefit	Description of the benefit	Estimate of the benefit expected
Time saving for families	Reduction of the time spent obtaining water	36 days/year of work per person (Embrapa Semi-Árido); 15 days/man and 10 days/women (Diaconia)
Savings in the purchase of water	Reduction of expenses with the purchased of water	Pernambuco and Paraíba: R$ 2.00/1000 liters
An increase in the days of work	Reduction of days lost due to diseases caused by the consumption of contaminated water	5 weeks/year (Embrapa Semi-Arid) 5.5 days/year per family
Savings in the purchase of medicines	Reduction of purchases of medicines, due to the reduction of diseases caused by the consumption of contaminated water	R$12.00/year/family
Reduction of diseases associated to water	Reduction in the occurrence if diseases caused by the consumption of contaminated water	–
Increase of school attendance	Reduction of the loss of school days (children)	–

Source: ASA, 2005

2.2 Water and its Impacts

Water has multifarious uses: human consumption, quenching animal thirst, irrigation, industrial processes, power generation, leisure activities and navigation, among others. The use of water as a fundamental and indispensable product for the health of the human population must have precedence over other uses, as guaranteed by the legislation in force (MACIEL FILHO *et al.*, 2000). According to the National Policy for Water Resources (1997), in its article 1, number III, "in situations of shortage, the priority use of water resources is human consumption and the quenching of animal thirst".

Regarding the use of water, there are several means by which man may become ill: by the direct intake of contaminated water, by the preparation of food and the performance of personal hygiene with contaminated water, by using it in agriculture, in the hygiene of the surroundings, in industrial processes and in leisure activities (MACIEL FILHO *et al.*, 2000).

The supply of water is an essential issue for populations; it is also a fundamental political issue for governments, due to the risks its absence or its inappropriate supply may ensue for public health. The universal provision of these services is the major objective of developing countries (IBGE, 2002).

2.2.1 The Quality and Quantity of Water in Households, the Level of the Service and Health

In a report written for the World Health Organization (WHO), Howard and Bartram (2003) reviewed works about the access to water and its relationship with health. These authors tried to determine, particularly starting from works conducted with vulnerable populations, on the association between the different uses of water (consumption, hygiene, production and entertainment), its quantity and quality, and health.

Howard and Bartram (2003) showed evidence that the availability of water has a relevant influence on health, particularly as far as diarrhea is concerned; such evidence is stronger in children. Some authors cited by Howard and Bartram

suggested that diseases are also indirectly associated to the time devoted to obtaining water, that is: the shorter the time spent by adults, the greater their availability for the preparation of food, for feeding the children and tending to their hygiene.

In Brazil, diarrhea has always been among the main causes of child hospitalization. Among children under the age of five, infectious and intestinal diseases represented, in 1996, 20.9% of the causes, 31.4% in the Northern Region and 26.4%, in the Northeast. On children under one year of age, the main causes were: pneumonia (28.2%), diarrhea (21.8%) and peri-natal aliments (16.4%) (MACIEL FILHO *et al.*, 2000).

Precarious sanitary conditions, associated to the non-availability of water supply (quantity and quality), are players that strongly contribute to the prevalence of cholera and other intestinal diseases in the Northeast Region, which has always concentrated the highest number of cases per year (MACIEL FILHO *et al.*, 2000).

The evidence gathered by Howard and Bartram (2003) suggested that the volume of water used in households alone is sensitive to striking differences in the level of service. An interesting indication along this line of reasoning is the work of Cairncross and Feachem (1987, *apud* HOWARD & BARTRAM, 2003), according to which as the time spent for obtaining water exceeds five minutes or a distance of 100 m from the house, the quantities collected of water decrease significantly. On the other hand, when water is collected from at least one point within the limits of the household itself, the quantity available increases considerably; greater increases are only recorded when there are several points of distribution within the household. Theses results indicate that the relevant factor regarding water is not only its quantity, but also the respective level of service.

Howard and Bartram (2003) also reported on research that tried to establish minimum quantities of water required for different uses, as well as the consequences of each of these levels of service for health. Chart 2 presents a summary of the main findings of these authors on this matter.

Table 2: Relationship among levels of water
service, needs met and risks for health

Level of the water service	Measurement of access		Needs met	Risks for health
Without access (quantity collected below 5 liters /*per capita*/day)	1)	Source at a distance of more than one 1 Km or needing a period of time of 30 minutes for obtaining water	Human consumption not guaranteed; hygiene impossible (unless at the very source)	Very high
Basic access (average quantity of 20 liters/*per capita*/ day).	2) 3)	Source at a distance between 100m and 1 Km or A period of time of 30 minutes for the total collection	Human consumption has to be guaranteed; hygiene: hand washing and food preparation, clothes laundry and bathing only at the very source	High
Intermediate access (average quantity of 50 liters/*per capita*/ day).	4) 5)	Water in the household itself (a spring) or at a distance of 100 m or 5 minutes for obtaining water	Human consumption guaranteed; personal hygiene and of food preparation guaranteed; clothes laundry and bathing have to be guaranteed	Low
Ideal access (average quantity of 100 liters/*per capita*/ day).	6)	Water at the household, from several sources	Human consumption and hygiene guaranteed	Very low

Source: Howard and Bartram, 2003

In the case of the P1MC, one notices that water services (for households having cisterns) are among the intermediate and basic levels, since the cistern alone does not meet the needs of all uses, obliging the dwellers to continue fetching water from other sources in order to meet other needs. Yet, indicators concerning quantity, quality and levels of services, as well as changes in the occurrence of several diseases, are relevant for the Program's impact assessment.

2.2.2 Vulnerability and Obtaining Quality Water

Some scholars have tried to identify vulnerability indicators from water services, by combining several measures in a water poverty index (WPI)

(SULLIVAN *et al.*, 2003; LAWRENCE, MEIGH & SULLIVAN, 2002). The purpose of this index is to combine measures of water availability with measures of the capability (of communities or countries) for obtaining water.

The index, therefore, allows one to determine whether communities or countries are "water poor ", either because they do not have water available, or because they lack the necessary conditions in terms of access to this resource, or both. In an assessment of the water poverty of 140 countries (LAWRENCE, MEIGH & SULLIVAN, 2002), Brazil was ranked in the 66th place, below several developed countries, but also below other peers in Latin America, such as Chile, Ecuador, Peru, Costa Rica, Uruguay, Colombia, Panama, Argentina, Venezuela, Bolivia, Mexico and Trinidad-and-Tobago.

The index of water poverty is made up of the following dimensions : a) access to and availability of water: water resources that can be used by communities and countries; b) quality and variability of water: access to water with quality and regularity according to the needs; c) uses of water: different purposes for which water is used (food, hygiene, production and entertainment); d) the ability to obtain water: the ability to obtain water from several sources and the ways it is managed; e) environmental aspects: concerns the integrity of the environment that may derive from different forms of access to water. Table 3 presents each dimension of this vulnerability as well as the indicators that might be used, within the impact assessment of the P1MC.

Table 3: Dimensions of vulnerability in obtaining water and relevant indicators for its measurement in the assessment of the impact of the P1MC

Dimension	Relevant indicator(s) for the P1MC	Logic for inclusion of the indicator (s)
Access to water	1) Distance from alternative source to cistern 2) Time spent obtaining water from these sources 3) Expenditure on water from alternative source	Since the P1MC cisterns have limited capacity, dwellers must resort to other sources. Thus, part of the benefits foreseen (such as saving time to fetch water), may fail to occur, for this reason, the indicators estimate limiting factors for the benefits foreseen.
Quality and regularity of the water	4) Quality of the water (of the cistern and from alternative sources) 5) Regularity in obtaining water (from the cistern and from alternative sources) 6) Treatment for cistern water 7) Water storage (from the cistern and from other sources)	Likewise, benefits regarding health may also be jeopardized by the quality of the water from other sources (and also from the cistern itself)
Capability to manage water	8) Education of the person in charge of the household 9) Proxies for household income 10) Training for the management and the treatment of water 11) Participation of the community in the management of water 12) Support to the management of water, by government organizations, NGOs or other bodies of the third sector	These indicators try to determine the individual capital for the management and stewardship of water, as well as the social support received for its management. Indicators 10 to 12, especially, are also important components of the P1MC Program, as already mentioned.
Use of water	13) Use of the water from alternative sources (human consumption, production etc.) 14) Sufficiency of water from the cistern for the provided uses provided	The limited storage capacity of the cisterns, and the ensuing need to use water from other sources, may limit foreseen benefits, particularly regarding health (if the water from the cistern is not enough for basic human consumption).
Environmental aspects	15) Environmental integrity related to water	It is not relevant for this analysis, since the P1MC Program was not aimed to contribute to change in the use of alternative sources and since the collection of water in cisterns does not bring about environmental impacts.

Source: Adapted from Sullivan *et al.*, 2003

2.2.3 Obtaining Water and Gender

The role of women in water management consumed in poor households has been emphasized by some authors. This role primarily relates to the division of labor in the household; for example, as a rule women and girls use water for domestic purposes (hygiene and the preparation of food), while it befalls men and boys to obtain water for agriculture and animal-husbandry purposes (WELL, 1998).

In many countries, on the other hand, women are responsible for the household and for the family, in the phenomenon known as the "feminization of poverty". Even if it is not the case, they are also in charge of agricultural activities, in addition to household chores (FAO, 2005).

Moreover, women are also responsible for obtaining water and sometimes they do it by taking long journeys and going through distances of several kilometers, in which they are typically assisted by their children (WELL, 1998). This means great physical strain on these women, as well as time spent that otherwise might be devoted to other activities (such as productive or schooling activities). This situation also leaves little time for children to play (which contributes towards their sound development) and for adults to ensure proper child-care.

The construction of cisterns, such as those implemented by the P1MC, may impact the division of labor in households and reduce the time devoted to fetching water, allowing for the involvement of women and children in new activities (productive or school-related). These are important changes advocated by the Program itself, which, therefore, must be the focus of this social-impact assessment.

2.3 Impact Assessment and Quality of Life

In this work, we have adopted the concept of impact assessment as suggested by Roche (2002): "it is the systematic analysis of the lasting or significant changes in the lives of people, brought about by a given action or series of actions" (ROCHE, 2002, p. 37).

The adopted impact assessment approach also has the following purposes: a) to identify changes directly or indirectly related to the P1MC; b) to check whether these changes were consequences of the Program, by means of the comparison with other social groups that were not included in the Cistern Program; c) to identify results of the construction of cisterns (with the beneficiaries of the P1MC) and longer-term impacts (on households with old cisterns, not built by the Program now under assessment).

The impact assessment focused on the beneficiaries' quality of life, after the construction of the cistern. Noll (2002) pointed out two different currents of thought in the conception of quality of life: the Scandinavian and the American approaches. In the former, quality of life is understood as the individual and conscious command of living conditions, starting from given resources. The individual is understood as a creative, active and autonomous being, capable of defining objectives. This approach considers that resources and living conditions relate to personal objectives, which are defined in terms of money, property, knowledge, social relations, psychological and physical energy. The second approach considered, the American approach, encompasses, in the concept of quality of life, the subjectivity of individual well-being, as the final result of conditions and processes. This approach is to a large extent influenced by the assertion of social psychologist W.I. Thomas, according to whom "if men define situations as real, they are real in their consequences" (THOMAS, 1928, *apud* NOLL, 2002). Thus, the most important indicators for measuring subjective well-being are: satisfaction and happiness.

Noll explains that currently there is practically a kind of consensus in terms of measuring quality of life by simultaneous consideration of objective and subjective indicators, because similar living conditions are assessed differently by different social groups.

In this work, we used indicators identified among the very beneficiaries of the P1MC, some of them corresponding to the expected changes from the construction of the cisterns; these indicators had, therefore, an objective referential (although always measured by a qualitative assessment of the beneficiaries). Others have tried to identify the valuation of these changes for the respective beneficiaries.

2.4 The Conceptual Model

Positive and/or negative consequences of access to water (suggested by the P1MC itself or by the literature), the conditions of its use and management in poor households and variables that influence (in a way or another) these consequences were included in the theoretical model adopted in this work.

In this model, the following sets of variables were deemed relevant, as having influenced the construction of cisterns' impact:

a) Access to and availability of water, as the existing need for obtaining this natural resource from other sources can jeopardize some expected results and impacts (on health and on time available and also on the savings in the purchase of water, in addition to indirect results deriving from them). Access and availability also influence decisions on the use of water;

b) Characteristics of the household, which allow for access to better-quality water, for carrying out the appropriate management of the cistern and facilitate the results of the training carried out by the P1MC;

c) Training and motivation, concerning the handling of the cistern and of the water and, as a consequence, its quality;

d) Handling of the cistern and of the water, with effects on the quality of the water of the cistern;

e) Water management and social support, influencing the decision on the use of water, training and motivation, uses of water;

f) Uses of water, that directly refer to the diverse expected changes driven by the construction of the cisterns;

g) Division of labor in households, which impact decisions on water usage.

The set of variables termed "changes induced by the cistern" corresponds to the direct and indirect impacts of its construction.

3   Goals of the Assessment

3.1 Overall Goal

:: To assess the social impact of the MDS/P1MC-ASA according to the perception of the beneficiaries and with regard to the Program's goals and principles;

:: To assess whether the beneficiaries of the MDS/P1MC-ASA were selected and trained according to criteria of socioeconomic equity, as well as the efficiency and effectiveness of the courses offered by ASA, geared to the use of potable water coming from the rural cisterns and to the need for their upkeep and hygiene.

3.2 Specific Goals

To assess impacts concerning the construction of the cistern, regarding:

:: The use of water coming from alternative sources to the cistern;

:: Social mobilization and decision on the use of water;

:: Meeting basic needs in terms of household consumption and improvement of the quality of life;

:: School attendance, access to leisure and child care, by means of increased time available without the need for fetching water;

:: New activities and family income;

:: Quality of the water and health conditions;

:: Permanence in the community;

:: Division of labor in households and empowerment of women.

To assess the selection of the families benefiting from the MDS/P1MC – ASA, and comparatively observing their socioeconomic characteristics with those of a similar sampling not contemplated by the Program;

To assess the adequacy of the training processes and their results used by ASA applied to families benefiting from the MDS/P1MC-ASA.

4   Methodology

4.1   Sampling

The procedure utilized was that of stratified household sampling, samples having been taken from a set of 11 regions with different geographic and environmental characteristics, starting from the agro-ecological zoning of the semi-arid region of the Brazilian Northeast.

The universe of samples, represented by households located in the same areas as those served by MDS/P1MC-ASA Program in Brazil's semi-arid region, was divided into 11 strata, each of them represented by a Landscape Unit, which contains several geographic and environmental units (GU)[8]. In the semi-arid region there are 110 GU. In each stratum, the individual size of the three samples was calculated. The sampling covered over 80% of the total of GU under reference. Thus, the procedure of sampling was identical to the one used for the environmental assessment of PAM Program (SILVA *et al.*, 2006). Starting from this procedure, three sub-samples were taken:

::   Sample 1: made up of 1923 households with cisterns built by the P1MC. This is a sub-sample of the sample used for assessing the quality of the water of the cisterns (SILVA *et al.*, 2006);

::   Sample 2: a sub-set of 1601 households (without cisterns), taken in a similar manner from the same UG;

::   Sample 3: sub-set of 665 households, in the same UG with cisterns not built by the P1MC.

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8   The GU is the referenced geographical unit of a territory or location; it corresponds to the specialized body in which the sub-stratum (material of origin of the soil), the natural vegetation, the modeling and the nature of soil distribution in the landscape make up a set with minimum variability, according to the cartographic scale.

4.2 Data Collection Procedures and Instruments

The collection of the data was carried out by means of three specific questionnaires, one for each sample. The collection was made by a group of 40 health agents trained for this purpose. The questionnaires were validated and adjusted before application, after having been tested with the groups of households and with the health agents themselves.

The questionnaires contained five sections, focusing on: characteristics of the dwellers of the households; indicators of work and income; alternatives for the acquisition of water; water management of the cistern; changes induced by the cistern. These sections were similar in the three samples. The sections with specific questions on cisterns were not included in the instrument meant for Sample 2 (without cistern).

The items in all questionnaires were multiple-choice questions; in few instances open-ended questions were used. The questionnaires also guided health agents in charge of collecting the data to introduce new sections during the interview on how each issue should be read, on the number of acceptable alternative answers (one or many) and alternative paths to be followed (in the questionnaire), depending on the answer given to certain questions. The agents also relied on a chart with the final version of the questionnaires, which provided more elaborate instructions, as well as examples concerning the more complex items of the questionnaire.

4.3 Data Analysis

In most of the analysis described below, central-trend (averages and standard deviations) measures were used, as well as frequencies and percentages of households, or of answers. Overall, the work features a descriptive analysis of the data.

The entire analysis was made by means of a comparison of samples. Thus, it contains descriptions of variables that indicate differences as well as convergences among samples, comparatively examining questions concerned with the characteristics of the households and of those in charge of them, their work

and income, as well as alternatives for obtaining water. The work also analyzed the water management of the cistern and the cistern-induced changes, by comparison of the two samples with cisterns.

5   Results

5.1 Selection of Households in the P1MC Program

In order to assess the adequacy of the selection of households made by the P1MC Program, it was necessary to compare at least two of the three samples mentioned: Sample 1, with cisterns financed and built by the Program; Sample 2, without cisterns. This comparison verified whether the samples were different from one another in terms of characteristics that were relevant for inclusion in or exclusion from the Program. The comparison also included Sample 3, in which households have cisterns not sponsored by the P1MC.

What were the differences between the samples described? Firstly, it was possible to notice that there is little difference, vis-à-vis the number of municipalities (on average, 50 municipalities) and states (8) in which households are located, and also vis-à-vis the number of interviews made in each state. Regarding this last indicator, households in Bahia, Piauí and Pernambuco were those subjected to more interviews, in this order, in the three samples.

As to the physical characteristics of the households, it was possible to notice:

:: In Sample 1, there was a greater proportion of isolated houses (36%), that were owned houses (80.12%) and with ceramic-tile roofs (95.18%);

:: In Sample 2, the proportion of owned houses (paid for or at the stage of being acquired) was smaller (72.94%) and the proportion of masonry finished houses was also smaller (46.01%). On the other hand, the sample had a higher percentage of assigned or borrowed houses (18.48%), of non-finished masonry houses (34.49%) and of houses without bathrooms (58.13%). Most of these dwelling had no sewage (47.90%) and sewage with septic pit (38.51%);

:: Sample 3 featured the lowest proportion of houses without bathrooms (29.89%) and the highest proportion of in-house bathrooms (39.75%);

:: Samples 2 and 3 were similar in the percentages assessed regarding the proportion of houses with ceramic tile roofs (circa 77%);

:: Samples 1 and 3 featured similar proportions of households with unfinished masonry walls (circa 22%) and finished masonry walls (about 62%);

:: There was no major distinction, among the three samples, in what concerns the destination of the garbage burnt (55 to 60%) or disposed of in open-air dumps (37 to 40%); the proportions were similar in the three samples.

By examining indicators concerning the presence of electrical appliances, vehicles and services, it was possible to establish the following distinctions among the three samples:

:: Sample 3 featured a higher proportion than the other in what regards the ownership of gas stoves (81.2%), television sets (76.8%), radio sets (82.2%), refrigerators (53.36%), sewing machines (38.15%), bicycles (60.41%), motorcycles (30.3%) and cars (17.11%);

:: In Sample 2, there were lower percentages of gas stoves (64.6%), radio sets (71.7%) and bicycles (49,04%) than in the other samples;

:: Samples 1 and 2 were similar in what regards the presence in households of: television sets (59 and 57%), refrigerators (32 and 31%), motorcycles (18 and 17.5%) and cars (4 and 6%);

:: The three samples were similar in terms of the reduced number of households having telephones (4%, 1% and 0, for samples 1, 2 and 3, respectively) and of the high availability of electric power (provided in at least 72% of the households, in the three samples, by means of a general grid).

The comparison described indicates that Sample 2, although quite similar to Sample 1, featured several indicators that show a more difficult socio-economic

situation for its dwellers. Sample 3 was the one that featured the best indicators, having been quite different from the two other ones.

It is also worth highlighting the fact that Sample 2 featured a higher proportion of households with piped water (11.67%), which can be one of the factors that explain why its households were not the focus of the P1MC Program, in its early stages.

It was also noticed that the persons responsible for the households are different in the three samples, as follows:

:: In Sample 2, there were higher percentages of households headed by women (52.04%) and of persons who currently do not attend school (64.5%);

:: Sample 3 featured higher percentages of people in charge of households in higher average age brackets (32 against 26 in samples 1 and 2) and retired persons (7.2%), who take care of the house and work in the property (30%);

:: In samples 1 and 2, there were higher percentages of people in charge of households who were not paid for this, as compared to Sample 3 (25.24 and 17.75%, in samples 1, 2 and 3, respectively).

As to the level of schooling of people responsible for households, it was possible to verify that:

:: A lower number of people responsible for households (18.99%), in Sample 3, cannot read or write. This Sample also featured the highest proportion of people responsible for households having schooling equal to or higher than incomplete high school, 13.47%, against 8.07% in Sample 1 and 7.47% in Sample 2;

:: In the other levels of schooling, the figures for all samples are similar.

Other relevant indicators for assessing the selection of households represent the level of income, whether direct, as a function of work, or indirect (by benefits, grants, etc.), as compared to the periodical commitments in terms of expenditure.

The analysis of these results indicated that these households obtain their income from their productive activity and from Government benefits. Donations represent the smallest part of their income. This result was confirmed in the items concerning benefits that are similar to donations (money received from churches, NGOs and individuals). In these cases the amount received is also close to zero.

Regarding work income, for any of the samples, there was a higher proportion of the production geared to self-consumption. The production meant for markets was higher in Sample 1 and lower in Sample 2; the samples were not different in regards to income derived from work outside the property.

As to benefits, the most important ones were: the *Bolsa Família* Program (Family Grant Program), the School Grant (*Bolsa Família*), the Rural-Retirement Pension and the Gas Voucher[9]. All these are benefits paid by the federal government. Among these benefits, Sample 1 includes the highest proportion of households receiving the School Grant, and Sample 3 is at the opposite end of the sequence (the lowest proportion). As to the Rural-Retirement Pension, Sample 2 features the lowest proportion, while Samples 1 and 3 are similar in this regard.

Monthly household bills include mostly electric power, cooking gas and others. Sample 3 featured the highest proportion of households that pay telephone, cooking-gas and other bills, and a lower proportion of households that pay for water supply (piped water). In the three samples there was a small percentage of households that normally have no bills to pay (out of the three samples, the one featuring the lowest proportion in this category was Sample 3).

These data indicated a very similar profile for the people included in the three samples, vis-à-vis income and expenditure. Some indicators confirmed data already shown on households; the results concerning bills to be paid, specifically, reinforced the conclusion according to which households in Sample 3 featured a slight economic superiority as compared to the households included in the other samples.

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9   The presence of indicators concerning the federal government's School Grant and the Gas Voucher, currently part of the *Bolsa Família* Program, is due to the fact that the collection of data was made during a period in which these benefits were still migrating to that Program.

To understand more in-depth differences among the samples, a total-vulnerability index was established for each household, starting from vulnerability indicators related to the characteristics of the heads of households (schooling, gender and occupational position), to direct and indirect income (income deriving from work, physical characteristics of the household and technology available in the household) and to the services available to the households. Chart 4 presents the indicators used, only for Samples 1 and 2, and their maximum and minimum values, starting from the original data.

These indicators were correlated to a 10-point scale (in which the original maximum value corresponded to ten). Partial-vulnerability values were calculated for each category (characteristics of the person in charge of the household, household income and services), corresponding to the sum of the total points of the correlated values of indicators in each category, divided by the total of available points.

The total vulnerability was also calculated, corresponding to the weighted sum of the partial vulnerabilities. The weight for each partial vulnerability indicator was 0.4 for household income and of 0.30 for each of the other categories. Thus, the total vulnerability also varied within a zero-to-ten-point scale.

Next, a T Student Test was applied, for the differences in averages of partial and total vulnerabilities, in Samples 1 and 2, assuming they were independent from one another. Table 1 contains the averages analyzed. The T Test indicated that there were significant differences between Samples 1 and 2, for partial vulnerabilities concerning income and services and for the total vulnerability, but no significant differences were found for the vulnerability concerning the characteristics of the heads of the households.

It is also interesting to highlight that the differences recorded among the averages indicated a higher level of vulnerability in Sample 2 – not contemplated with cisterns – as compared to Sample 1. This indicates the need for improving the criteria of selection used by the Program. Nevertheless, it is also important to notice that the criteria adopted by ASA for the selection of households were particularly related to the characteristics of the people responsible for households, among which no significant differences were identified between the two samples.

In order to better establish the differences among samples, the indicators that make up the vulnerability index were compared. In order to achieve these goals, T and chi-square tests were used, as appropriate (for binary variables, the second type of analysis was used). Only the components of the vulnerability related to household income and to services offered to households were compared, that is: income, characteristics of the household, household technology, bills to be paid (water, electric power, cooking gas), location of the household and hygiene services.

Chart 4: Categories of vulnerability indicators of households and minimum /maximum values of indicators taken into account

Categories of vulnerability indicators	Indicators	Degree of vulnerability	
		Lower value	Maximum value
Characteristics of the person responsible for the household	Schooling	0= Equal to or higher than incomplete high school	3= Can not read or write
	Gender	0= Male	1= Female
Household income	Occupational position	0= Employer	3= Worker, in production for his or her own consumption
	Income	0= Household featuring all types of income presented	2= Consumption of products from the property
	Characteristics of the household	0= Finished-Masonry house, owned by dwellers, number of rooms higher than four, in-house bathroom	7= The house is not owned by the dwellers, it is not a Masonry house, number of rooms below two, no bathroom

Categories of vulnerability indicators	Indicators	Degree of vulnerability	
		Lower value	Maximum value
Services available to households	Household technology	0= All the electrical appliances mentioned	10= No electrical appliances
	Bills to be paid (water, electric power, cooking gas)	0= Pays bills concerning all these services	2= No bills to be paid concerning these services
	Location	0= In a populated area	1= In an isolated area
	Hygiene/sanitation services	0= Has a septic pit and the garbage is burnt /buried	3= Without bathroom sewage; garbage in the open air

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Table 1: Averages and standard deviations for indicators of partial and total vulnerability, in Samples 1 and 2

Vulnerability indicators	Sample 1 (n=1923)		Sample 2 (n=1601)	
	Average	Standard deviation	Average	Standard deviation
Vulnerability related to the characteristics of the person responsible for the household	1.77	0.69	1.79	0.70
Vulnerability related to household income *	1.13	0.36	2.01	0.59
Services available to households *	0.93	0.60	1.07	0.58
Total vulnerability *	3.83	1.03	4.87	1.12
* Indicators with significantly different averages (at the level of $\leq=0.01$) (T Test)				

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

The results indicated that there are significant differences between the two samples, regarding: characteristics of the household, hygiene/sanitation services and location. In all of them, Sample 2 is more vulnerable than Sample 1. Regarding household technologies, Sample 1 is worst off than Sample 2. On the other hand, no significant differences were found vis-à-vis the isolated income indicator and the number of services (water, electric power, cooking gas) on which households count.

The individuals interviewed were asked about the ownership of land and about farming production. The results on these questions indicated that most households own land. The proportion of landowners, though, is lower for Sample 2, while in Sample 3, the large majority is made up of landowners, squatters or sharecroppers. In terms of proportion, the second place is occupied by households that do not own land; in this category, the lowest proportion is found in Sample 3.

In what regards production, most households, in any Sample, are, first, devoted to agricultural production, and, second, to animal farming. Cattle breeding is extensive in most of the households included in the Samples 2 and 3, while only one third of Sample 1 adopts this system for the handling of animals.

In what refers to agricultural production and the production of extensive animal farming, Sample 1 featured a percentage significantly lower than those of the others (70% of the households, against circa 90% in the other samples). In Sample 3, there are a higher number of households that use agricultural production for self-consumption and for market sale. In this sample, the percentage of households that produce animals in the property for self-consumption and for the market was also higher.

The households in Sample 3, therefore, seem to derive their livelihood from agricultural activities carried out in the property, either for self-consumption or for market sale (or even for the PAA, to whom they also sell at a higher proportion than the other samples) and they do it at a higher rate than the households included in the other samples.

In sum, the three samples featured indicators of a low level of quality of life, in general, which would qualify all of them as subjects of a Program such as

the P1MC. In Sample 3, which has cisterns built before (and out of) the P1MC Program, in general, the most positive values of the different indicators analyzed were found. In addition, several indicators showed the need for extending the Program to beneficiaries having profiles similar to those of Sample 2. These indicators are either similar to or worst than those assessed in Sample 1.

5.2 Alternatives for the Acquisition of Water

This section describes and analyses the indicators concerning alternative sources (that is, other than the cistern itself), used for the acquisition of water. The understanding on the relationship between the cistern and these sources is important, for one knows beforehand that the cistern alone can hardly meet all the needs of households in terms of water. Consequently, it is possible that these households will access other sources, jeopardizing some important results expected from the use of the water from the cistern (for example, in terms of health improvements and of more time available for other activities).

The study's results indicated that a very similar proportion of households (approximately 13%) uses only the cistern, in the two samples that have this facility. From another perspective, this means that most (more than 86%) households also use also another source, in addition to the cistern, to meet their needs in terms of water.

For the three samples, the four main sources are, according to the proportion of households that use them: ponds, dams or lakes; wells or springs; tubular wells and Amazon wells or *cacimbão*[10]. The "water transported per person without animal" was the most often recorded category, in any case. The main difference also has to do with this category, which is used at a lower proportion by the households included in Sample 3. In addition to this form of transportation, all the modalities that use animals (accompanied by women or men) are preferred, in any of the samples taken into account. For all these, the cistern truck (with treated or non-treated water) is the least used form of transportation.

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10   Big well.

Expenditure with transportation and with water itself when obtained from alternative sources were reported by a large proportion of households included in Sample 1. As an average, 75% of the households included in this Sample pay for the transportation and for the water, against 6% and 17% in the other samples. This result indicates the great value of the cisterns for the households included in this Sample, since they allow for an important reduction in expenditures related to obtaining water. The highest expenditure with water, in Sample 1, bears no relation with the time of construction of the cistern, as shown by the small relationship between the respective variables.

Under which conditions do families obtain water from these alternative sources? Table 2 presents a set of indicators related to the effort necessary for the acquisition of water from these sources and the results of this situation, particularly in terms of the quality of the water for drinking purposes. The data indicated that, almost without distinction, the households included in these three samples devote considerable time to fetching water. A large proportion of them spend less than an hour in this task. However, one may not disregard the fact that circa 35% of the households included in the three samples spend more than an hour to fetch water. The effort is even greater taking into account the fact that most of the households included in the three samples have to fetch water every day of the week.

As to the quality of this water for human consumption (drinking), no big differences were identified among the samples. In all of them, the quality of the water was assessed by most people as being "more or less good". A lesser proportion, in the three samples, assessed it as "bad". Sample 2 made a more positive assessment of the quality of the water from alternative sources, followed by Sample 3 and Sample 1.

What are the uses for which water from alternative sources is meant? Table 3 presents the results concerning this issue (per sample.) A quite interesting pattern emerged from the analysis of these results:

:: Firstly, all samples use the water from alternative sources mainly for washing dishes, washing clothes, bathing and, lastly, in agriculture;

:: In Samples 1 and 3 (that have cisterns), the study found similar values for the proportions of the different uses. These samples also try not to use this water for drinking or cooking;

:: Sample 2 (without cistern) uses this water for almost all purposes, as compared to the other samples and, at a high proportion, for drinking, cooking and brushing teeth. As to giving this water to animals and using it for agricultural purposes, this sample does not differ from others.

This pattern is interesting, precisely because Sample 2 (without cistern) is the one that depends most on an alternative source. The households included in Samples 1 and 3, in turn, may better govern the use of water from alternative sources, as indicated in their answers. Apparently the two last samples deemed this water less appropriate for activities that may directly affect health (such as drinking and cooking). On the other hand, recalling their assessment of the quality of the water from the main source, they probably think it is good-quality water which, therefore, should not be used in agriculture.

Finally, information was also requested on the sharing of the water coming from alternative sources with other families. The logic behind this is that the sharing, if, on the one hand, indicates the creation of social-protection networks within communities, on the other, may mean a reduction in the capacity of the respective source (and also of the cistern, since there are compromises between one decision and the other), as to meeting families' needs in terms of water. Table 4 contains the results for as questions on the sharing of the water from alternative sources, per sample.

Table 2: Access to water from alternative sources
and the quality of the water, per sample

Indicators of access	Sample 1		Sample 2		Sample 3	
Hours spent fetching water						
	f*	%	f	%	f	%
0	956	65.17	859	66.85	350	65.18
1	264	18	280	21.79	127	23.65
2	59	4.02	116	9.03	22	4.1
3	26	1.77	24	1.87	7	1.3
4	13	0.89	4	0.31	3	0.56
5	4	0.27	2	0.16		
6	2	0.14				
Doesn't know		9.74			28	5.21
Minutes spent fetching water						
0 a 5	52	3.55	45	3.51	35	6.91
6 a 10	151	10.31	133	10.37	58	11.44
11 a 30	421	28.75	308	24.03	131	25.84
More than 30	447	30.52	467	36.43	178	35.1
Frequency with which water is fetched						
Every day	1,167	76.57	1,118	77.69	357	65.38
Three times a week	168	11.02	222	15.43	96	17.58
Once a week	83	5.45	80	5.56	39	7.14
Every 15 days	48	3.15	6	0.42	18	3.3
Once a month	20	1.31	12	0.83	19	3.48
Every 2 months	32	2.1			9	1.65
Every 6 months	6	0.39	1	0.07	8	1.47
Quality of the water for drinking (scale from 1 to 4)						
Good	489	29.55	510	32.55	186	33.57
More or less	747	45.14	753	48.05	212	38.27
Bad	247	14.92	170	10.85	86	15.52
Very bad	172	10.39	134	8.55	70	12.64
						*f=frequency of households

Source: Research and Assessment of the Processes of Selection and Training of the
Cisterns Program of the MDS/P1MC-ASA: Social and Environmental
Impact in Brazil's Semi-arid Region, 2006

Table 3: Uses given to water from alternative sources, per sample

Use of the water	Sample 1		Sample 2		Sample 3	
	f*	%	f	%	f	%
Drinking	579	30.11	1,295	80.88	190	28.57
Cooking	832	43.27	1,457	91	285	42.86
Brushing teeth	863	44.88	1,408	87.94	313	47.07
Bathing	1,538	79.98	1,485	92.75	538	80.60
Washing clothes	1,341	69.73	1,368	85.44	473	71.13
Washing dishes	1,457	75.77	1,489	93	479	72.03
Given to animals	791	41.13	661	41.29	333	50.08
Use in agriculture	260	13.52	224	14	112	16.84
*f=frequency of households						

Source: Research and Assessment of the Processes of Selection and Training of
the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental
Impact in Brazil's Semi-arid Region, 2006

Table 4: Sharing water from alternative sources, per sample

Water sharing	Sample 1		Sample 2		Sample 3	
	f*	%	f	%	f	%
Is water shared?	600	31.20	486	31.42%	193	33.98
With how many families? (% of answers)						
1 to 3 families	127	22.04	126	27.04	65	32.99
4 to 6 families	104	18.5	80	17.17	23	11.66
7 to 9 families	26	4.63	34	7.29	22	11.17
10 or more families	176	31.32	142	31.33	45	22.84
Doesn't know	129	22.95	80	17.17	42	21.32
*f=frequency of households						

Source: Research and Assessment of the Processes of Selection and Training of
the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental
Impact in Brazil's Semi-arid Region, 2006

As can be observed, a large number of households in each sample shares the water obtained from alternative sources. The pattern of answers regarding the number of families that share the water, was also similar, for it concentrates on two categories for the three samples, the most important results were: sharing between one and three families, and between ten or more families. The last category was

the answer of choice of households located in settlements, where as a rule water is more often shared.

5.3 Management of the Water of the Cistern

This section assesses several aspects of the construction of the cistern and its maintenance right after the construction. It also deals with issues pertaining to the guidance and training received by the families, on the maintenance of the cistern and on water treatment and storage. Another important issue concerns the following: current uses of water and the maintenance of the cistern; decisions on water management and the participation of the community in these decisions; support received by the households, on the part of different bodies, for any interaction concerning water and its use.

As a rule, it is expected that the cisterns of Sample 3 are older than those of Sample 1, built by the P1MC. However, what is, more precisely, this difference? As expected, the set of cisterns of Sample 1, in their majority, have been built less than two years ago. In Sample 3, in turn, one mostly finds cisterns built three or more years ago, and there is an important part (circa 20%) of cisterns built over eight years ago.

A very small part of these cisterns no longer receive water, all of them (40, in a total of 1,923) belonging to Sample 1. A relatively small number of cisterns became empty after having received water for the first time. In Sample 1, this number corresponded to 22% of the total of cisterns, while in Sample 3, it corresponded to 38% of the total. This result may indicate that the support received by Sample 1, in the construction, management and maintenance of the cistern, has allowed for more efficiency on the part of the households in the appropriate operation of these reservoirs.

The first water of the cistern, used for drinking by 82% of the households included in Sample 1 and by 86% of Sample 3, mostly came from the collection of rainfall. It is worth highlighting in these results that Sample 3 resorted more than Sample 1 to other sources, in addition to the collection of rainfall. Within

each sample, the proportion of water – treated and non-treated – received through cistern trucks was similar. The contribution of these providers (cistern trucks), in any event, is of 8.10% in the case of Sample 1, and of 16.20%, in the case of Sample 3.

The collection of water from rainfall is the most used form of supply, at any time, for the two samples. It was also a little more used by Sample 1 than by Sample 3. The supply by means of cistern truck was the second more often used option. For the two samples, it was noticed that the use of non-treated cistern-truck water is greater in the current supply (as compared to the first water). Although treatment may take place later (by filtering, boiling, etc.), this result raises possibilities that must be better investigated in the section of cistern-induced changes (Section 5.6).

5.4 Guidance and Training to Deal with the Cistern

One of the important principles of the One Million Cisterns Program is the cistern training: its management and forms of storage and treatment of the water. This section analyses the way training – here termed "guidance" – was conducted. This is a mandatory short-term training for the people living in the households included in the two samples. In the case of the households included in Sample 3, a lower proportion of dwellers having received guidance is expected, since there has been little systematized effort in this direction.

The dwellers indicated that this had been the case: while 93.08% of the dwellers included in Sample 1 said they had received guidance along these lines, only 54.59% of the dwellers included in Sample 3 confirmed the provision of this guidance. So, in the third sample, almost half the dwellers did not receive guidance on the management of the cistern and of the water.

The categories of dwellers that were preferably trained, both in one sample and in the other, are adults (wife or husband). This result is also expected, because adults typically accumulate the responsibility for the household and for the cistern. In this regard, the samples show few differences.

Which were the persons or bodies in charge of providing guidance on the cistern and on the use of water to dwellers? In Sample 1, this role mostly befell non-governmental organizations (NGOs), also responsible for the guidance in Sample 3, although at a lesser scale. The way information was transferred may provide clues on the systematization of the guidance received by the two samples. Community meetings were the most frequent forms of guidance for any sample. A noticed, interesting point was the high number of answers indicating the category "courses" – a systematized form of guidance – in Sample 1, in what regards the proportion recorded in Sample 3. On the other hand, the category "visits by bodies to the household", a less systematized form of guidance, was relevant in the sample of households not included in the P1MC.

An additional indicator of the systematization of the guidance provided on the cistern is represented by the written material made available to the dweller. Although it means more systematization, the provision of this material is not necessarily the most appropriate, if it fails to incorporate creative forms to take the information to households, because these dwellers are typically people with few years of schooling.

In the results found, it was possible to identify that 17.89% of the dwellers of Sample 3 said they had not received written material. But this was not the case in Sample 1, in which charts, posters, leaflets and texts following the format of popular literature were often used. It must be highlighted that this last type of material, due to its unique nature, is possibly the most appropriate vehicle for this audience.

Another interesting point to be recorded is the use of newspapers, in both cases, to provide guidance on the cistern. Depending on the way it is designed, this material can be less appropriate for the training intended.

The guidance on the management of the cistern can also be a reference for dwellers, in the event of occurrence of problems related to the cistern itself or to the water. A well differentiated pattern was noticed in the two samples. While a vast majority of answers, in the case of Sample 3, concentrated on the mason

who built the cistern and, secondly, on the associations, the dwellers of Sample 1 singled out, first of all, NGOs, followed by the masons, associations and trade unions. In a certain way, these results also reinforce a conclusion according to which there was little systematized interaction among the dwellers of Sample 3 and organizations that are more present, in the case of the P1MC, for providing support and guidance as to the proper use of the cisterns and of the water.

Graphic 1 presents the results on persons or bodies that provided guidance to families as to the management of the cisterns, and those people sought by dwellers in the event of problems concerning the cisterns or the water. The Graphic shows the different patterns of supply of and demand for guidance, in the two samples.

The patterns reflect the interaction between dwellers and the different persons and bodies, throughout the period, about the cistern. In Sample 1, made up of households whose cisterns were built by the P1MC, it was noticed that both in the supply of and in the demand for guidance, the bodies most sought after were NGOs. Masons gained more importance, having been the second category in terms of the demand for guidance. Trade unions, associations and churches were important players in the provision of guidance, but somehow lost this importance, when it was about looking for help. The other players mentioned lost relevance as time went by.

For Sample 3, on the other hand, NGOs, which were the most important player in the supply of guidance, lost much of their importance, moving to the fourth place. These institutions are contacted when difficulties with the cisterns lead dwellers to seek support. Masons – of little importance in the supply of guidance – became the most sought after players, in the event of problems with cisterns; trade unions and churches maintained a relative position, but are less important in the demand for guidance, while associations lost both position and importance. The category "other players", ranking second when guidance was sought, fell to second from last place in the number of contacts seeking guidance.

The results indicated the greater relevance of NGOs in the process of social support to cisterns, ahead of any other player taken into account; and this was

expected, given the strong participation of these organizations in the P1MC. The construction of cisterns of Sample 3, on the other hand, although it was also supported by NGOs, rural trade unions, associations and churches, depended much more on individual and community-led initiatives ("rotating funds", for example). This fact can partly explain the patterns observed.

It was also asked, in each household, if there was at least one dweller who knew how to properly take water from the cistern, how to clean it, to treat and store the water of the cistern. The results in Table 5 show the success of the training, from the point of view of the beneficiaries. They also showed the little superiority of the households included in Sample 1 in this respect. The guidance more specifically provided by the P1MC to Sample 1 is the probable explanation for this difference.

Graphic 1: Persons and bodies that have provided guidance or are contacted to provide guidance on the cistern
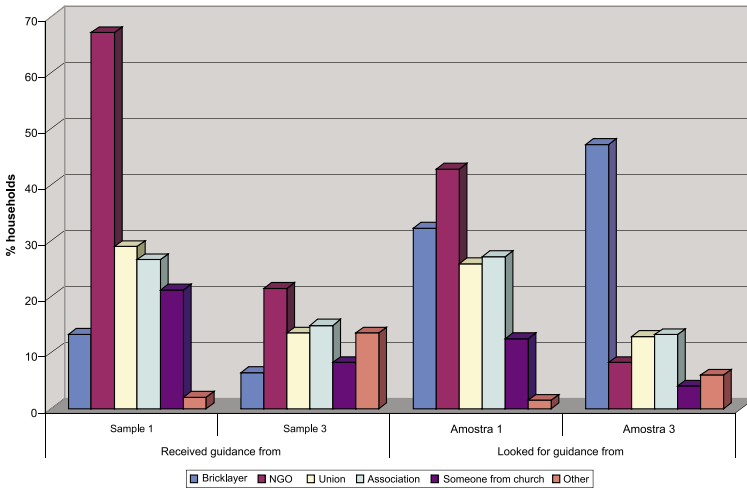
Source: Research: Assessment of the Processes of Selection and Training of the Cistern Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Table 5: Capacity of the dwellers to carry out several activities concerning the management of the water of the cistern, in the two samples (in percentage of households)

Existence of dweller in the household, capable of properly:	Sample 1	Sample 3
Take water	93.29	82.28
Clean the cistern	93.49	89.78
Store the water taken from the cistern	93.50	88.44
Treat the water in the cistern	93.86	88.71

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

5.5 Decisions on Water: Community Participation and Social Support

This subsection examines issues concerning the sharing of water from the cistern, the decision making on the water (in the household and in the communities) and the social support received by the households, in what regards water-related issues.

Regarding the sharing of the water from the cistern, most households, in any event, do not share the water from the cistern, and this result is more impressive in Sample 1. In this Sample, a lower proportion of households that often share water with neighbors were also recorded.

In order to understand how the sharing of the water from alternative sources and of that coming from the cistern occurs, Table 6 was prepared and it showed that:

:: In the case of water from alternative sources, sharing occurs in similar proportions in both samples. When the mentioned water comes from the cistern, Sample 3 shows an important difference (88%), while Sample 1 does not surpass one third of the households that share the water;

:: When one analyses this sharing in terms of the number of persons and of families with which water is shared, one notices that the proportions of households are similar between the two samples, both for the sharing of water from alternative sources and for the water from the cistern;

:: The average of persons and families with which water from alternative sources is shared is clearly higher than that of persons and families with which water from the cistern is shared.

Table 6: Sharing water from alternative sources and water from the cistern, in the two samples

Water sharing	Water from alternative sources			
	Sample 1		Sample 3	
	f/average	% – standard deviation	f/average	% – standard deviation
Shares water (f, %)	600	36.19	193	33.98
With how many persons? (average, sd)	28.38	397.43	23.61	192.66
With how many families? (average, sd)	18.54	563.45	13.39	190.56
Water sharing	Water from the cistern			
	Sample 1		Sample 3	
	f/average	% – standard deviation	f/average	% – standard deviation
Shares water (f, %)	583	30.96	224	88.7
With how many persons? (average, sd)	7.16	138.78	7.72	49.28
With how many families? (average, sd)	1.86	132.71	2.67	34.98

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

The data indicated that, given the greater effort required for obtaining water from alternative sources, there probably is a strategy of sharing (of both the effort and the water), involving a bigger number of families and persons. But, since the cistern has individual characteristics in each household, although there still occurs sharing, it occurs among smaller numbers of persons and families.

One of the essential traits of the P1MC, in its design, is the proposal that the Program is not merely geared to the construction of cisterns, but that a structure should be developed starting from a wide mobilization of the families and that this mobilization continues throughout the process of water management, after the construction of the cistern. Some indicators were used, trying to identify whether mobilization really was one of the benefits brought about by the Program. The indicators concern: decision making (by the household/community) on the use of the cistern; regularity of the meetings held by the community on the use of water; participation of the dwellers in the meetings and their agreement to the decisions made in these meetings. Table 7 presents the assessment of the dwellers on such issues. The results showed that:

:: In Sample 1, there was more participation in the decisions on water, made in community meetings than in Sample 3. There was an important and similar proportion of communities that held meetings every six months and once a month, and a larger number of households that always comply with the decisions made in community meetings;

:: In Sample 3, there was a greater proportion of absenteeism in meetings, as indicated by half the families. an significant number of families hold meetings every two months, a zero percentage of families hold meetings every month and a greater proportion of dwellers that never participated in meetings and do not comply with the decisions made in community meetings;

:: Similar proportions, in the two samples, comply with the decisions in a non-systematic manner ("just sometimes").

These indicators showed that, in the communities included in Sample 1, there is greater mobilization around the issue of water and of related problems

than in Sample 3. Thus, it is suggested that the basic principle of the P1MC is being adopted in households and communities that participate in the Program.

Table 7: Decision making on the use of the cistern
in the two samples (% of households)

Indicators	Sample 1 %	Sample 3 %
Procedure used for decision making		
Each household decides how water is going to be used	65.86	75.67
Decisions are made in community meetings	26.74	16.33
Doesn't know	7.40	8.01
Periodicity of community meetings on the use of water		
No meetings are held	30.95	48.05
Every six months	21.56	11.26
Every three months	9.52	4.76
Every two months	9.79	32.90
Once a month	24.74	3.03
Other	3.44	0
Frequency of participation in community meetings		
Do not participate	5.06	18.24
Participate sometimes	35.30	29.41
Always participate	56.76	47.06
Doesn't know	2.87	5.29
Compliance with decisions made in community meetings		
Yes, always	60.00	37.06
Sometimes	29.56	37.06
No compliance	6.37	20.98
Doesn't know	4.07	4.90

Source: Research and Assessment of the Processes of Selection and Training
of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental
Impact in Brazil's Semi-arid Region, 2006

As an indicator of social support to communities, dwellers included in the samples were asked about the frequency with which they received visits of representatives of city halls, NGOs, churches, trade unions and community associations to deal with matters pertaining to water. Graphic 2 only includes the options that represented extremes of the frequency of visits, that is: "never", "every three months" and "once a month", the last two were compiled in the classification as "at least once every three months".

The results showed a high index of "no visits" by representatives of city halls to the three samples; of visits of any other body to Sample 2; of visits from most of the bodies to samples 1, 3 and 2, in a decreasing order of frequency. In what regards Sample 1, NGOs are more active, as well as associations and trade unions; Samples 2 and 3 receive more visits of representatives of associations and of the city hall.

Graphic 2: Proportion of visits by different bodies
to households of the three samples
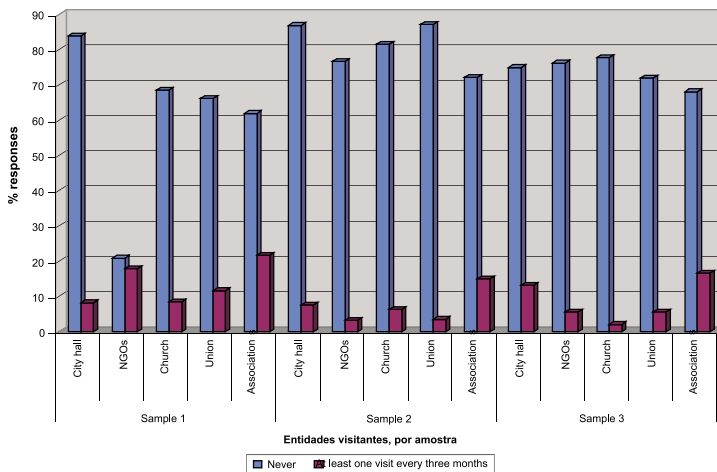
Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Thus, the conclusion is that the social support received by the households is not as strong as it should be. But, on the other hand, there also is a kind of segmentation of the action of the different bodies, considering each sample. This distinction is clear, and it indicates that Sample 1 has been more strongly contemplated with social support as far as water is concerned. This result may be due to the fact that the P1MC is the first Program geared to water management in households and communities in which it operates. However, this support must be extended, in a similar manner, to the households of the other samples.

5.6 Cistern-induced Changes

In this section, several (direct or indirect) changes brought about by the construction of the cisterns are investigated. The changes are broad and range from the response to the most basic needs, in terms of household consumption, and the improvement perceived in the quality of life: changes concerning the time devoted to fetching water and the opportunities that may emerge for households with the reduction of this time; changes in the quality of the water, which consequently relates to the quality of the food and countless improvements in health conditions; the effects in terms of a greater likelihood of permanence of the dwellers in the semi-arid region (with the improvement of the living conditions) to the distribution of power within households (through a possible empowerment of women, as consequence of the changes in their opportunities, brought about by the cistern). All these changes were assessed by the beneficiaries of Samples 1 and 3, as compared to the period prior to the construction of the cisterns, as shown below.

5.6.1 Meeting Basic Needs – Improvement of the Quality of Life

This subsection is aimed at verifying the households' general perception of changes introduced in families' lives by the construction of the cisterns. The family members included in the research assessed to what extent the cistern allows for meeting the basic needs in terms of household consumption (drinking, cooking and brushing teeth) and uses to which the P1MC cisterns were geared. They

were also asked about the improvement in their quality of life brought about by the cistern and on the importance of this fact for their lives. The assessment of participants of Samples 1 and 3, which count on cisterns, is in Table 8.

As to meeting their needs, although the vast majority of the two samples indicated that the cistern allows households to meet their needs (in what regards drinking, cooking and brushing teeth), it has also been noticed that there is a large number of households, in both samples, which deem insufficient the water of the cistern for even this sub-set of basic needs.

It has been noticed that the most pessimistic assessment on the meeting of needs was that of Sample 3. In this sample, except for a lesser number of households for which water is enough only for drinking and cooking, a greater number of answers indicated the insufficiency of water provided by the cistern, even if only for drinking, in relation to Sample 1.

In households, it has even been said that, even without totally meeting the basic needs in terms of household consumption, the cisterns meant an improvement in the quality of life for the vast majority of the participants of both samples. A clear majority of these participants demonstrated the high importance of the cistern in the life of the families, and only a minority said that the cistern has "some" importance.

5.6.2 Time for Obtaining Water and Personal Development of Dwellers

In the absence of a cistern or another form of water access in the household itself, the daily task of fetching water, from sources often quite distant from the household, takes people's effort and time. Therefore, one of the important impacts the Program by means of the cisterns may free up time, which can then be used for other chores, giving new opportunities for the dwellers.

Table 8: Assessments on the cistern and of how needs in terms of household consumption are met, improvement in the quality of life, and their importance

Indicators	Sample 1	Sample 3
Meeting the needs in terms of drinking, cooking and brushing teeth		
The water does not meet any of these needs	2.54	3.44
No, water is only enough for drinking	4.97	12.03
No, water is only enough for drinking and cooking	25.71	21.88
Yes, it totally meets all these needs	66.77	62.66
Improvement in the quality of life, brought about by the cistern		
It hasn't changed	0.26	0.16
It has improved more or less	4.44	7.97
It has improved a lot	95.29	91.88
Importance of the cistern, in the opinion of people interviewed		
It is not important	0	0
More or less important	5.34	3.91
Very important	94.66	96.09

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

For example, it is expected that the time gained with the use of the cistern may be devoted to personal growth activities such as the quest for more schooling for adults, adolescents and children. It can also be expected that this gain may allow children to have more time for playing (an important activity for the development of children) and that adults, in turn, may have more free time to provide appropriate care to their children.

Tables 9 and 10 present interviewed persons' assessments in the two samples contemplated with cisterns, as to their greater availability of time and to the changes regarding: time for school, for playing and for taking care of children. The data contained in these tables indicated that if, on the one hand, the time devoted to fetching water has diminished considerably, on the other this gain

could not, alone, promote major changes in school attendance, as compared to the period prior to the construction of the cistern, both for adults and for adolescents and children. In some cases, even the opposite of what was expected was noticed: there was a decrease in the number of children or adults attending school. It is possible that other variables influence this, including, among them, the very presence, greater or lesser, of adults, adolescents and children in the household.

Table 9: Indicators concerning the gain of time
with the cistern for the two samples

Indicators	Sample 1		Sample 3	
	Before	After	Before	After
Time devoted to fetching water (in hours) %				
0 to 1 hour	61.52	84.73	53.13	80.83
2 to 4 hours	23.00	3.04	22.51	3.84
> 4 hours	3.41	0	2.49	0
Doesn't know	12.08	12.23	21.88	15.34

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Table 10: Indicators concerning school attendance, time for playing and for taking care of the children, before and after the cistern, in the two samples

Indicators	Sample 1		Sample 3	
	Average	Standard deviation	Average	Standard deviation
Adults at school (number of adults)				
Before the construction of the cistern	1.43	6.93	4.22	17.53
After the construction of the cistern	1.23	7.29	2.53	11.62
Number of children under the age of 14 at school				
Before the construction of the cistern	2.40	9.31	3.45	13.88
After the construction of the cistern	2.85	10.78	3.52	13.88
Number of children aged 14 to 18 at school				
Before the construction of the cistern	3.40	15.096	3.73	16.78
After the construction of the cistern	3.04	15.18	3.07	13.94
Crianças com tempo para brincar (1=nunca, 2=algumas vezes, 3=sempre)				
Before the construction of the cistern	2.69	0.823	2.82	0.87
After the construction of the cistern	3.00	0.67	3.00	0.65
Children with time for playing (1=never, 2=some time, 3=always)				
Before the construction of the cistern	2.55	0.83	2.67	0.83
After the construction of the cistern	2.98	0.64	2.99	0.69

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Nevertheless, the result was consistent where it indicated an increase in children's free time for playing, after the construction of the cistern. Likewise, adults now have more time to take proper care of their children.

Another important investigated indicator in both samples regarding time and its use by the dwellers of households relates to the assistance given by persons in the 14-18 age bracket, in household chores, in fetching water and in tasks out of the house, before and after the construction of the cistern. The results are in Graphic 3.

Again, a differentiated pattern was observed for the two samples: the households included in Sample 3 resort, more than Sample 1, to the assistance of persons in the 14-18 age bracket, for the different activities analyzed, before and after the construction of the cistern. In both samples, considering the period before the construction, most assistance sought from these persons concerned the activity fetching water.

In Sample 1, a reduction reliance on this assistance was recorded after the construction of the cistern. The highest proportion of assistance in this period concerns household chores. In Sample 3 there was a reduction in the assistance related to the activity fetching water and an increase in the other household chores after the construction of the cistern.

Finally, in Sample 1, there was an increase in the proportion of households that do not seek assistance of these persons for any of the stated activities. This proportion shows a (small) reduction in Sample 3, after the construction of the cistern.

Graphic 3: Type of assistance provided to households by persons in the age bracket from 14 to 18, before and after the construction of the cistern, in the two samples
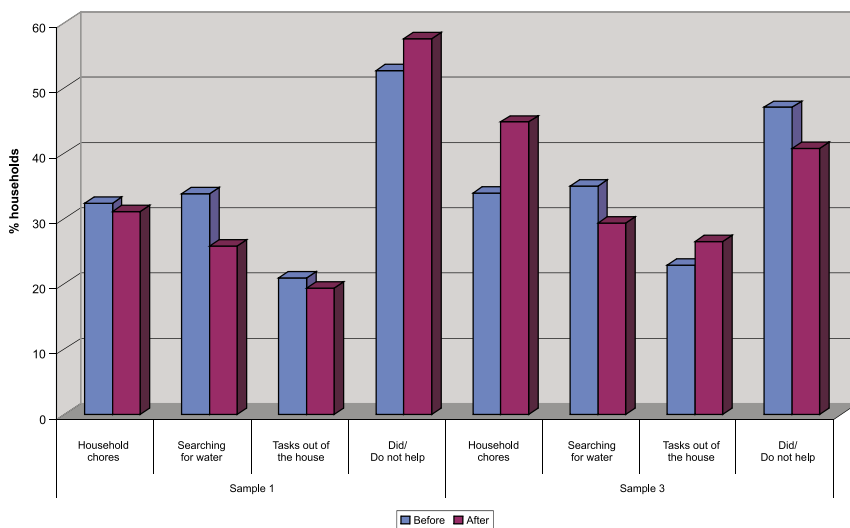
Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

5.6.3 Economic Changes Allowed by the Cistern

This subsection analyses changes in expenditure on water and in household income, as well as the emergence of new activities (that may ensue greater income or higher social status) for the dwellers of the households that benefited from the construction of cisterns included in the research. The indicators of the changes are presented in Table 11.

At first, it was noticed that there was an important gain in the reduction of expenditure on water, linked to the acquisition of the cistern, for the two samples. This gain, on the other hand, corresponded to the reduction of expenditure by more than half, in the case of Sample 1, and to a reduction of expenditure by 41%, in the case of Sample 3. It is important to investigate which variables caused the difference between the samples.

As to household income, after the construction of the cisterns, no major differences were recorded between the two samples: almost half of the people said that there had been no changes in income; a similar number of people said that there had been a little increase in income, and a small group of people in the two samples said that income had increased a lot.

In this work, the increase in household income associated to the cistern is deemed an indirect effect of the respective construction. The benefits brought about by the construction of the cistern would release time (previously used for fetching water) so that the dwellers might devote themselves to other activities, in the household or out of it. Table 11 describes the results of other activities developed by dwellers that were previously responsible for fetching water. But a similar and important proportion (the highest of all), in the two samples, does not have at present any new activities. Among the dwellers that undertook new tasks, are, more clearly, women who now devote themselves to household chores; followed by men, in activities out of the household; in third place, are also women, in activities outside their household; in fourth place, in a proportion similar to that of women who work outside their household, men who devote themselves to household chores. These results are similar in both samples, and the three groups of dwellers and sets of activities accounted for the frequency of 40% and 44% of the indications of change reported by those interviewed.

The last results indicated that, when new activities were incorporated as a consequence of the construction cisterns, although the traditional division of labor between men and women prevailed (the latter doing household chores and the former undertaking productive activities outside their household), there has also been an important proportion (although smaller) of women undertaking tasks outside their home, as well as of men doing household chores.

Other indicators investigated concerned the new activities learned since the construction of the cistern. The new professions reported were: mason, community leaders and health agents. In this aspect, the results presented in Table 11 indicate that, as to the profession of mason, the involvement of the dwellers of the two samples in this activity is small, and when it becomes effective work, dwellers devote themselves more specifically to the construction of cisterns. Sample 3 featured a proportion slightly higher than that of Sample 1 as to this activity.

Very few dwellers became community leaders as a consequence of their experience in the construction of cisterns. And even fewer dwellers became health agents as a consequence of the same experience.

5.6.4 Quality of the Water and Changes in Health Conditions

This subsection investigates indicators concerning the quality of water, the overall health conditions and the treatment of water, before and after the construction of the cistern, for both samples. The results are presented in Table 12 and in Graphic 4.

Table 11: Indicators of household income and of the performance of other activities for the two samples, before and after the construction of the cistern

Indicators	Sample 1	Sample 3
Expenditure with water (in *reais*) (average)		
Before the construction of the cistern	9.88	7.88
After the construction of the cistern	2.53	3.25
Was there an increase of the income of the household after the construction of the cistern? (%)		
Yes, it increased a lot	3.52	4.12
Yes, it increased a little	42.40	45.32
The income remained unchanged (as before the construction of the cistern)	52.85	48.34
No, income diminished	1.23	2.22
Do those who were responsible for fetching water before the construction of the cistern have now another activity? (%)		
Yes, women, doing household chores in the house	28.29	28.57
Yes, women, in activity outside their household	14.56	10.67
Yes, children, doing household chores in the house	2.60	6.32
Yes, children, in activity outside their household	0.10	3.31
Yes, adolescents, doing household chores in the house	5.88	10.98
Yes, adolescents, in activity outside their household	4.78	9.02
Yes, men, doing household chores in the house	8.42	11.57
Yes, men, in activity outside their household	21.68	16.39
No	46.22	51.42
Do dwellers who learned how to build cisterns now work in related activities? (%)		
Yes, in the construction of other cisterns	9.62	11.73
Yes, in other masonry tasks	6.03	3.61
Do not work in this activity	31.72	32.93
Does not apply	53.82	50.22

Indicators	Sample 1	Sample 3
Are dwellers who participated in the construction of the cistern now community leaders? (%)		
Yes, the very person in charge of the household	3.90	0
Yes, wife/common-law wife	0.94	0.75
Yes, husband/common-law husband	1.30	4.81
Another member of the family	0.83	3.76
No	91.94	86.61
Did dwellers who received guidance on water become health agents? (%)		
Yes, the very person in charge of the household	0.52	0
Yes, wife/common-law wife	0.42	1.95
Yes, husband/common-law husband	0	1.80
Another member of the family	0.47	1.8
No	97.03	90.98

Source: Research and Assessment of the Processes of Selection and Training of the Cistern Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Table 12: Indicators concerning the quality of the water and overall health conditions (in percentage of households in each sample)

Indicators	Sample 1	Sample 3
Quality of the water used by the dwellers for drinking and cooking		
Before the construction of the cistern		
Extremely bad	21.42	22.95
Reasonable	56.42	52.81
Good	22.16	24.24
After the construction of the cistern		
Extremely bad	0.69	0
Reasonable	2.44	5.57
Good	96.87	94.93

| Indicators	Sample 1	Sample 3
Quality of the water used by the dwellers for drinking and cooking		
Change in the preparation of food, after the construction of the cistern		
Became more difficult	0.79	0.79
It hasn't changed	12.04	5.50
Became easier	86.32	91.19
Does not apply	0.85	2.52
Quality of the food, after the construction of the cistern		
Remains unchanged	16.43	12.60
Has improved	83.15	84.53
Does not apply	0.42	2.87
Improvement in the health of dwellers, after the construction of the cistern		
There was no improvement	8.21	13.39
Yes, it has improved a little	50.56	52.10
Yes, it has improved a lot	41.23	34.52

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

The results of Table 12 indicated that, for both samples, there was a considerable reduction in the number of assessments that classified the quality of the water as "extremely bad", at the same time as a vast majority (96% in average, for the two samples) classifies it as "good". For 86% of Sample 1 and 91% of Sample 3, the preparation of food became easier and the quality of food has improved.

The vast majority of the two samples also declared that there has been some improvement in the health of the dwellers after the construction of the cistern. But this improvement was not emphasized enough by the dwellers of Sample 1, as compared to Sample 3, possibly because the participants of this sample, at the time of the construction of their cisterns, are able to forecast impacts that may take more time to be noticed by the participants of the other sample.

The results presented in Graphic 4, on the treatment of the water of the cistern, in turn, indicated that, for the two samples, there was a strong reduction in the proportion of households that do not treat the water, as compared to the proportion that, prior to the construction of the cistern, did not treat it. The uses of chlorine, of sieves and of filters were the practices most often mentioned; boiling water was very seldom mentioned; the combination of two or more treatments were often mentioned.

Graphic 4: Treatment of the water of the cistern used
by the households in the two samples
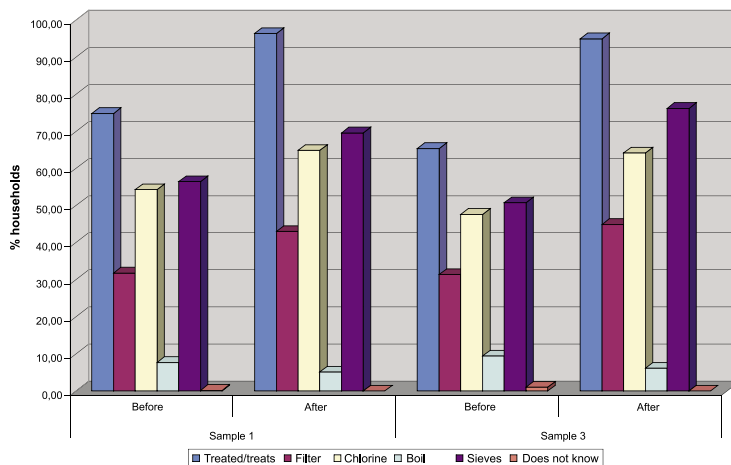
Source: Research and Assessment of the Processes of Selection and Training
of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental
Impact in Brazil's Semi-arid Region, 2006

Thus, overall, more concern on the part of dwellers with the treatment of the water they consume was noticed after the construction of the cistern. Assessments were also carried out in collaboration with dwellers on specific health conditions, before and after the construction of the cistern, for the two samples.

The results of this assessment are in Table 13, and led to the conclusion that there was a reduction in the frequency with which adults and children were taken ill, for the two samples. There has also been a reduction in the frequency of occurrence of practically all types of diseases investigated: diarrhea, dehydration, skin diseases, kidney diseases, in addition to a reduction in the sensation of tiredness, losses of days of work and visits to physicians.

Table 13: Indicators concerning the specific health conditions and expenditure related to diseases, before and after the construction of the cistern, for the two samples (in percentages*)

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Frequency of adults with diseases				
Never	10.39	41.29	18.93	38.73
Sometimes	63.68	56.58	62.30	57.78
Always	25.93	2.13	18.77	3.49
Frequency of children with diseases				
Never	6.87	34.43	17.20	31.55
Sometimes	46.33	47.96	41.48	49.21
Always	30.80	0.80	22.51	0.32
Frequency of dwellers with diarrhea				
Never	24.67	63.13	22.83	46
Sometimes	46.70	31.03	41.9 6	46.15
Always	22.24	0.58	25.08	2.83
Frequency of dwellers with dehydration				
Never	57.26	80.14	55.63	81.16
Sometimes	26.46	10.97	28.14	12.56
Always	4.29	0	6.59	0
Frequency of dwellers with skin diseases				
Never	77.57	86.47	79.10	87.60
Sometimes	12.30	8.04	16.72	7.69
Always	5.83	1.97	1.29	1.26
Frequency of dwellers with kidney diseases				
Never	59.54	78.59	67.36	72.21
Sometimes	19.25	13.10	14.79	21.19
Always	16.17	3.62	11.74	2.04
Frequency of dwellers with the sensation of tiredness				
Never	37.17	47.91	43.57	45.68
Sometimes	24.64	43.42	19.61	43.49
Always	35.53	6.26	34.24	8.95

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Frequency of loss of days of work				
Never	18.49	45.47	15.27	37.05
Sometimes	58.47	47.29	63.83	55.73
Always	17.21	3.27	14.47	0.78
Frequency of visits to physicians				
Never	5.15	22.32	3.55	8.56
Sometimes	62.32	65.98	60.42	72.74
Always	27.27	8.36	28.59	12.52
Expenditure related to diseases				
Remain unchanged		30.90		25.52
Have reduced a little		38.79		43.42
Have reduced a lot		23.32		18.07

The Table does not include the percentages concerning the answers "Does not know /Does not apply", which can be inferred by subtracting the sum of the presented percentages from the 100% total, 2006.

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

The best pattern one could expect, considering the difference between the answers on the occurrence of diseases before and after the construction of the cistern, would be one in which there were growth of the frequency of the alternative "never"; and reduction of the alternatives "sometimes" and "never". In Sample 1, this pattern was observed for the frequency of: adults taken ill; dwellers with diarrhea, with dehydration, skin diseases, and kidney diseases; with the sensation of tiredness and losses of days of work. Only indicators of frequency of children taken ill, adults with the sensation of tiredness and visits to physicians did not feature this pattern, because there was no reduction in the alternative "sometimes" in none of these analysis.

In Sample 3, only three indicators featured the "optimum" pattern of health improvement: adults taken ill, frequency of dwellers with dehydration and days of work lost. For other indicators, although there has been an overall improvement, the optimum pattern was not declared.

In sum, the two samples featured evidences of improvement of specific health conditions after the construction of the cisterns.

5.6.5 Changes as to the Idea of Migration and in the Division of Labor in the Household

This subsection will examine (indirect) changes related to the construction of the cistern. These changes are associated with the dwellers's intention to leave the community and the region before the construction of the cistern, due to bad living conditions. These changes also concern the division of labor in the household. The logic for this change would be that, in releasing the time devoted to fetching water, women who are mostly responsible for this task (as indicated by the entire literature on water management), would undertake nobler activities, and they would have, thus, a role with greater power within the household. The table below presents these results.

Table 14: Indicators concerning the change in the intention to leave the community after the construction of the cistern, for the two samples

Indicators	Sample 1	Sample 3
Intention was carried out	2.22	11.09
Intention was postponed	9.04	12.52
Intention was abandoned	23.20	16.80
Does not apply	65.54	59.59

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Although there are few households in which there was at least one dweller that intended to leave the community - as one can verify through the high frequency of answers in the category "Does not apply"- circa 34% of the households included dwellers having this intention. Little by little it was either postponed or abandoned after the construction of the cistern. The influence of the cistern was greater for Sample 1 than for Sample 3.

Tables 15 and 16 shows the first influence: persons responsible for household chores or for contributing towards their performance, before and after the construction of the cistern, for the two samples; the second one, persons in charge of financially supporting the household or of assisting in the production of household income, before and after the construction of the cistern, for the two samples. While in the first Table the aim is identify changes in the attribution of the responsibility for household chores, a typically feminine "obligation", the second table checks the activities of head of household, traditionally undertaken by men. The results presented in the two tables indicated the following:

:: For household chores (to take care of the house, to wash and iron clothes), both the main responsibility and the responsibility of cooperation, in the two samples, befall on the women of the household, and this situation has changed little with the gains brought about by the cistern;

:: The responsibility for the financial support of the family (and assistance in the production of family income) befalls, in the first place, on the person responsible for the household, and in the second place, husband /common-law husband; in the third place, wives/common-law wives and, in the fourth place, adult children/stepchildren. The situation didn't change either after the construction of the cistern, as characterized in the two samples.

There remains a doubt when one examines these results: since in all samples there are people from both genders responsible for households. The alternative "the very person in charge of the household" does not clearly express whether the head of the household is a man or a woman, the rationale behind this question. For this reason, another analysis was carried out, considering the same results, but classifying them according to the gender of the person responsible for the household. Separating only the assessments that indicate at least 10% of the answers, for the majority of the assessments concerning each family role considered in the first column, the results are shown in Table 17.

Table 15: Indicators concerning the responsibility for household chores and for the cooperation in these tasks, before and after the construction of the cistern

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Responsibility for cooking, taking care of the house, washing and ironing clothes				
The person in charge of the household (either male or female)	23.55	22.52	20.15	20.90
Wife/Common-law wife	73.53	70.41	70.83	70.98
Husband/Common-law husband	2.34	2.13	4.51	4.81
Daughter/Stepdaughter (age 5 to 10)	3.22	3.17	2.10	1.05
Daughter/Stepdaughter (age 10 to 18)	12.22	12.58	10.37	15.19
Daughter/Stepdaughter (over 18 years of age)	11.54	11.02	10.68	12.93
Son/Stepson (age 5 to 10)	0	0.26	10.53	2.10
Son/Stepson (age 10 to 18)	1.09	1.25	1.80	2.56
Son/Stepson (over 18 years of age)	0.41	0.42	0.90	1.65
Another woman	0.62	0.94	0.75	1.95
Another man	0	0	0.30	0
Person with the task of assisting in taking care of the house, washing and ironing clothes				
The person in charge of the household (either male or female)	22.31	20.80	18.50	18.35
Wife/Common-law wife	45.14	43.79	40.60	37.89
Husband/Common-law husband	7.18	5.88	8.42	9.77
Daughter/Stepdaughter (age 5 to 10)	7.33	8.21	9.77	6.92
Daughter/Stepdaughter (age 10 to 18)	27.30	28.86	21.50	30.52

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Person with the task of assisting in taking care of the house, washing and ironing clothes				
Daughter/Stepdaughter (over 18 years of age)	16.33	14.51	19.40	23.00
Son/Stepson (age 5 to 10)	2.13	3.38	5.11	2.86
Son/Stepson (age 10 to 18)	2.86	4.52	4.51	7.37
Son/Stepson (over 18 years of age)	2.65	3.27	2.40	5.71
Another woman	2.13	2.96	4.36	4.64
Another man	0	0	0	1.20

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Table 16: Indicators concerning the responsibility for the financial support of the household and for assisting in the production of household income, before and after the construction of the cistern, for the two samples

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Responsibility for the financial support of the household				
The person in charge of the household (either male or female)	69.06	69.52	67.67	68.42
Wife/Common-law wife	24.54	27.25	21.95	27.52
Husband/Common-law husband	31.72	30.89	30.22	30.22
Daughter/Stepdaughter (age 5 to 10)	1.30	0.88	0	1.05
Daughter/Stepdaughter (age 10 to 18)	2.23	3.22	0.45	2.40
Daughter/Stepdaughter (over 18 years of age)	2.28	3.02	1.05	1.20

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Responsibility for the financial support of the household				
Son/Stepson (age 5 to 10)	0.67	0.47	1.95	1.05
Son/Stepson (age 10 to 18)	4.62	4.37	1.20	3.16
Son/Stepson (over 18 years of age)	7.95	9.41	5.71	10.07
Another woman	0.26	0.26	0	0
Another man	0.36	0.36	0	0
Person with the task of assisting in the production of family income				
The person in charge of the household (either male or female)	42.28	41.34	38.50	36.24
Wife/Common-law wife	31.40	31.35	34.74	38.80
Husband/Common-law husband	18.15	17.57	19.40	19.85
Daughter/Stepdaughter (age 5 to 10)	1.20	1.46	0	1.20
Daughter/Stepdaughter (age 10 to 18)	5.30	4.94	3.00	2.86
Daughter/Stepdaughter (over 18 years of age)	7.17	7.49	3.76	5.11
Son/Stepson (age 5 to 10)	2.03	1.87	1.20	0
Son/Stepson (age 10 to 18)	11.54	10.87	7.07	8.12
Son/Stepson (over 18 years of age)	14.09	15.08	12.48	18.65
Another woman	0.83	0.83	1.05	23.08
Another man	1.20	1.51	1.05	1.80

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Table 17: Indicators concerning the family roles regarding household chores and financial support (assessments above 10%)

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	After the construction of the cistern	Before the construction of the cistern	After the construction of the cistern
Person responsible for the household : gender male				
Responsibility for taking care of the house, washing and ironing clothes				
The person in charge	12.08	11.49	11.88	9.20
Wife/Common-law wife	63.56	62.19	59.38	54.91
Person with the task of assisting in taking care of the house, washing and ironing clothes				
Wife/Common-law wife	28.60	28.42	25.79	19.14
Daughter/Stepdaughter (age 10 to 18)	19.70	19.76	13.52	21.60
Daughter/Stepdaughter (over 18 years of age)	13.90	12.07	15.72	16.67
Another man	11.86	12.61	–	–
Responsibility for the financial support of the household				
The person in charge	39.10	37.65	43.89	37.23
Wife/Common-law wife	19.55	19.47	12.85	16.92
Husband/Common-law husband	27.67	27.38	31.97	30.46
Son/stepson (over 18 years of age)	–	–	(8.46)	13.85
Person with the task of assisting in the production of family income				
The person in charge	17.52	15.84	15.99	11.32
Wife/Common-law wife	21.79	21.01	15.67	14.78
Husband/Common-law husband	12.50	13.42	19.75	17.92
Son/Stepson (over 18 years of age)	14.96	17.05	15.99	15.31
Another man	19.55	18.26	23.82	23.47

Indicators	Sample 1		Sample 3	
	Before the construction of the cistern	**After the construction of the cistern**	**Before the construction of the cistern**	**After the construction of the cistern**
Person responsible for the household: Gender Female				
Responsibility for taking care of the house, washing and ironing clothes				
The person in charge	14.69	13.95	11.11	9.57
Wife/Common-law wife	55.50	54.51	57.91	53.47
Daughter/Stepdaughter (age 10 to 18)	10.99	12.12	9.43	9.57
Daughter/Stepdaughter (over 18 years of age)	13.64	13.20	13.47	15.51
Person with the task of assisting in taking care of the house, washing and ironing clothes				
Wife/Common-law wife	22.09	21.83	20.61	15.89
Daughter/Stepdaughter (age 10 to 18)	23.19	24.81	16.55	25.17
Daughter/Stepdaughter (over 18 years of age)	15.96	15.55	21.96	22.85
Responsibility for the financial support of the household				
The person in charge of the household him or herself	38.38	37.39	50.85	44.85
Wife/Common-law wife	18.34	17.84	13.90	17.28
Husband/Common-law husband	28.68	27.99	30.51	28.57
Person with the task of assisting in the production of family income				
The person in charge	16.20	15.96	19.66	11.90
Wife/Common-law wife	19.72	18.36	17.29	19.39
Husband/Common-law husband	13.11	13.99	18.31	16.67
Son/Stepson (over 18 years of age)	13.54	14.32	10.85	15.31
Another man	21.54	20.44	24.41	23.47

Source: Research and Assessment of the Processes of Selection and Training of the Cisterns Program of the MDS/P1MC-ASA: Social and Environmental Impact in Brazil's Semi-arid Region, 2006

Overall, the data in Table 17 confirmed the general findings described in Tables 15 and 16. But something new emerged from this analysis:

:: Household chores, whether as the main person in charge or as an assistant, befall on women, even when they have the role of person responsible for the household. On the other hand, the activities of financial support of the household mostly befall on men, in households in which they are the persons in charge. In these cases, the proportion of women with this role is much lower than that of men;

:: The role of assistant in household chores is slightly more often undertaken by women than by men, in households headed by women, as compared to those headed by men. Female participation in the activity of cooperation for the production of household income is greater in households headed by women;

:: Households in which the person in charge is a woman featured greater diversity in terms of the people responsible for cooking, taking care of the house etc;

:: The construction of the cistern did not change in a perceptible manner the division of labor between men and women, in the households of the two samples. Only in Sample 3, for tasks traditionally feminine (household chores), the data featured different values before and after the construction of the cistern.

In the first case, in households headed by men, one noticed:

:: A reduction in female participation on responsibility for household chores, after the construction of the cistern;

:: A reduction in participation of the wife/common-law wife and an increase in the participation of the daughter (age 10 to 28), in the assistance of household chores;

:: A reduction in the participation of the person responsible for the financial support of the family and an increase in the participation of the wife/common-law wife;

:: A reduction in the participation of the person responsible for the task of assisting in the production of family income.

In households headed by women, one noticed:

:: A reduction in the participation of the person responsible and an increase of the responsibility of daughter/stepdaughter (age 10 to 18) in what regards the assistance in household chores;

:: A reduction in the participation of the person responsible for the financial support of the family and an increase in the participation of the wife/common-law wife;

:: A reduction in the participation of the person responsible for assisting in the production of family income and an increase in the participation of the son/stepson over 18 years of age in this task.

Some of the changes recorded in what regards Sample 3 must be taken with caution, since they may be related, not to the construction of the cistern, but to the time elapsed since this construction and to the specific characteristics of the Sample. For example, when one notices that the son/stepson (over 18 years of age) started undertaking, after the construction of the cistern, a greater contribution in the responsibility for the financial support of the household, this result may be simply related to the passing of time (it is expected older children become part of the Economically Active Population).

In conclusion, the changes verified before and after the construction of the cistern are minor as to responsibilities traditionally attributed to men and women. In general, even with the observed changes, the logic behind them seems to be the one that has governed these roles for centuries.

6 Summary of Results and Final Recommendations

6.1 Selection of Households Contemplated with Cisterns in the P1MC

The three samples featured indicators of low level of quality of life, with few and precarious sources of income. In most cases, families produce for their own consumption and receive, as an average, the value of one of the social benefits mentioned, while they have permanent expenses and two or three bills to be regularly paid.

These indicators qualify the three samples as focus of Programs such as the P1MC. However, the indicators concerning Sample 2 (without cisterns) indicated a more difficult socio-economic situation for its dwellers as compared to those included in the two other samples.

In view of the situation of vulnerability found in the households included in Sample 2, it is urgent to include new criteria for the selection of families to be contemplated with cisterns. Among these criteria appear those that were used for assessing that situation, that is: household income (direct or indirect), services that households count on (including those related to hygiene, which are of paramount importance due to their direct relationship with the changes one intends to achieve through the construction of cisterns). The analysis of the conditions of Sample 2 allowed for the identification of criteria specifically related to the characteristics of households, hygiene/sanitation services and location as the strongest for the inclusion of new households in the Program.

The expansion of the P1MC to include households with characteristics similar to those of Sample 2 is an important improvement to be sought in the short run.

6.2 Alternatives for the Acquisition of Water

The vast majority of households that count on cisterns also use other sources to meet their needs in terms of water. The main alternative sources mentioned by all samples analyzed were: ponds, dams or lakes; wells or springs; tubular wells, Amazon wells or *cacimbão*s.

The households included in the three samples devote considerable time to fetching water. This effort is even greater because most households in the three samples need to perform this task every day of the week.

The quality of the water from alternative sources was assessed by the majority as "more or less good". This water is used by all samples, in a priority basis, for washing dishes, bathing and, lastly, in agriculture. Sample 2 (without cisterns) also uses this water, in large volumes, for drinking and cooking, which is avoided in households that have cisterns. In addition, water is shared among families.

The results indicated the importance of looking for alternatives to guarantee the availability of water in volumes enough to meet all needs of the families, as for example: a second cistern or an increase in water captured by already built cisterns.

In any situation, it is important to maintain the guidance provided to households on the importance and even the indispensability of appropriate treatment of the water coming from any source.

6.3 Training and Guidance for the Use of the Cistern/ Social Mobilization

All the indicators analyzed showed that the households included in Sample 1 (households related to the P1MC) are better equipped to manage the cistern and to treat the water than those included in Sample 3 (with cisterns, but not part of the Program).

Guidance was mostly provided by NGOs, which preferably focused on Sample 1 for this purpose. In addition, the analysis on the way the decisions concerning water are made indicated more mobilization in this direction on the part of the communities included in Sample 1.

The social support provided by city halls, NGOs, trade unions, associations and churches to households for the management of the water is generally small. On the other hand, Sample 1 (of the P1MC) is the one that has been most often and strongly contemplated with this kind of support.

The results on influences that are relevant for achieving the changes intended with the construction of cisterns showed that the process of training and social support that mark the P1MC are crucial for the success of the Program. For this reason, it is important to guarantee the continuity both of this training and of the support lent to the dwellers of the households, for the introduction and maintenance of appropriate behaviors in the management of the cistern, for treatment of water, in the remedy of problems, in matters of personal hygiene and in sharing the water.

6.4 Cistern-induced Changes

The analysis presented showed that cisterns induced changes for the beneficiaries, in different domains:

:: It allowed households to meet their needs (in what regards drinking, cooking and brushing teeth), but it remains insufficient even for this sub-set of basic needs;

:: It meant an improvement in the quality of life for the vast majority of households, both in Sample 1 and in Sample 3.

In terms of the time spent fetching water and the development of other activities:

:: For the two samples, the time devoted to fetching water dropped considerably, but this reduction did not ensue major changes in school

attendance, before and after the construction of the cistern, both for adults and for adolescents and children;

:: There was an increase in the time left for children to play, and adults now have more time to take proper care of their children.

In terms of economic results achieved since starting the construction of the cisterns:

:: There was an important gain in the reduction of expenditure with water for the two samples;

:: As to household income, there was no major difference between the two samples.

As to the quality of the water after the construction of the cistern, the assessment shows that it:

:: Has improved, possibly as a consequence of more appropriate treatment, and the preparation of food became easier, improving nourishment quality;

:: Led to an improvement in the dwellers' health, for there was a reduction in the frequency with which adults and children are taken ill, for the two samples; there has also been a reduction in the frequency of practically all types of diseases investigated: diarrhea, dehydration, skin diseases, kidney diseases, and also in the occurrence of the sensation of tiredness, of losses of days of work and of visits to physicians.

The cistern may also have influenced the decision of dwellers regarding abandoning the community due to the poor local conditions before the construction. The decision was postponed or abandoned in a higher proportion by the dwellers of Sample 1.

Finally, regarding behaviors related to the division of labor, there have been small changes, before and after the construction of the cisterns, in terms of the responsibilities traditionally attributed to men and women.

The assessment of the impact of the cisterns on the quality of life of the families was quite favorable to the P1MC. Although some of the changes (particularly indirect changes, such as income increases due to the re-allocation of time) have not been perceived by the dwellers, there are direct indicators of positive changes in the life of the households contemplated by the Program. In sum, the construction of the cisterns has meant: an overall improvement in the quality of life, better health conditions, less time devoted to fetching water, a reduction in the expenditure related to water, more playing time for children, and more time to take better care of them (for adults).

All the results indicated the importance of the continuity of the Program, with the purpose of pursuing its current objectives and goals. On the other hand, the results indicated the need for re-adjusting the Program in order to include households not yet served which are as vulnerable as or even more vulnerable than those currently contemplated.

It is also important to expand the Program, with the aim of increasing the availability and improving the level of water services, trying to achieve the goal that families may count in their houses on the water they need, not only for basic human consumption, but also for use in productive activities.

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Opinion Survey of Popular Restaurant Users

Photo: Bruno Spada

Opinion Survey of Popular Restaurant Users[1]

Maurício Tadeu Garcia[2]

1   Introduction

Popular restaurants are meal and nutritional units where healthy meals are prepared and sold at reasonable prices. These units are preferentially located in large urban centers with populations of over one hundred thousand (100,000) inhabitants. The Ministry of Social Development and the Fight Against Hunger (MDS) has been supporting the installation of popular restaurants, through the funding of building construction, reform and adaptation, of the purchase of permanent equipment, new furniture and utensils, as well as of professional training in the area of food and nutrition.

This study covered the users of popular restaurants located in the following capital cities: São Paulo, Rio de Janeiro, Brasília, Salvador and Belo Horizonte, and was conducted between May and June of 2005, from a total of 600 interviews. The objective was to evaluate, based on the opinions provided by the users of the restaurants, the pertinence of the Program regarding its continuity, perfecting and expansion. Aspects such as food quality and variety, restaurant access, price of the meals and of other services offered were evaluated as indicators.

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1   The results of this study, executed by the Brazilian Institute of Public Opinion and Statistics (IBOPE), were published by the Secretariat for Evaluation and Information Management (SAGI/MDS) in the report "Public Opinion Survey – Popular Restaurant Users", in August, 2005.

2   Undergraduate studies in Social Sciences at FFLCH/USP and graduate studies in Marketing at ECA/USP. He is currently Project Manager at IBOPE/Public Opinion.

2 Sampling Methodology[3]

2.1 Technical Specifications

a) Area of the study: Belo Horizonte (MG), the Federal District (DF), Rio de Janeiro (RJ), Salvador (BA), and São Paulo (SP);

b) Sample universe of the study: users of popular restaurants located in the cities listed above – three in Belo Horizonte, five in the Federal District, three in Rio de Janeiro; two in Salvador, and six in São Paulo.

2.2 Sample Criteria

The sample was broken down by city and selected through probabilistic criteria, in two stages:

a) For each city, the restaurants were selected based on the complete list of the units (Annex 1);

b) In each of the selected restaurants (Annex 2), users were randomly chosen (systematic jumps) during daily opening hours, for a period of a week, which was the period of investigation.

With this methodology, a representative sample of the universe of popular restaurant users was obtained for the cities under study, considering user distribution among the various units, as well as the days of the week and opening hours.

Twenty interviews were conducted at each sample point, in accordance with the methodology submitted in the proposal and approved in the final bid. According to said criteria, a drawing was conducted only for the city of São Paulo, as per Annex 2.

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3   It must be pointed out that the details of the sampling methodology, as well as the profiles of the interviewees and the questionnaire used in this study are available in the "Research Methodologies and Instruments used to Evaluate Programs of the Ministry of Social Development and the Fight Against Hunger", organized by the Secretariat for Evaluation and Information Management (SAGI/MDS).

2.3 Size of the Sample

A total of 600 interviews were conducted, 120 at each of the five locations.

2.4 The Margin of Error and the Confidence Interval

A confidence interval of 95% was considered, and the maximum estimated margin of error (assuming maximum heterogeneity, with proportions of 50%) was plus or minus 4.0 percentage points for the global results of the sample.

2.5 Data Collection

a) Field work: an authorized team of interviewers from the Brazilian Institute of Public Opinion and Statistics (IBOPE)[4], all permanently registered employees, with experience and training in public opinion research, conducted the personal interviews, using a questionnaire especially developed for this study;

b) Verification: in order to verify the questionnaire application criteria and the adequacy of the sample, 20% of the total of questionnaires applied by each interviewer were verified;

c) Criticism and quality control: all the questionnaires were submitted to a critical and consistency process.

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4   The interviewers of IBOPE are registered under the regimen of the Consolidation of the Working Laws, and have a long period of experience in studies of public opinion or in social character.

3 Profile of the Interviewees

In the profile data for each location, interesting aspects were detected regarding the users of each popular restaurant.

First, since no socio-demographic quotas were determined among the patrons of popular restaurants (as mentioned above, systematic jumps were made among the restaurant users), the results indicated that there were more male users than female.

Gender	
Male	70%
Female	30%

The study showed that more women used the restaurants in Rio de Janeiro, while in the other locations the ratio was approximately 7 men for every 3 women. In said city's restaurants, the proportion was less than 6 men for every 4 women, indicating a more balanced use of popular restaurants in Rio de Janeiro.

With regard to the age groups, these were divided into three main groups: one-third under 30 years of age; another third between 31 and 50 years of age; and the remaining group, over 50 years of age.

Age	
Under 30	34%
Between 31 and 40	19%
Between 41 and 50	16%
Over 51	31%

The distribution at the restaurants in São Paulo, Belo Horizonte and Salvador was similar to the average, i.e., a greater concentration in the groups at either end of the spectrum (under 30, and over 51). More than half (53%) of restaurant users in Rio de Janeiro are over 51 years of age, which is a large concentration of older users. On the other hand, in the Federal District, the situation was opposite: more than half, 57% of users, were under 30 years of age.

Schooling	
Up to 4th grade	27%
Between 5th and 8th grades	27%
High-school and college	46%

Concerning schooling, almost half of users reached high-school or college level, with the remaining users divided equally between those having concluded the 4th grade, and those between the 5th and 8th grades.

The users with the lowest level of schooling were found in Rio de Janeiro, with 43% of users reaching the 4th grade, while greater proportions of users in the capital cities and in the Federal District possessed high school and college levels of schooling

With regard to income, the highest concentration is among those earning between one and three monthly minimum salaries; the second largest group earns up to one monthly minimum salary.

Individual income	
More than 3 minimum salaries	13%
Between 1 and 3 minimum salaries	39%
Up to 1 minimum salary	31%
No personal income/ No opinion	17%

It was also identified that among the users, the great majority had a fixed residence, while 21% do not have a regular address.

Fixed residence	
Yes	79%
No	21%

The highest rates of users without a fixed residence are in São Paulo and the Federal District. Of the total of those without a fixed residence, 45% were users of restaurants in São Paulo; 38% in the Federal District; 10% in Rio de Janeiro; 6% in Belo Horizonte, and 2% in Salvador.

4 Main Results

Listed below are the study's main findings, based on the information obtained from 600 interviews conducted at 19 popular restaurants at the locations mentioned:

:: 86% of all users approved of the restaurants, considering them good or excellent;

:: 22% of all users have no food intake when they do not go to these restaurants;

:: 21% of all users do not have a regular address, possibly being homeless individuals living in the streets;

:: Price is the factor that motivates 78% of users of popular restaurants. Food quality is also very important, with 86% of users stating being concerned with this issue;

:: The aim of popular restaurants was widely recognized by interviewees, 97% of whom believed that the overall objective of these establishments helped improve users' standard of living;

:: Users in the cities of São Paulo and Rio de Janeiro were those who best rated their restaurants: 92% and 90% respectively considered them "excellent" or "good". The highest "regular" rating was given by users of restaurants in Belo Horizonte (17%), while users interviewed in the Federal District were more "critical" - 5% rated the popular restaurants "bad" or "poor".

Other issues regarded the following:

:: **Overall attendance:** nearly half the users go to the restaurants regularly (45%). Approximately one-fourth (27%), stated doing so "once in a while". Only 6% rarely ate at the establishments; another 6% were there of the first time;

:: **Weekly attendance:** 39% said that they had their meals nearly five times a week at popular restaurants, i.e., Monday-Friday. On average, the interviewees attended the restaurants 3.7 times a week;

:: **Reason for attending:** the main reason mentioned was the price of the meals (78% of interviewees), followed by the healthy quality of the meals served (43% of interviewees);

:: **Means of access to popular restaurants:** 40% of those interviewed used the bus to reach the restaurants, while 44% walked. More than half the women (51%) took the bus, and more than half (52%) of the interviewees over 30 years of age walked. Furthermore, 63% of users over the age of 51 took the bus to the restaurants. The distribution among the states shows that in São Paulo, Belo Horizonte and the Federal District, most users walk; in Rio de Janeiro and in Salvador, most users take the bus;

:: **Attendance among families:** the great majority of the popular restaurant users (71%) eat their meals alone, without the company of other family members. Of those eating with relatives, there were more women than men. Regionally, in the Federal District there was a higher incidence of users eating with members of the family;

:: **Spending on meals:** there was practically a consensus among users regarding the price charged: 98% stated that the price was accessible, while 84% believed that the price of the meals, at these restaurants, represented a low or very low value in their personal budgets;

:: **Most consumed foods:** the traditional rice, beans, meat and salad, which is a nutritionally balanced mix, were the most consumed foods;

:: **Food preferences:** the choices that most appealed to users were those not consumed on a daily basis. The choices mentioned were chicken and *feijoada*[5] for 17% of interviewees, and meat/steak for 8% of interviewees.

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5   *Feijoada* is a dish of beans cooked with dried meat, pork, sausages

5   Analysis of the Results

(Stimulated response – One choice – %)

Graph 1: Frequency of meals at popular restaurants
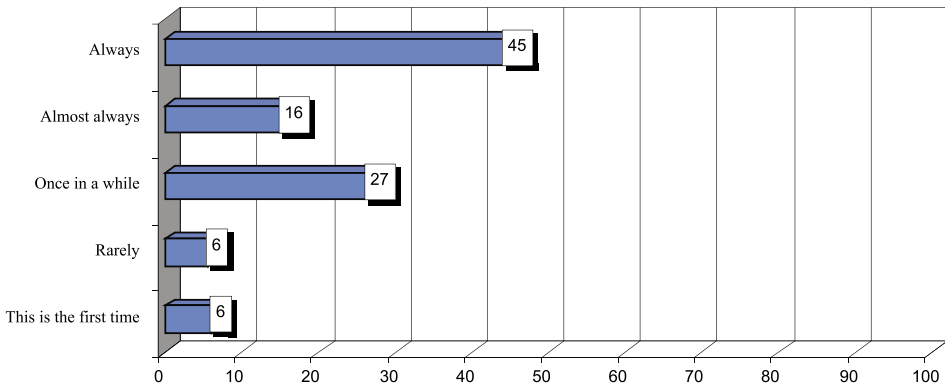
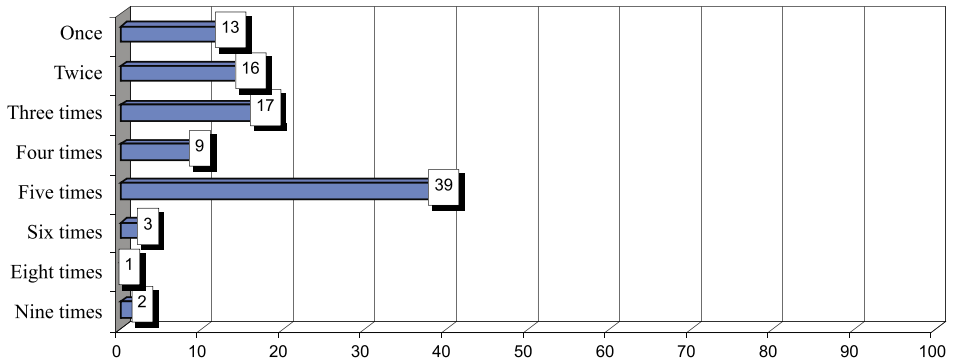Source: prepared by the researcher, based on data collected

An analysis of these results by segment indicates that men are more "loyal" to this type of restaurant: 50% stated always eating there, as compared to 33% of women. Besides the men, those with lower levels of schooling (up to the 4th grade) are also frequent users of the restaurants.

Interviewees who declared having no personal income were those who most stated in the interview (15%) that this was their first visit to the restaurant.

Regionally, it may be observed, at the time the interviews were being conducted, that the most frequent restaurant users were in Rio de Janeiro: 53% stated that they always attended these establishments. Graph 2 below depicts the weekly average attendance (only for those who attend 3.7 times a week, on average).

Graph 2: Average weekly attendance at popular restaurants

Base: 563 casos

Source: Prepared by the researcher, based on the collected data

It must be pointed out that higher incidence of weekly attendance is due to the fact some of the restaurants studied are open for both lunch as well as for dinner, thus increasing the availability of food, and consequently the possibility of a greater number of visits by users.

Also relevant is the fact that popular restaurants users in Rio de Janeiro are those who have the most meals at establishments serving both lunch and dinner, with an average weekly attendance of 3.9 times.

Restaurant attendance in the Federal District is more sporadic: 19% stated attending only once a month, while 21% attended all five working days. As a result, average attendance in the Federal District is 39%, in comparison to attendance in Rio de Janeiro, which reaches 50%.

Users of popular restaurants mainly eat at these establishments for financial reasons, as well as the possibility of obtaining a healthy, well-balanced meal (Table 1). Of every four persons interviewed, three (75%) stated that one of the decisive factors was the price, while 43% pointed out the healthy meals offered.

Table 1: Reasons influencing the choice of a popular restaurant

Reasons	%
Price	78
Healthy meal	43
Location of restaurant	16
Quality meal	4
Good assistance	2
Cleanliness/hygiene	2
Necessity (lives alone/no spouse/no one to cook)	2
Convenience	1
No time to eat at home	1
To try it out	1
Recommended by friends/others/relatives	1
Other reasons	2
No main reason	2
No opinion	0

Source: Prepared by the researcher

Although generally the price factor is by far the reason mentioned the most, certain regional aspects must be pointed out. For example:

:: In Belo Horizonte, the price factor was the reason mentioned the most, surpassing the overall restaurant average: 86% justified their presence at the establishments because of the price;

:: More than half (58%) of popular restaurant users in São Paulo pointed out the healthy quality of the meals.

Graph 3 illustrates the forms of access used by users to reach the popular restaurants.

(Spontaneous responses – Several options - %)

**Graph 3:** Means of transportation used to reach the popular restaurants
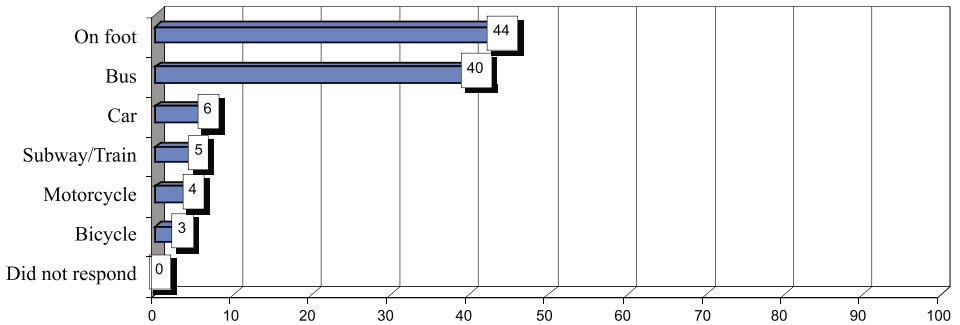
Source: Prepared by the researcher based on the collected data

The "bus" option, as opposed to "on foot" has regional differences: in São Paulo, Belo Horizonte and in the Federal District, most users reach the restaurants on foot; in Rio de Janeiro and Salvador most users take the bus.

One other issue mentioned was where users were located before going to the restaurants. The responses indicate that most users either came from work or from home (Graph 4).

Graph 4: Where individuals usually are located before going to the restaurants
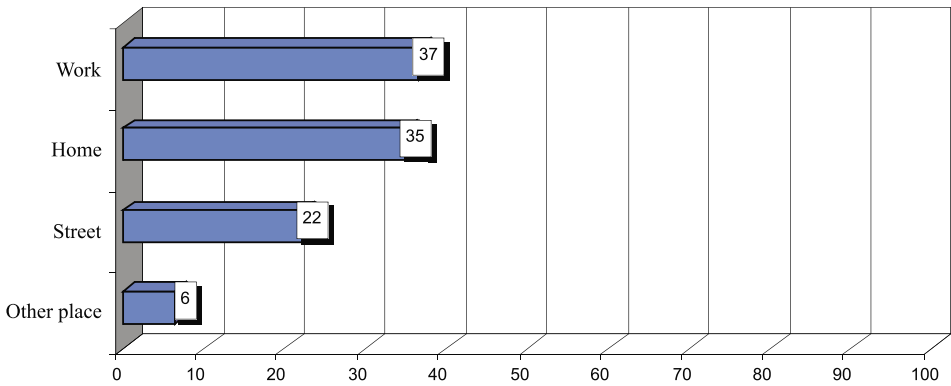
Source: Prepared by the researcher based on the collected data

As was expected, most women came from their residences, while most men came from their places of work. By age group, the younger the user, the more likely he or she came from work (48% of those under 30, as opposed to 15% of those over 51 years of age); most users aged 51 or older (58%) came from their residences.

It was observed that the level of schooling also influenced the answers: the lower the level of schooling, the more likely the user came from his or her residence; the higher the level of schooling, the more likely he or she came from work.

Regionally, certain differences were noted: users in Rio de Janeiro mostly come from home, while those in São Paulo, Belo Horizonte and the Federal District mostly come from work. But users in Salvador mostly come from the street.

When cross-checking the data regarding "where he or she came from" e "how he or she came", the following was noticed: most users who are at home come to the restaurants by bus; most who are at work, walk to the restaurants.

Another issue mentioned was the period in which users stood in line at the restaurants to be served their meal. The responses indicated that the waiting period was not very long, since little over 30% (one of every three interviewees) stating having waited up to 10 minutes, while 19% stated not having waited in line (Graph 5).

(Spontaneous response – One option - %)

Graph 5: Waiting time at restaurants
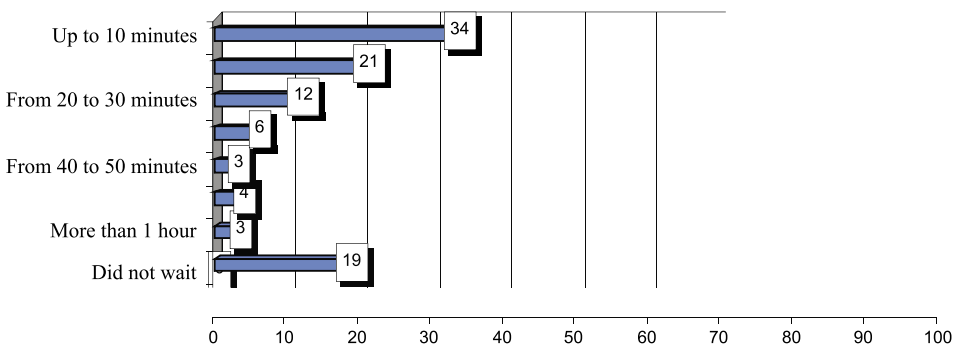
Source: Prepared by the researcher

Regionally, it was observed that in São Paulo and in the Federal District (mainly the latter) lines flowed quickly, with a waiting period of no more than 10 minutes. In Belo Horizonte, for example, there were no lines. One in every four interviewees (25%) in said capital city stated not having stood in line. But service at the restaurants in Rio de Janeiro took longer: 12% of users stated having spent more than an hour in line waiting to be attended.

The great majority of popular restaurant users (71%) ate alone, without the company of other family members (Table 2).

Table 2: Family company during meals at popular restaurants

Responses	%
Husband/Wife	6
Companion	3
Son/Daughter	9
Mother/Daughter	5
Brother/Sister	9
Father/Mother in-law	1
Bother/Sister in-law	2
Cousin	3
Uncle/Aunt	1
Niece/Nephew	3
Grandson/daughter	1
Other relative	2
No other family member	71

Source: Prepared by the researcher

Among those eating with relatives, there were more women than men. In the Federal District, there is a greater incidence of users eating with relatives.

The frequency that these relatives eat with the restaurant users was measured among those who ate in the company of family members (Graph 6).

Graph 6: Frequency of meals at popular restaurants
in the company of family members

Always — 35
Almost always — 16
Base: 176 casos
Once in a while — 36
Rarely — 13
Does not know/did not respond — 1

0 10 20 30 40 50 60 70 80 90 100
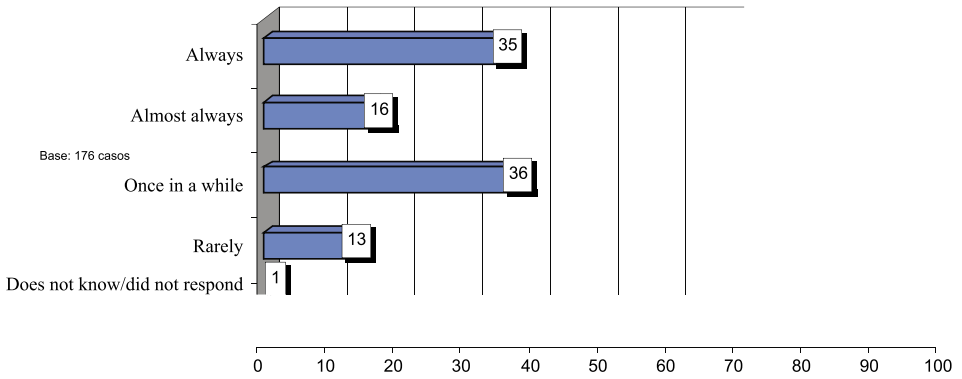
Source: Prepared by the researcher

With regard to the price charged for the meals, the distribution of the opinions is illustrated in Graph 7 below.

Graph 7: Evaluation of the price charged for meals at popular restaurants

Not affordable
2%

Did not respond
1%

Affordable
98%
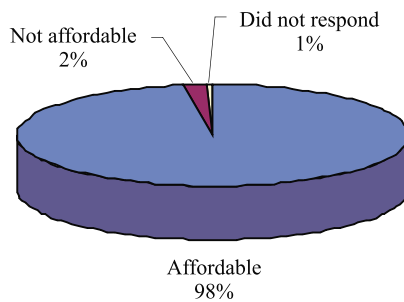
Source: Prepared by the researcher

The only point worth mentioning which was practically unanimous is that 7% of restaurant users in Rio de Janeiro stated that the price charged was not accessible.

On the other hand, the weight of the price paid for meals at popular restaurants in individual budgets varied greatly, as may be seen by the percentage values shown in Graph 8.

Graph 8: Percentage of spending on meals at popular restaurants in relation to personal/family income
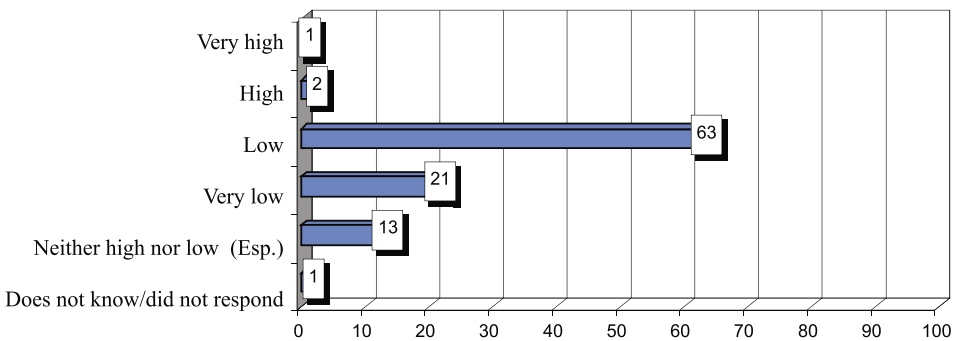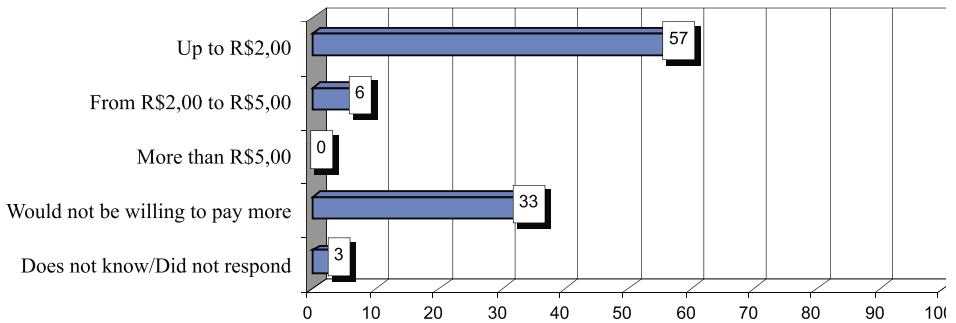

Source: Prepared by the researcher

Regionally, a high number of restaurant users in Salvador (36%) stated, spontaneously, that the price was neither high nor low. In the overall average for all restaurants, only 13% had the same opinion. A hypothesis was tested regarding an alteration in the price of the meals, which generated several suggestions (Graph 9). It was observed that more than half of the interviewees (57%) said they would be willing to pay up to R$ 2.00 for the meals. However, one third of the interviewees said they would not be willing to pay the current price for the same meals.

**Graph 9:** Capacity of users to pay a higher value for meals

Source: Prepared by the researcher

The segments most willing to pay up to R$ 2.00 were users under 30 years of age, those with incomes higher than three minimum salaries, and the residents of the Federal District.

As expected, those less willing to pay more were users with lower purchasing power, with no income, or with income less than one minimum salary, as well as the residents of the capital city of Salvador.

An issue that was mentioned in the study was the concern of restaurant users with regard to the healthy food. The great majority stated being concerned with this aspect, as illustrated in Graph 10.

Graph 10: Concern with the quality of the food at popular restaurants
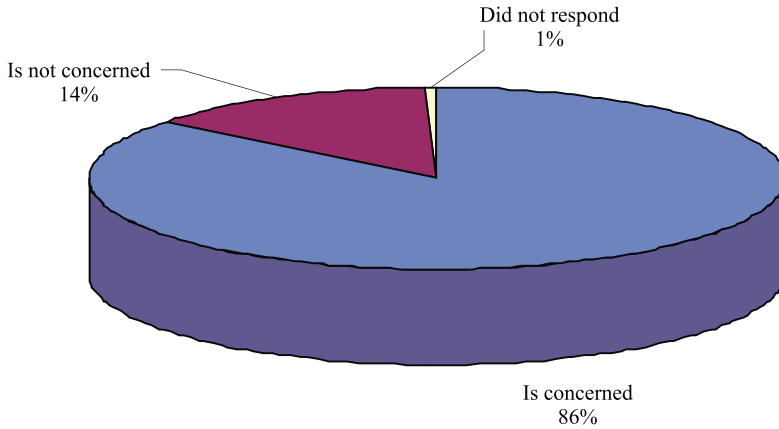
Source: Prepared by the researcher

Among these users, those who demonstrated being the least concerned with the quality of the food were users 51 years of age or older, and those whose level of schooling reached the 4th grade. The users of popular restaurants in the city of Rio de Janeiro also manifested being less concerned with healthy food in comparison with the others.

From a regional perspective, those more concerned with the quality of the food were the users of the restaurants in Salvador.

With regard to healthy habits, it was also possible to identify the foods most consumed by restaurant users (Table 3). The preferred foods were rice, beans, meat and salad (as mentioned previously).

Table 3: Food most consumed daily

Options	%
Beans	94
Rice	92
Chicken	66
Meat/Beef	66
Salads	58
Green vegetables	57
Other vegetables	55
Fruit	48
Fish	46
Pasta	45
Bread	37
Eggs	32
Milk/Yogurt	27
Wheat meal	26
Manioc/Yam/Cassava/*Tapioca*[6]	23
Sweets	22
Dry meat/Beef jerky	19
Cereals	17
Maize flour/*Cuscus*[7]	16
Cake	16
Snacks	15
Sandwiches	11
Coffee	1
Other foods mentioned less than 1% of the time	1
No main food	0

Source: Prepared by the researcher

In regional terms, the diversity of the responses indicated some differences, as may be seen below:

:: Users of the restaurants in Belo Horizonte stated that pasta was the preferred food;

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6   *Tapioca* is a nutritive preparation of cassava (manioc) starch.
7   *Cuscus*: couscous is a dish of North African origin, made of steamed rice or maize flour.

:: Users of the restaurants in Rio de Janeiro stated preferring chicken instead of 'meat/beef';

:: Wheat meal was the most frequently mentioned item by interviewees in the city of Salvador;

:: Eggs were the food item most frequently mentioned by restaurant users in the Federal District and in Belo Horizonte. This food item was the least frequently mentioned by residents of the city of São Paulo;

:: Manioc, yam and tapioca were among the most consumed food items by users in Belo Horizonte, but were the least consumed by users in the other cities;

:: Sandwiches and salty finger foods were the preference mentioned in the Federal District;

:: Fruit, however, was the food item mentioned more frequently by users in Salvador than in the other capitals cities and the Federal District.

Another question made in the study was: **where do users eat on the days they do not go to the popular restaurants?**

Responses given indicate the predominance of eating at home, followed by eating at other types of restaurants and, what is worse, not eating, as declared by 22% of interviewees.

As mentioned earlier, men eat more frequently at other types of restaurants, while women have their meals at home or do not eat at all; 30% of interviewees do not eat when they do not go to the popular restaurants. Among men, this rate is 19%.

Among those who do not attend other establishments, users over the age of 51, and those whose schooling reached the 4th grade predominated. Users in Rio de Janeiro (50%) and in São Paulo (38%) also had the highest rates of people not eating when they did not go to the popular restaurants. However, in the Federal District and in Salvador, 53% (in each city) ate at home, when they do not go to a popular restaurant (Graph 11).

Graph 11: Place of eating when users do not go to popular restaurants
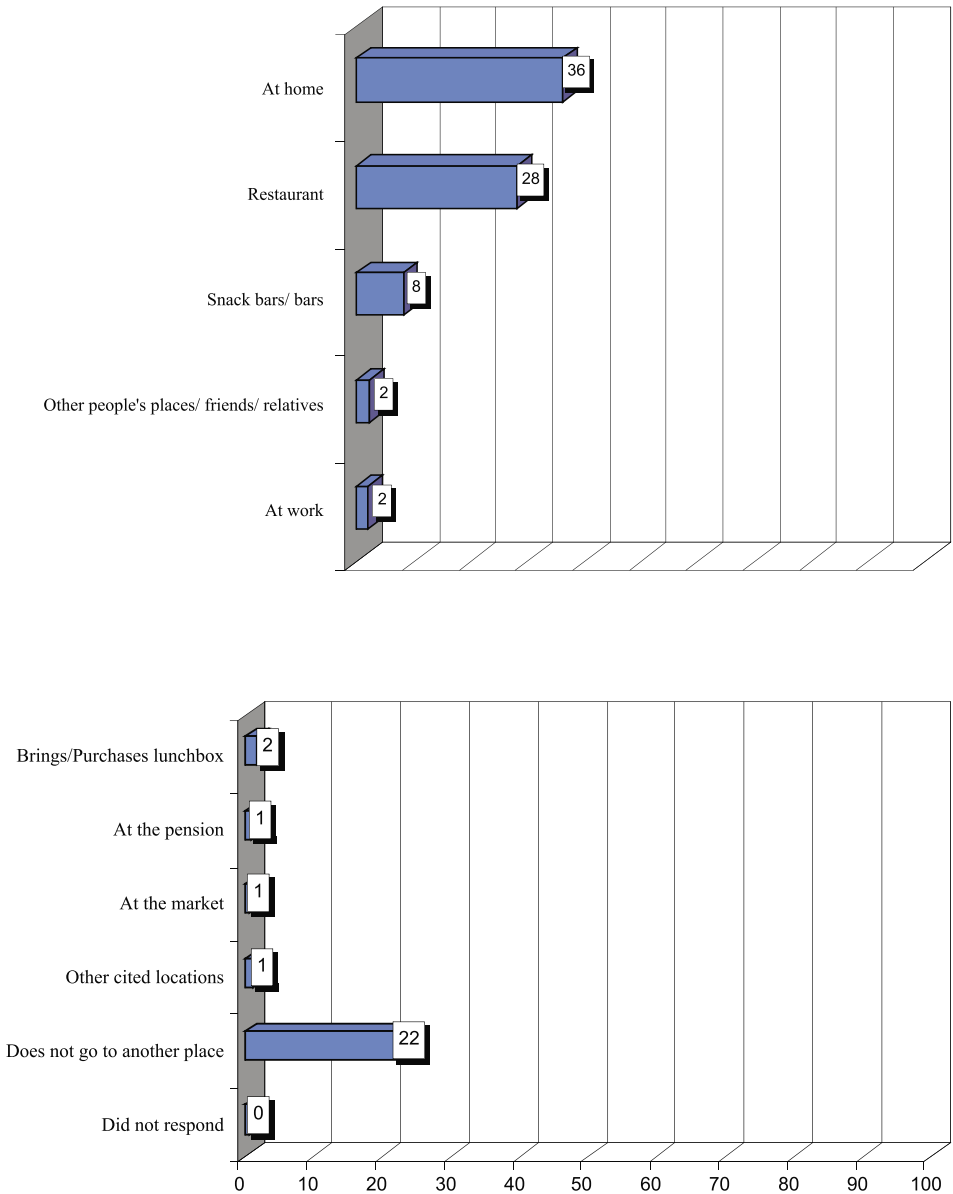
Source: Prepared by the researcher

Among those eating at other restaurants, information was requested regarding average expenditures at these establishments. From the responses given, the average expenditure was R$ 4.00, but most, 57%, stated not spending any money (Table 4), because they ate at home.

(Spontaneous response – One option – Average expenditure: R$ 4.60)

Table 4: Average value spent on meals at other establishments

Value Spent	%
R$ 1.00	1
R$ 2.00	4
R$ 3.00	8
R$ 4.00	10
R$ 5.00	9
R$ 6.00	2
R$ 7.00	1
R$ 8.00	1
R$ 10.00	0
R$ 12.00	1
R$ 15.00	0
R$ 18.00	0
R$ 20.00	1
R$ 30.00	0
No money spent; eats at home	57
Asks for money (esp.)	0
Does not know/No opinion	5

Source: Prepared by the researcher

In regional terms, spending also varied from city to city: the highest number of interviewees declaring spending money at other establishments, on average, were residents of the Federal District, while those stating spending less were popular restaurant users in Belo Horizonte.

Regarding food items not normally consumed on a daily basis, the responses varied (Table 5) among the users studied:

:: Chicken was the option most frequently mentioned by interviewees between 31 and 40 years of age, by those over 51 years of age, and by the least educated. It was also the preference of residents of the cities of Rio de Janeiro and Salvador.

:: The *feijoada* was most appreciated by men and by the younger interviewees (under 30). Residents of São Paulo and of the Federal District are those who also preferred

(Only those mentioned over 1% of the time - Spontaneous responses – One option)

Table 5: Food item preference of users other than the typical mix – rice, beans, meat

Options	%
Chicken	17
Feijoada	17
Fish	8
Beans	7
Rice	4
Boiled meat	3
Salads	3
Roast chicken	3
Dobradinha[8]	2
Liver	2
Rice and beans	2
Lasagna	2
Vegetables	1
Chicken stew	1
Pasta	1
Meat stew	1
Diced meat	1
Roast meat	1
Arrumadinho[9]	1
Manioc/*tapioca*	1
Salty finger foods	1
Ground meat	1
Manioc and meat	1

8   *Dobradinha* is a dish prepared with tripé stew or ragout.
9   *Arrumadinho* is a dish with rice, beans and meat prepared all together.

Options	%
Maxixada[10]	1
Barbecue meat	1
Soup	1
Pork chops	1
Beets	1
Breaded chicken	1
Pancakes	1
Typical Bahia food	1
Anything	3
Disliked all	0
No opinion	7

Source: Prepared by the researcher

More explicitly, the food items that the interviewees declared liking the least at popular restaurants are listed in Table 6.

Table 6: Food item liked the least at popular restaurants

Items like the least	%
Chicken	7
Ground meat	6
Liver	5
Fish	4
Dobradinha	4
Meat/beef	4
Feijoada	3
Vegetables	2
Beans	2
Innards	2
Boiled meat	2
Green vegetables	2
Sausage	2
Salads	1
Soups	1
Pork	1
Maxixada	1

10   *Maxixada* is a dish prepared with maxixe fruit of the anguria.

| Items like the least	%
Pasta	1
Eggs	1
Diced meat	1
Steak	1
Hamburger	1
Hot dogs	1
Breaded chicken	1
Chicken stew	1
Meat stew	1
Pirão	1
Meatballs	1
Eggplant	1
Pancakes	1
Rice	1
Likes all items	27
No opinion	5

Source: Prepared by the researcher

Regionally, regarding this item, the main points are the following:

:: Chicken and fish are not well accepted in the Federal District and in Salvador;

:: Residents of the Federal District are those who most reject *feijoada*;

:: Ground meat is not well accepted in São Paulo, nor in Belo Horizonte;

:: Among residents of Salvador, only 18% stated liking all food items offered at popular restaurants. Among residents of Rio de Janeiro, this percentage was 34%.

Regarding the overall evaluation of the establishments, Graph 12 below presents the distribution of users' opinions.

Graph 12: Evaluation of the services provided by popular restaurants
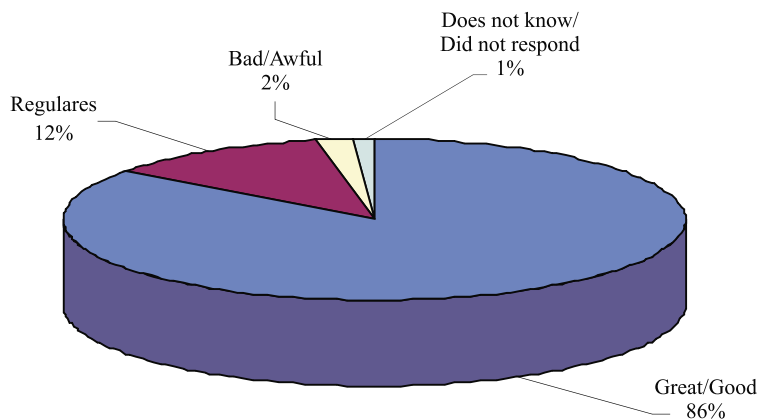
Source: Prepared by the researcher

The residents of the cities of São Paulo and Rio de Janeiro rated their restaurants best: 92% and 90%, respectively, considered them "excellent" or "good". The highest "regular" rating was given by users in Belo Horizonte, 17%, and the most "critical" were those in the Federal District, where 5% rated the restaurants "bad" or "poor".

In the following phase, the interviewees were asked to rate specific aspects of popular restaurants they attended. These were rated according to the following categories: excellent (5), good (4), regular (3), bad (2) and, poor (1). Weights were then attributed to each, from which an average for each aspect was obtained.

The following graphs illustrate the ratings of the following aspects of restaurants: premises, service, meals, and cultural programs.

Of these four categories, the ones receiving the best ratings were: "premises" and "meals", with an average of 4.1 points, according to the category average attribution concept described above. "Service" obtained an average of 3.9 points, and "cultural programs", 3.7 points.

Graph 13 presents the average rating of each area, for a general view of users' evaluation.

(Scale: 1 to 5)

**Graph 13:** Average rating attributed to each aspect of popular restaurants
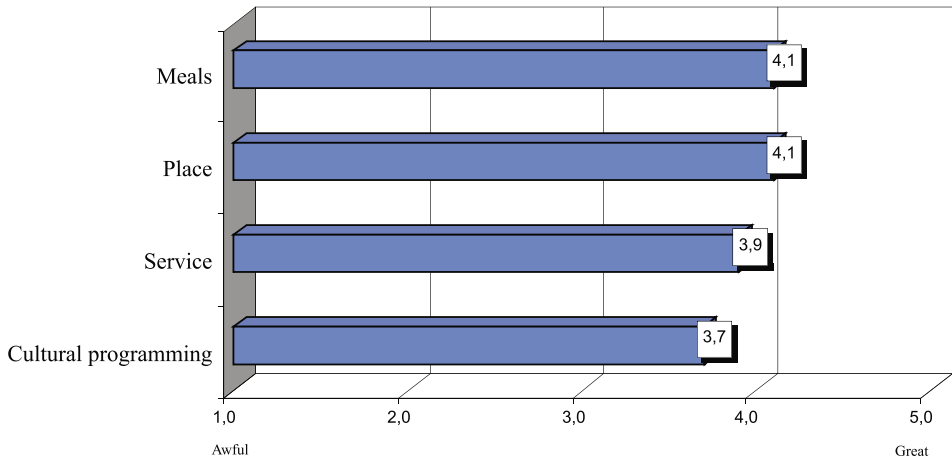
Source: Prepared by researcher

Specific points regarding the physical and sanitary aspects of the services provided by popular restaurants were also evaluated by users (Graph 14). These aspects were evaluated in the same manner by restaurant users, as shown in Graph 15.

Premises

(Scale: 1 to 5)

Graph 14: Evaluation of physical and sanitary
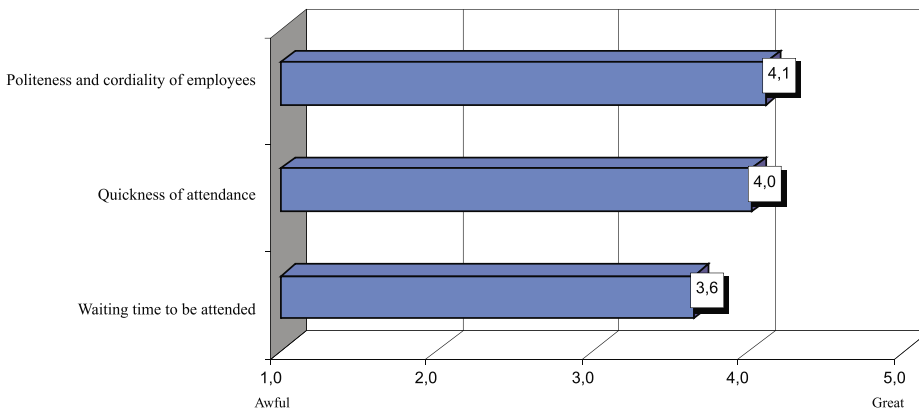aspects of popular restaurants studied
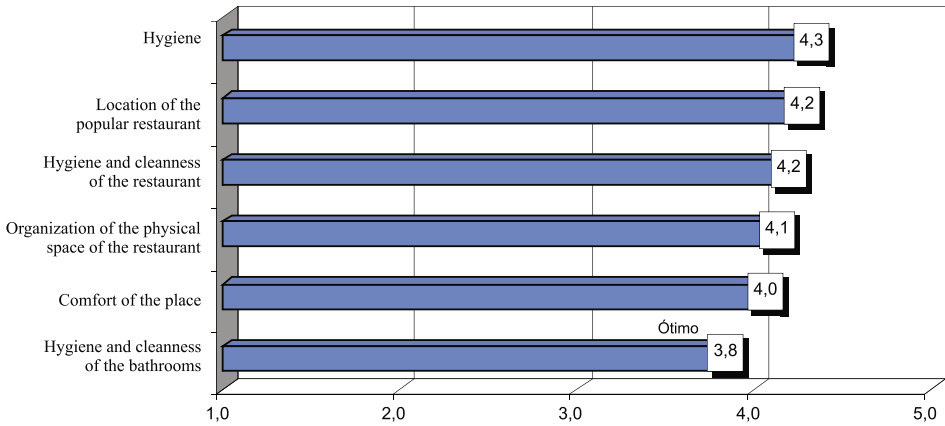
Source: Prepared by the researcher

Services

(Scale 1 to 5)

Graph 15: Evaluation of specific aspects related to user attendance
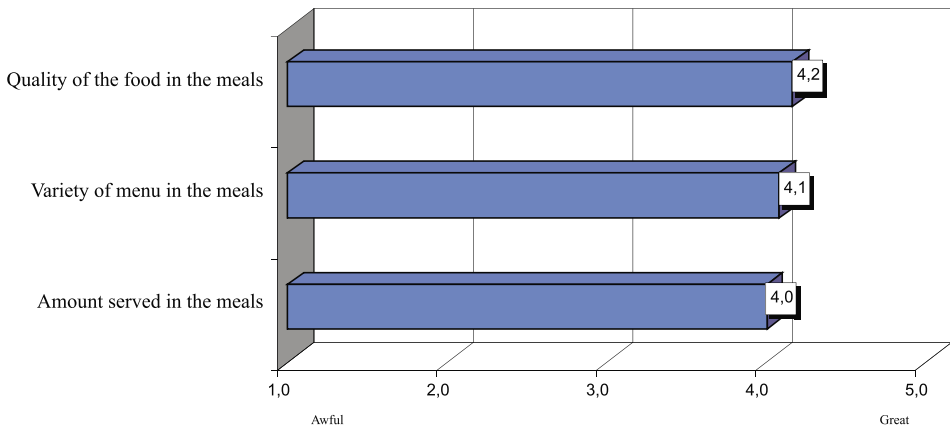

Source: Prepared by researcher

The overall user rating of the meals is shown in Graph 16.

Meals

(Scale: 1 to 5)

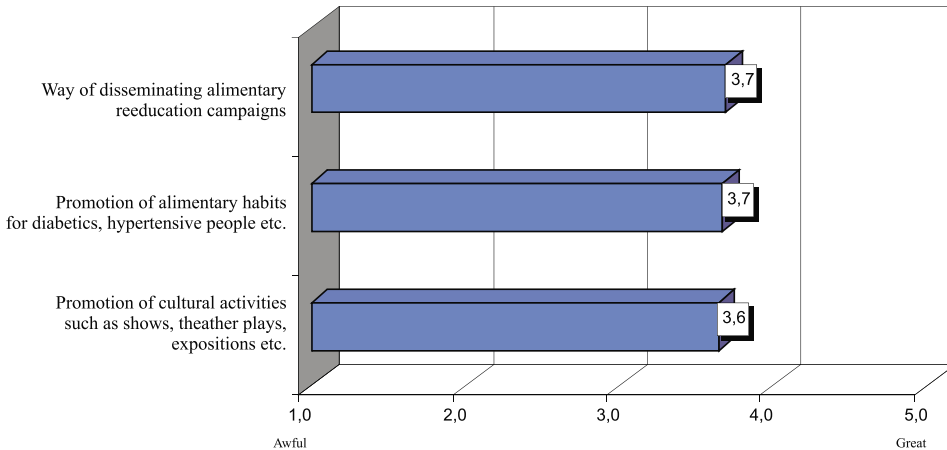**Graph 16:** Evaluation of specific aspects of services related to food

Source: Prepared by researcher

Regarding cultural programs, the evaluation of popular restaurant users was the lowest of the three areas evaluated (Graph 17).

Graph 17: Evaluation of specific aspects of cultural programs
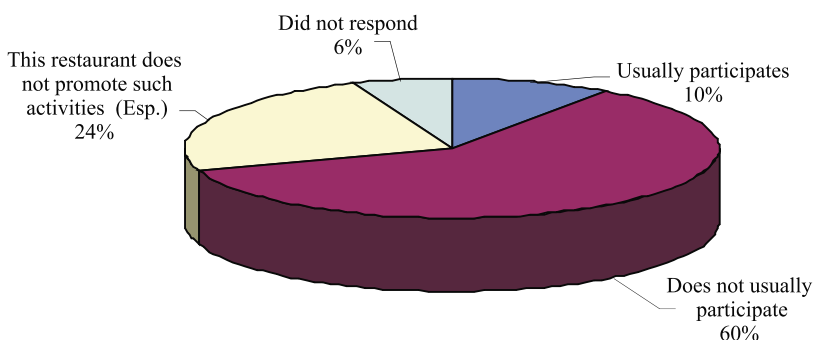

Source: Prepared by the researcher

Of all the aspects in the four areas rated, the best score was attributed to "kitchen cleanliness and hygiene", with a point average of 4.3 and a 28% rating of "excellent" and 43% for "good". The overall approval rate was 71%. Regarding this aspect, the restaurants in São Paulo stood out, with an overall approval rating of 88%: 36% considered them excellent, and 52% good.

However, the lowest point average was for "time waiting to be served", with and average of 3,6, as a result of a 65% excellent or good rating; 20% regular, and 14% bad or poor. In spite of being the lowest rating in comparison with the other aspects, it was nevertheless positive, thus corroborating the overall positive evaluation of popular restaurants.

The most critical restaurant users with regard to "time waiting to be served" were those in Belo Horizonte, where 29% attributed a negative evaluation to this aspect; 17% bad, and 12% poor.

After the specific evaluation of the restaurants' activities, cultural issues were addressed among users of popular restaurants. Regarding the first question, most of those interviewed, 60%, were not aware of the cultural activities promoted by popular restaurants, while one in four interviewees (25%) stated that the restaurant did not promote any cultural activities. The distribution of the results is illustrated in Graph 18.

Graph 18: Opinion regarding cultural programs at popular restaurants

Source: Prepared by the researcher

The interviewees that participated the most in cultural activities were the patrons of popular restaurants in the Federal District (16%), and Belo Horizonte (14%). However, the least participation was in São Paulo (87%). The great majority of restaurant patrons in Salvador (68%) spontaneously declared that there were no cultural activities at the restaurants.

The purpose of popular restaurants was also widely recognized by interviewees: 97% stated that the work done at these establishments, overall, helps to improve the standard of living of their patrons.

As well as the direct nutritional services provided to users by popular restaurants, also investigated were the reflections these services had upon the lives of their users (Graph 19).

Graph 19: Reflection of the activities of popular restaurants upon the lives of their users

Did not respond
1%

Does not enable
a better life condition
3%

Enables a better
life condition
97%
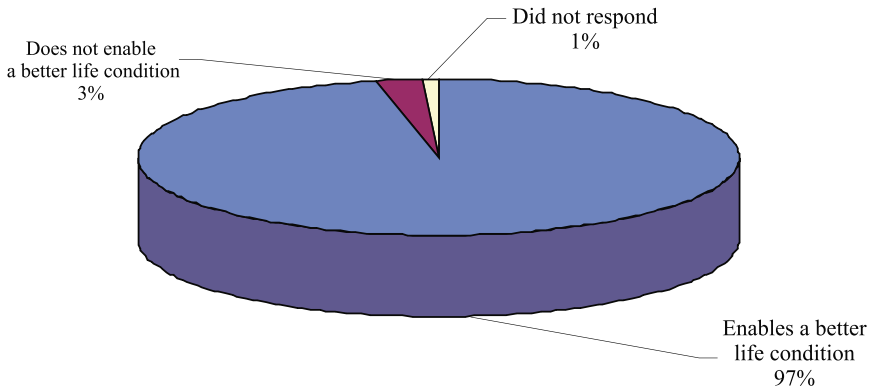
Source: Prepared by researcher

For all those interviewed, the continuity of the popular restaurant project was considered important: 86% considered it very important, and 14% important. Graph 20 presents the results of this evaluation.

Graph 20: Level of importance of the continuity of the popular restaurant project as attributed by users

Level	Value
Very important	86
Important	14
Little important	1
Unimportant	0
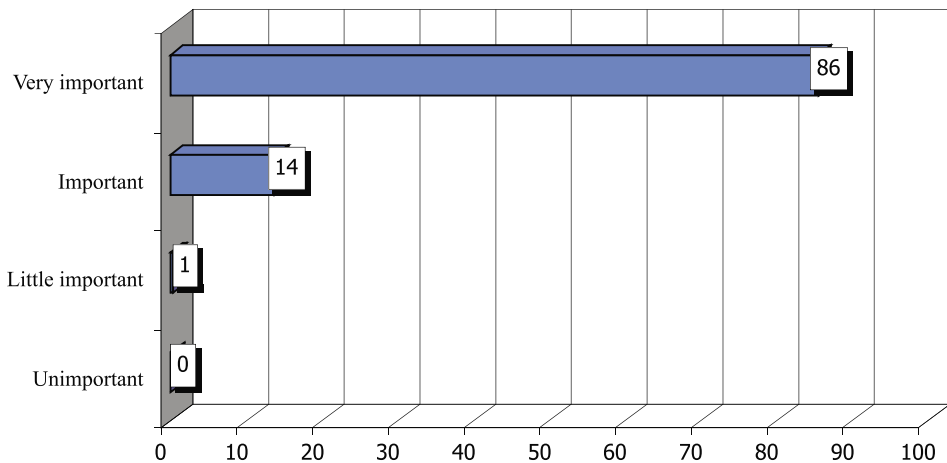
Source: Prepared by the researcher

The rating of very important was highest among users in Salvador (93%), in comparison with the other capital cities.

Suggestions were made to improve the popular restaurants. One of the most frequent (12%) suggestions was the increase in the physical space of the restaurants, thus making them more comfortable, as well as increasing the possibility of attending more users (Table 7).

However, when attributing a positive evaluation regarding the quality of the food, cost, hygiene and assistance, most interviewees did not make any suggestions. Nevertheless, it must be pointed out that there was no correlation between the increased use of the restaurants, the availability of cultural spaces, community equipment, and the lack of suggestions.

An important suggestion made during the course of the study was the reduction of waiting time at the restaurants, which was diagnosed as a problem. Also mentioned was the need to open new restaurants, indicating an overall consistency between the previous questions and the suggestions made by users.

(Answers given more than 2% of the time - Spontaneous responses – Several options)

Table 7: Suggestions for the improvement of popular restaurants

Suggestions	%
Increase of physical space	12
Reduce waiting time in lines	7
Open more restaurants	6
Increase the variety on the menus	4
Increase the quantity of food served	4
Install awnings where people stand in line	3
More rapid assistance	3
Improve the quality of the food	3

Suggestions	%
Hire more employees	2
Improve assistance	2
Improve hygiene/cleanliness	2
Open on weekends/holidays	2
Increase security/guards at the door	2
Nothing	33
Does not know/No opinion	9

Source: Prepared by the researcher

6   Concluding Remarks

This study is an important instrument for the monitoring and evaluation of Popular Restaurants, aimed at determining the influence of this service regarding the nutritional and food security of residents in large urban centers. Furthermore, this study provides basic data on the profile of users and their eating habits, which may be used to improve this and other initiatives of the Federal Government in this area.

It is important to point out that, overall, user ratings were very positive regarding the quality and variety of food items, hygiene, price, assistance, access and the need to continue this assistance. This is thus an important factor to legitimize the policies of the Ministry of Social Development aimed at combating hunger and malnutrition among large segments of the Brazilian society.

Annex 1

Complete List of Popular Restaurants in the Country

NO	State	Municipality/ FD	Name of unit/restaurant	Address of unit or overseeing agency
1	SP	São Paulo	Restaurante Bom Prato Brás	R. Dr. Almeida Lima, 900, Brás
2	SP	São Paulo	Restaurante Bom Prato Campos Elíseos	Largo Coração de Jesus, 28, Campos Elíseos
3	SP	São Paulo	Restaurante Bom Prato Guaianazes	R. Otelo Augusto Ribeiro, 343, Guaianazes
4	SP	São Paulo	Restaurante Bom Prato 25 de Março	R. Vinte e Cinco de Março, 166, Glicério
5	SP	São Paulo	Restaurante Bom Prato Itaim Paulista	Av. Marechal Tito, 4120, Itaim Paulista
6	SP	São Paulo	Restaurante Bom Prato Lapa	R. Afonso Sardinha, 245, Lapa
7	SP	São Paulo	Restaurante Bom Prato Liberdade	R. Galvão Bueno, 747, Liberdade
8	SP	São Paulo	Restaurante Bom Prato Santana	R. Dr. Zuquim, 532, Santana
9	SP	São Paulo	Restaurante Bom Prato Santo Amaro	R. Mário Lopes Leão, 685
10	SP	São Paulo	Restaurante Bom Prato São Mateus	Av. Mateo Bei, 2604, São Mateus
11	SP	São Paulo	Restaurante Bom Prato São Miguel Paulista	R. José Otoni, 256
12	SP	São Paulo	Restaurante Bom Prato Vila Nova Cachoeirinha	R. Deputati Cantídio Sampaio, 140, Vila Nova Cachoeirinha
13	SP	São Paulo	Restaurante Escola Boracea	R. Boracea, 270, Barra Funda
14	RJ	Rio de Janeiro	Restaurante Popular Herbert de Souza Betinho	R. Senador Pompeu, s/ nº, Central do Brasil
15	RJ	Rio de Janeiro	Restaurante Popular Getúlio Vargas	Av. Francisco Real, 1780, Bangu
16	RJ	Rio de Janeiro	Restaurante Popular Radialista Jorge Curi	R. Prof. Eurico Rabelo, Maracanã
17	BA	Salvador	Restaurante Popular Prato do Povo Liberdade	Primeira Travessa Lima e Silva, 258, Liberdade

NO	State	Municipality/FD	Name of unit/restaurant	Address of unit or overseeing agency
18	BA	Salvador	Restaurante Popular Prato do Povo Comércio	Av. Terminal da França, s/nº, Ed. Instituto do Cacau da Bahia
19	MG	Belo Horizonte	Restaurante Popular Unidade I	Av. do Contorno, 11484, Centro
20	MG	Belo Horizonte	Restaurante Popular Unidade II	R. Ceará, 490, Santa Efigênia
21	MG	Belo Horizonte	Restaurante Popular	Av. Antônio Carlos, 821, Mercado Municipal da Lagoinha
22	DF	Distrito Federal	Restaurante Comunitário São Sebastião	SEPN, Quadra 516, Edifício Carlton Center, 2º andar
23	DF	Distrito Federal	Restaurante Comunitário Samambaia	SEPN, Quadra 516, Edifício Carlton Center, 2º andar
24	DF	Distrito Federal	Restaurante Comunitário Ceilândia	SEPN, Quadra 516, Edifício Carlton Center, 2º andar
25	DF	Distrito Federal	Restaurante Comunitário Paranoá	SEPN, Quadra 516, Edifício Carlton Center, 2º andar
26	DF	Distrito Federal	Restaurante Comunitário Santa Maria	SEPN, Quadra 516, Edifício Carlton Center, 2º andar

Annex 2

Restaurants Randomly Chosen for the Study

NO	State	Municipality/FD	Name of unit/restaurant	Interviews
1	SP	São Paulo	Restaurante Bom Prato Brás	20
2	SP	São Paulo	Restaurante Bom Prato Guaianazes	20
3	SP	São Paulo	Restaurante Bom Prato Lapa	20
4	SP	São Paulo	Restaurante Bom Prato Santana	20
5	SP	São Paulo	Restaurante Bom Prato Santo Amaro	20
6	SP	São Paulo	Restaurante Bom Prato São Mateus	20
7	SP	São Paulo	Restaurante Bom Prato Vila Nova Cachoeirinha	20
Subtotal				**140**
8	RJ	Rio de Janeiro	Restaurante Popular Herbert de Souza Betinho	40
9	RJ	Rio de Janeiro	Restaurante Popular Getúlio Vargas	40
10	RJ	Rio de Janeiro	Restaurante Popular Radialista Jorge Curi	40
Subtotal				**120**
11	BA	Salvador	Restaurante Popular Prato do Povo Liberdade	60
12	BA	Salvador	Restaurante Popular Prato do Povo Comércio	60
				120
13	MG	Belo Horizonte	Restaurante Popular Unidade I	40
14	MG	Belo Horizonte	Restaurante Popular Unidade II	40
15	MG	Belo Horizonte	Restaurante Popular	40
Subtotal				**120**
16	DF	Distrito Federal	Restaurante Comunitário São Sebastião	24
17	DF	Distrito Federal	Restaurante Comunitário Samambaia	24
18	DF	Distrito Federal	Restaurante Comunitário Ceilândia	24
19	DF	Distrito Federal	Restaurante Comunitário Paranoá	24
20	DF	Distrito Federal	Restaurante Comunitário Santa Maria	24
Subtotal				**120**
Total				**620**

Health and Nutrition Day: a Study of the Nutritional Situation of Children in the Brazilian Semi-arid Region

Health and Nutrition Day: a Study of the Nutritional Situation of Children in the Brazilian Semi-arid Region[1]

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1   Introduction

Geographical factors (sparse and irregular rainfall, recurrent drought, and poor soils), historically unfavorable economic and social factors (with over half the local population living below the poverty line), and persistent anachronistic

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1   Text originally published in the series *Cadernos de Estudos: Desenvolvimento Social em Debate*, of the Ministry of Social Development and the Fight Against Hunger, from the research "Health and Nutritional Day on children below de age of five years living in semi-arid areas and in land-reform settlements in the Northeast Region and the north of Minas Gerais". This research was carried out during the second round of the 2005 National Vaccination Campaign, and counted on the participation of 1.100 municipal city halls and 10 state governments, besides the The United Nations Children's Fund (UNICEF) and of 12 public universities.

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5   Federal Fluminense University.

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political models, make the semi-arid the region of Brazil at highest risk for food insecurity, and for general and specific nutritional deficiencies.

Poverty in the region is exacerbated by environmental, economic, and social factors that seriously impact various aspects of collective living conditions. These are further aggravated by striking asymmetries in the standards of living of families in the so-called Polygon of Drought (*Polígono das Secas*), an area that encompasses parts of 8 states in the western portion of Brazil's Northeast region (not including Maranhão), and 85 municipalities in the north of Minas Gerais, in Brazil's Southeast region.

According to one of the most renowned scholars of the physical and human geography of the region, Professor Manuel Correia de Andrade, the semi-arid region comprises 900,506 square kilometers, whereas the Polygon of Drought covers an area of 1,085,187 square kilometers. Thus, 10.6% of Brazil is located within the semi-arid region, and 12.7% in the polygon afflicted by irregular rainfall or drought. It is within these areas that the greatest risks of food shortages and nutritional insecurity occur and, figuratively speaking, they comprise "the cartography of hunger".

Most alarmingly, at the very center of the semi-arid portion of Brazil's Northeast Region, spreading threateningly over a large portion of the southeast of the state of Ceará, the east of Piauí, the north of Bahia, central and western portions of Pernambuco, and certain areas of Paraíba and Rio Grande do Norte, are huge areas described as "susceptible to desertification". This phenomenon, according to researcher Fernando Barreto, must be considered within a broader context, since mapping of the region's ecosystems reveals areas of 'low' and 'very low' environmental viability, encompassing areas that, collectively, amount to almost 354.000 square kilometers. Such areas amount to over one third of the entire semi-arid region, implying severe limitations to farming and livestock in much of Brazil's Northeast, since prospects for sustainability are extremely low. With population densities ranging between 15 and 20 persons per square kilometer, much of the land is severely degraded and unable to sustain further anthropogenic impacts. It is hardly surprising that the region is a source of emigration, producing constant and increasing outflows of emigrants to the cities and to other less hostile environments, both within and beyond the limits of the semi-arid region.

Given that farming and livestock raising (the traditional occupations that originally enticed people to settle in the region) are subject to serious physical limitations posed by fragile soils and adverse climatic conditions, unquestionably, prospects for creating jobs and generating income in semi-arid areas are more remote than in any other major region of Brazil. Among the reasons why the Northeast semi-arid (Sertão) is so dependant upon farm incomes, according to professor Aldomário Rodrigues, is the fact that over 41% of the population ekes out a living from the land. This proportion is very high when contrasted with the population dependant upon farm incomes in the South (30%), in the Midwest (22%), in the Southeast (12%), and in the North (7.4%). Moreover, in the semi-arid region, even the performance of activities normally considered as being typically urban (i.e., industry and services) tend to bear very close links with the performance of the farm sector. Metaphorically speaking, they are viscerally-articulated economic and social metabolisms, with rural areas acting as the driving force behind the process.

What then are the characteristics and vulnerabilities of this region? Over the past four decades, there has been a sharp decline in the share of the region's farm-sector toward GDP, which dropped from around 30.5% in 1960, to 9.1% in 2000 (SILVA, 2001). A second (and more emblematic) characteristic is the fact that the most stable and significant source of incomes in the rural areas are the benefits paid out by Social Security: i.e., old-age pensions, and incapacity benefits paid to heads of households and other family members. The irony of this situation should not pass unremarked: the predominant economic activity is remunerated inactivity in the form of retirement benefits.

A third characteristic element that reflects economic and social fragilities of the semi-arid region can be perceived in the extreme disparities of income among geographic areas and social groups, and in unequal access of the population to the means of production. In Pernambuco, according to Virgolino e Monteiro (2001) per-capita incomes range wildly, from US$ 5.829 in the Recife Metropolitan Region; and US$ 1.340 in the Zona da Mata; to US$ 764 in the Sertão do Moxotó; and US$ 378 in Sertão de Araripina.

Such disparities are likewise (or perhaps even more starkly) reflected when one of the most crucial contributing factors to fragilities of the farm sector in the semi-

arid region is considered, namely, land tenure. A study (SAMPAIO & PESSOA, 1987) that examined six different food-production systems found that no less than 39.4% of registered land holdings (System 1) and no more than 66.2% (under Systems 2 and 5) are accounted for by farmers with holdings of less than 10 hectares, whereas averages range from 3.2 to 7.5 hectares in System 1 (livestock/general food crops), and in System 5 (livestock/beans/general food crops) respectively. From a general perspective, land holdings of less than 50 hectares, (i.e., micro and small holders) accounted for between 81% and 91% of the total number of properties registered, in counterpoint to large landowners who, while representing only around 1% of land titles, hold one third of all available land in the semi-arid region.

This is a very adverse land-tenure profile, since it reflects successive subdivisions into ever-smaller holdings, through inheritance over various generations. This situation has become critical, in view of the fact that, using current production technologies and taking into account current market demand, it is highly unlikely that farms in the semi-arid region with less than 150 hectares can produce monthly family incomes equivalent to one minimum wage per head.

The context thus revealed is one of environmental, physical, economic, and social adversities, that exacerbate potential risks and present a particularly vulnerable food and nutritional security scenario in drought-prone areas of Brazil's Northeast.

* * *

Half a century ago, Josué de Castro (1946), in his classic work *Geografia da Fome* (Geography of Hunger) described the hinterlands of the Northeast as being, in normal years, one of the best parts of Brazil, in terms of food and nutrition. This pastoral idyll, however, would vanish completely in periods of drought, which brought on total crop failures and decimation of herds of cattle, goats, sheep, pigs and poultry. Such climatic cataclysms did not spare human populations, but descended upon them in the form of famine. In 1877, reports of drought and famine in the semi-arid areas of Brazil's Northeast shocked the wo-rld. Indeed, in the State of Ceará, including Fortaleza, half of the entire population died, owing to absolute lack of food, water, and outbreaks of epidemic diseases associated with nutritional deficiencies and water shortages. Thus the Northeast was afflicted by a cycle of pandemics (plague, hunger and war) of

biblical proportions. It should be remembered that the drought of 1877 also marks the onset of a cycle of banditry (*ciclo do cangaço*) that only came to a close in 1938. Another emblematic event of this period was the epic and mystic War of Canudos (1896-1897) in the *Sertão* of Bahia.

It must be stressed that, today, in the Northeast region, whereas vast human tragedies brought on by drought no longer kill hundreds of thousands of people as they did in the past, nonetheless, even in the most favorable years when the rains do not fail, the population of the region is not spared from food shortages and nutritional deficiencies. Dramatic outbreaks of famine have, in little more than 50 years, been replaced by less visible, more silent and subtle manifestations of endemic deficiencies. Without the protective context of closed production and consumption systems (the peculiar '*oikos' sertanejos*), and with borders now open to the vicissitudes of a free market economy, the semi-arid region has begun to reveal systemic weaknesses of its traditional production and consumption models.

Thus, as the traditional separation between the drought-prone areas (*Sertões secos*) and the better-watered *Zona da Mata* and *Agreste* have begun to disappear, a convergence of epidemiological trends becomes perceptible among the various climatic areas of the Northeast. As this trend progresses, malnutrition, anemia, and vitamin A deficiencies, on the one hand, and the growing pandemic of overweight/obesity and related morbidities on the other, have begun to manifest a scenario quite different from that portrayed by Josué de Castro, Orlando Parahym, José Nivaldo, and other observers of the nutritional status of Northeastern populations in the past.

A recent review of the literature produced over the past 15 years (BATISTA FILHO, 2005), i.e., since 1990, despite limitations and poor statistical representativeness of studies available, reveals certain aspects leading up to the more recent scenario. Thus, prevalences of biochemical vitamin A deficiency ranged from 16.1% to 55.1%; whereas anemia among different groups (< 6 years old and school-age children) ranged between 22.3% and 46.5%. With respect to protein energy malnutrition in children, the data is even more conflictive. Thus, when applying the inferences of a predictive model to each of the 867 municipalities of the semi-arid region referenced so far, it would appear that there is an average

height deficit of 31.3% (<-2 z scores in height/age) in children below 5 years of age. Another more recent study (UNICEF, 2005) of children below the age of 24 months, in 1,289 municipalities of the semi-arid region, portrayed a very different situation: the modal group for height deficit (4 to 10%) corresponded to 48.5% of the municipalities investigated, with 14.3% presenting a "good" condition (i.e., a height/age deficit below 4%).

At the end of the day, confronted with such disparate results, what is the most realistic expression of the anthropometric status of children in the region?

* * *

This question is crucial, not only for specialists on food and nutrition problems that monitor the economic and social status of dry areas of Brazil's Northeast and their health implications, but especially for policymakers and managers of human-development programs targeted at the semi-arid region.

Now, however, thanks to the study on child malnutrition in Brazil's semi-arid region: prevalence, social distribution, secular trends, and impact of income-transfer programs, undertaken by the Ministry of Social Development and the Fight Against Hunger, with cooperation from the Ministry of Health, the question has, to a great extent, been elucidated, through examination of an issue that has assumed paradigmatic dimensions, namely, protein energy malnutrition among children, as measured by anthropometry. Metaphorically speaking, it has become an "exchange indicator" of nutritional status, in view of its virtual "convertibility" for assessment of other health and nutritional problems afflicting children, and has come to symbolize an expression of the development status of society as a whole.

The 2005 Health and Nutrition Day, taking advantage of the fact that practically all children converge upon the health services on National Immunization Days, took the opportunity to assess the anthropometric status (height and weight) of 16,239 children below the age of 5 years in 277 municipalities in 9 Brazilian states, including semi-arid areas of Minas Gerais.

By incorporating such variables as "socioeconomic status of the family, mother's schooling level, participation in social programs, monitoring of the child's health, knowledge of symptoms of common childhood diseases, and

breastfeeding", among others, the survey produced a wealth of data which, after a preliminary analysis for this report, makes interesting revelations with respect to the current nutritional status of children in the region.

It should be stressed, initially, that the National Immunization Day strategy is an efficient method for massive employment of a public-health technology created in Brazil. Initially viewed with skepticism by writers of normative vaccination manuals, National Immunization Days are now acknowledged as a valid strategy, currently in use in various countries. The Health and Nutritional Day is another Brazilian innovation. It was first deployed for rapid assessment of the anthropometric status of children, and subsequently successfully employed to assess breastfeeding patterns in all of Brazil's state-capital cities and, finally, it was tested in the town of Ribeirão (Pernambuco) as a strategy for evaluating multiple aspects of health and nutrition (determining the nutritional status of children and mothers by measuring weight and height, determining hemoglobin levels, breast-feeding status, compliance with prenatal care, child growth and development surveillance, recent occurrence of diseases, and participation in food-support programs). This model was tested, under an initiative of the Ministry of Health's National Epidemiology Center (CENEPI) in 12 municipalities in different Brazilian states. Thus, the success of its large-scale deployment (in 277 municipalities in 9 states) represents validation of a strategy which could, evidently, be replicated in other countries, since it offers an enhancement of instruments available for the conduct of studies in the field of epidemiology, and for evaluation of services and activities in the health sector, and in other areas.

More than merely interesting, the Health and Nutrition Day has produced results that are instigating. It is surprising, for example, to find that the prevalence of malnutrition in children declined to 6.6% in the semi-arid areas, as measured by the height/age ratio, precisely the indicator that takes longest to reverse. When examined from a time perspective, despite certain inadequacies acknowledged by the authors of the report, it points toward a singular and surprisingly bright prospect: malnutrition rates have declined from 47.8% in 1974-75, to 6.6% in 2005. Moreover, this 30-year series indicates that the rate of decline has accelerated progressively, with annual declines of 3.1% between 1975 and 1989; of 4.9% between 1989 and 1996; and 7% between 1996 and 2005.

Evidently, it is not possible to guarantee that these results are strictly valid, however, the results of the prevalence survey match data from another study (UNICEF 2003/2004), which revealed an interval of prevalences of height deficit somewhere between 4% and 20%, and thus represents a reference for validation that merits due consideration.

This population must be considered as poor, since almost 75% of the families are classified as belonging to classes D and E, nonetheless, despite this overall characterization of structural poverty, striking progress can be perceived in relation to various aspects, such as prenatal care coverage (above 95%), access to electricity in the home (almost 95%) schooling levels of mothers (less than 4% are illiterate), access to treated drinking water (around 90%), alongside other items, such as longer periods of exclusive breastfeeding.

It is indeed probable that these surprisingly favorable developments in the nutritional status of children have, to a great extent, been conditioned by rising schooling levels, better primary healthcare, improved sanitation, a decline in low birthweights, and (perhaps) even more by rational management of household budgets, with a sharp reduction in the number of dependents per family as a consequence of plummeting fertility rates and, consequently, smaller numbers of children. Such factors are cited in the international literature, and advocated by United Nations Children's Fund (UNICEF) and the World Health Organization (WHO) as feasible strategies of fundamental importance for protecting child health and nutrition.

The data leads us to the observation that, having effected the appropriate statistical adjustments to account for effects directly attributable to these interventions, the child beneficiary of the *Bolsa Família* Program presents a 30% lower occurrence of low height/age ratios, i.e., the indicator selected as the epidemiological predictor of malnutrition in children. The most encouraging finding, however, is that this beneficial effect reflects, under logistical regression analysis, a 62.3% reduction in the occurrence of malnutrition among children from 06 to 11 months old, which is precisely the biological segment at greatest risk for growth retardation among Brazilian children. This is an exceptionally positive finding. Moreover, worldwide, few interventions in similar epidemiological contexts have produced such significant outcomes.

* * *

Considering limitations imposed by climatic and soil factors, harsh economic and social conditions, low expectations on the part of low-income populations, low schooling and, lastly, high child-malnutrition prevalence estimates foreseen by predictive models based upon an assortment of risk variables, the results of the 2005 Health and Nutrition Day are surprisingly upbeat.

This apparent paradox contains lessons that require deep reflection as to the dynamics and swiftness of the recent epidemiological decline in malnutrition rates and their implications for the transition underway throughout Brazil, encompassing the semi-arid region of Brazil's Northeast, including rural areas. All consolidated time-bound and geographic trends, referent both to Brazil and to Latin America as a whole, point to the semi-arid areas of Brazil's Northeast as being among the continent's most problematic areas, owing to the persistence of intractable adverse factors that, in the short term, would appear to be very hard to resolve.

If the predictive models failed to foresee the improvement, it is because of at least three highly significant items revealed in the new child-nutritional scenario: 1) the rapid rate of decline of prevalence in the 1996-2005 period (7% per year) that surpasses all results so far detected in the transitional process underway in Brazil; 2) the presumed 30% reduction, attributed to effects of the *Bolsa Família* Program, in the height deficit among children and, especially, the 68% impact in preventing malnutrition in the 6-month to 1-year age bracket, that have been another noteworthy contribution to the evaluation of nutritional interventions; 3) provided that these findings are indeed reliable and if the trends can be maintained, they would appear to support the thesis that, over the next 5 years, child malnutrition may be brought fully under control, and that rates similar to those reported in such other Latin-American countries as Cuba, Chile, and Jamaica will be achieved. This prospective outlook takes into account two conditioning elements: a) the fact that, in 3 years of execution, the effects of interventions among the under-5 year-old cohort have not yet realized their full potential impact; b) program coverage is extended over time to successive layers of beneficiaries, and that the period of exposure of participants is thus not the same for all age groups.

This bright outlook could also be extended to even more ambitious dimensions. There is evidence that cases of anemia in the semi-arid region might

be 30 or 40% lower than those encountered in coastal areas and in the *Zona da Mata*. For its part, vitamin A deficiency, prevalences of which are currently no less than 2 or even 3 times higher than those of height deficit among children, can be controlled by means of very simple and low-cost interventions. Why not make this goal a priority item on the nutrition agenda for dry areas of the Northeast?

Evidently, this optimistic and feasible short-term goal does not aim to replace the even more legitimate commitment to transformation of the prevailing scenario of structural poverty in the semi-arid areas. More than merely a question of evolutionary progress, such a goal would entail a revolutionary policy; an ethical and cultural agenda, grounded upon economic, environmental, social, and participative parameters that outline the fundamentals of human development. Much remains to be done in this respect in terms of governmental programs and within a doctrine of citizenship.

2.   Development of a Methodology for Health and Nutrition Day at the Regional Level

Regular assessments of the communities' nutritional condition, based on residential nutritional surveys, would be the ideal form of characterizing the nutritional profile of a given segment of the population and its evolution over time. However, because of the large volume of human and material resources required, these types of surveys are costly, which reduces their feasibility. One of the alternatives experimented in Brazil, on a municipal level, was the taking of health and nutrition surveys during national vaccination campaigns (MALTA *et al.*, 1998). During these campaigns, an important popular turnout takes place, and part of the necessary structure needed to collect this data is, to a certain extent, in place. Batista Filho and Ferreira (2001) validated the carrying out of epidemiological studies during vaccination campaigns. The authors concluded that the strategy is an efficient one, since financial costs, logistics and data collection time are optimized, if compared with other residential surveys. A wider study on breastfeeding was conducted in conjunction with a vaccination campaign in 1999, in all state capitals and in the Federal District (BRASIL, 2000).

The Health and Nutrition Day conducted with the vaccination campaign demonstrated the feasibility of monitoring the nutritional status of specific groups on a large scale, as well as the opportunity of providing initial and additional training to technical and auxiliary personnel responsible for municipal nutritional surveillance. Studies of this type are normally conducted by institutes and universities. Therefore, by associating data collection processes with large-scale campaigns, it is also possible to provide training and additional orientation to relevant municipal personnel, increasing their awareness and commitment regarding the importance of their work.

2.1 Sample Design

The study was designed as a cross-sectional survey including children below the age of 5 years who attended vaccination posts on August 20, 2005, when the 2nd stage of the National Immunization Campaign was carried out. The universe of this survey encompasses 1,133 municipalities of the semi-arid region (as delimited in 2005 by the Ministry of National Integration) located in 8 States of the Northeast region (not including Maranhão) and the north and northeastern portions of Minas Gerais. This area has an estimated population of 26 million, of which approximately 2.3 million are children below the age of 5 years.

The sample survey aimed to provide independent estimates for each of the States, by means of probabilistic sampling, considering each State as a separate domain (strata). The municipality was the primary unit for sampling and, with the aim of ensuring representativeness when drawing, the IBGE's homogeneous micro-regions in which such municipalities are located were also considered.

In each of the surveyed municipalities, two vaccination posts were selected as secondary sampling units. The aim of including these two posts per municipality was to ensure dispersion among them. Random selection of the vaccination posts was carried out so as to ensure that both rural and urban areas were represented.

At each of the posts, children were systematically selected from the line, and stratified into two age brackets: 0 to 11 months; and 12 to 59 months. A specific interval for the selection of children was calculated for each post, considering the

number of children vaccinated, stratified by age bracket, reported for the previous year's National Immunization Day (2004).

Thus, the selection process was broken down into three stages, proportional to the number of children vaccinated in each primary unit. In principle, in each of the 9 States, 30 municipalities should be selected by means of the following steps: (a) obtaining the list of all municipalities that comprise Brazil's semi-arid region (in accordance with boundaries established by the Ministry of National Integration); (b) random selection of 30 municipalities per State, considering IBGE's homogeneous micro-regions; the exceptions were the States of Sergipe and Alagoas, where all municipalities in the semi-arid area were included since there are only 29 in Sergipe and in Alagoas it was not adequate to select 30 of the 38 municipalities from a statistical standpoint; the process resulted in a total of 277; (c) the random selection of 2 vaccination posts per municipality, from among those that were to operate on the 2nd round of the National Immunization Day; (d) definition of the sample interval, by age group, considering the number of children vaccinated at each post during the 2004 National Immunization Day (systematic sampling).

In calculating sample sizes, prevalence of a weight-for-age deficit of 8.3% in the Northeast region was considered, in accordance with estimates from the latest National Demography and Health Survey, PNDS 1996 (BEMFAM, 1999). The sample size, calculated using Epi-Info 2002 software, was 2,284 children in each State, considering an expected prevalence of 8.3% (± 1.6%), a confidence limit of 95%, and a design effect of 2. This sample size, equivalent to 76 children in each municipality, gives a total of 21,052 children. Taking into account possible losses of samples, it was decided that roughly 80 children per selected municipality in the semi-arid region should be examined.

2.1.1 Expansion of the Sample

Each child in the Health and Nutrition Day (HND) sample represents a given number of children that were vaccinated on the 2nd National Immunization Day in each municipality. Thus, each child was awarded a sample weight or

expansion factor which, when linked to the characteristics investigated in the HND (e.g. children weighed and measured) enables calculation of estimates for the universe of the survey. The expansion factors of the sample were calculated by professional statisticians specialized in sampling techniques, based upon conglomerate sampling principles.

2.2 Data Gathering

2.2.1 Data Gathering Instruments

For gathering data, a questionnaire developed at a health post in Ceilândia (Federal District - DF) that had been tested in June 2005 during the 1st stage of the vaccination campaign, was used. This questionnaire, to be filled out by an interviewer based upon answers provided by the person responsible for the day-to-day well being of the child, contained questions relating to: schooling levels of the interviewee and of the head of household; access to basic goods and social benefits; the number of daily meals eaten by the family; monitoring of the child's growth and development; ability to identify symptoms of common childhood diseases (acute respiratory infection and diarrhea); breastfeeding practices; compliance with prenatal care; etc.

2.2.2 Data Gathering Logistics

At the policy level, the decision to conduct the HND was approved by all the governors of the states of the Northeast region, and by 1,100 mayors that signed the Pact for "A World Fit for Children and Adolescents in the Semi-arid Region" under a partnership with the United Nations Children's Fund (UNICEF). The proposal had been presented and debated in Thematic Chamber 2 on Nutrition and Health of the National Council on Food and Nutritional Security (Consea), and certain of the council members participated in preparatory meetings and in execution of the HND.

Official letters were dispatched from the Ministry of Social Development and the Fight Against Hunger, and from the Ministry of Health to municipal

authorities, informing them that the survey was to be conducted, and requesting technical and logistical support. At the state level, a coordination structure was assembled, comprising one professor from a Federal or State University, and a staff member of the State Secretariat of Health responsible for issues relating to food and nutrition. Among the responsibilities of the survey's State Coordination Units were: recruitment and selection of professionals or undergraduates of courses in the health area to perform the role of multiplying agents in the municipalities; capacity building for multiplying agents; establishing and maintaining contact with Municipal Secretariats of Health for recruitment of health professionals, technical and support staff to comprise the local teams responsible for data gathering; and awareness building for municipalities to ensure that they provide logistical support for multiplying agents and supervision for field work on the day of the HND. The preparations for the HND also led to the establishment of a hitherto unprecedented data gathering network.

2.2.3 Selection and Training of Interviewers

As has been described, training teams were set up, comprised of multiplying agents, health professionals or undergraduates in health-related courses, to provide capacity building for local data-gathering teams, made up of health professionals, technical and support staff of the municipalities.

The State Coordinators participated in strategic meetings, with the aim of standardizing training procedures, after which they proceeded with the work of training the professionals responsible for conducting activities in the municipalities. With a view to ensuring standardized training and, consequently, consistent data gathering procedures, the following manuals and handbooks were produced:

:: Training Manual – general guide for filling out questionnaires;

:: Training Manual – guide for anthropometric examinations;

:: Handbook for training local teams.

Training for multiplying agents took place in early July 2005, and field trips and training of local teams followed immediately thereafter, in July and August. The training schedule varied from one state to another, depending upon distances

and the number of municipalities involved. Training of municipal terms lasted 2 to 3 days, depending upon the performance of local team members during training, and was carried out by a pair of multiplying agents. Of the 277 municipalities that comprise the HND sample training was provided for approximately 2.600 health professionals and technical and support staff for local teams.

Two teams, each comprised of 5 local technical staff members, participated in the training, and the responsibilities of each team member were designated during the training, depending upon the aptitude of each individual (see the section on the structure of field work and supervision). Training content was divided into theory and practice. The training program encompassed presentation of the Project, a general introduction to HND, the importance of standardized data-gathering procedures, field logistics, standardized selection of children in the vaccination line, filling out of questionnaires, and practical advice on standard anthropometric practice.

When holding training in the municipalities, multiplying agents demonstrated the use of instruments employed in conducting anthropometric procedures. These included pediatric and anthropometric weighing scales from the local health services, and the infantometers and stadiometers to be used on the HND. All scales used were verified during training in the municipalities, using 5-kilo packets of rice that had been pre-checked on scales at the Universities, and in several cases municipal authorities were requested to replace faulty weighing scales.

The pair of multiplying agents, after providing training for local teams, submitted a "Local Team Training Report" for each municipality, containing information on: (a) training and designation of tasks among local team members; (b) identity of local team members; (c) description of training stages; (d) performance of the local team; (e) structural conditions at vaccination posts to be operated on the 2nd National Immunization Day; (f) condition of anthropometric equipment available at the vaccination posts. Upon conclusion of the training in each locality, this report was dispatched by e-mail to the State and National Coordination Units. These reports served as a reference for measures needed and substitution / procurement of equipment required to enable gathering of data on August 20.

2.2.4 Structure of Field Work and Supervision

Field work is based upon the municipality, and was entrusted to two teams, each comprising 5 members with distinct responsibilities. Local data-gathering teams were structured as follows:

:: 1 team supervisor, responsible for team supervision and support during data collection;

:: 1 interviewer, responsible for applying the questionnaire to the caregiver responsible for the child;

:: 1 line organizer, responsible for selecting children according to the predefined interval;

:: 2 anthropometrists, responsible for gathering anthropometric data on the child.

All members of the data-gathering team wore distinctive t-shirts as identification.

Gathering of data in the semi-arid region took place on August 20, 2005, on the occasion of the 2nd National Immunization Day, from 8 am. to 5 pm., the period when the vaccination posts were open to the public. The children were selected as they waited in line for vaccination, whereupon, with acquiescence of the person (caregiver) responsible, they were identified with a colored ribbon on their wrists, signifying that they were participants in the survey. After they had received vaccination, the interviewer filled out the questionnaire with responses provided by the caregiver, after which an anthropometric examination was conducted.

In the interests of quality control, all state and national coordinators participated in the monitoring of the field work, and multiplying agents engaged in supervision at the municipal level on the HND. Additionally, in some states the gathering of data at all or most vaccination posts was supervised by health professionals and/or specially trained nutrition students. On the days immediately prior to the survey and on the HND itself, the Ministry for Social Development and the Fight Against Hunger (MDS) set up a help desk with four telephone lines to field enquiries from the municipalities.

2.2.5 Anthropometric Evaluation

For measuring babies CARCI wooden infantometers with a measuring range of 10 - 99 cm and graduation of 5 mm, were used. For measuring the height of children SECA 206 Microtoise stadiometers, with frontal reading and a measuring range of 0 to 2 meters and graduation in millimeters, were used in almost all the states, except Ceará, Minas Gerais and Maranhão, where AlturaExata stadiometers, with a measuring range of 2.13 meters and graduation in millimeters were used. Especially for the HND, the Ministry of Health procured 560 infantometers and 560 stadiometers, which were subsequently transferred to the municipalities.

For weighing children, anthropometric weighing scales (with 150 kg capacity and intervals of 100g), and for weighing babies, pediatric scales (with 16 kg capacity and intervals of 10g) were used, both of which are available at the municipal health services. As mentioned earlier, to ensure their accuracy, all scales were checked during training in the municipalities, using 5 kg packets of rice that had been previously weighed on scales at the universities.

Anthropometric weight and height measurements were carried out by a pair of anthropometricists, one of whom was responsible exclusively for weight readings and the other for height readings. Each child was weighed and measured twice. No approximations were made, meaning that the measurements taken were written down to the nearest decimal place, i.e., to the nearest gram or millimeter.

2.3 Ethical Issues

The HND protocol was approved by the National School of Public Health and Oswaldo Cruz Foundation (ENSP/FIOCRUZ) Ethics Committee. Caregivers responsible for the children were informed in advance, in clear and simple language, of the objectives of the survey, of the way in which the data was to be gathered, on the confidentiality of the information, possible discomfort, their right to refuse to participate or withdraw consent during the process of gathering the data, publication of the results of the survey, and that the identities of the children and of their caregivers would be preserved. Data was gathered only after the persons responsible for the children had given their consent and signed a Term of Informed Consent and Clarification.

After conducting the anthropometric examination, the weight and height of the child was recorded, and the parents or caregiver informed of its nutritional status. Children diagnosed as having a nutritional deficit (Weight-for-Age < percentile 3) were provided with a term of referral, referring them to the nearest health service. Information on these children was also recorded on a more detailed social survey form, including references for locating their addresses. At the end of the survey, this information was delivered to the local Social-welfare Secretariat (or corresponding bodies) in each municipality.

2.4 Data Treatment and Analysis

2.4.1 Codifying and Digitalization of Data

The questionnaires were codified by 10 specially trained undergraduate nutrition students, and 30% of these questionnaires for each state were checked by a team of 5 nutritionists with vast experience in nutritional surveys and fieldwork. The questionnaires were then scanned (front and back) and stored in a digital format. A critique of data consistency was carried out by the Center for Epidemiological Research in Nutrition and Health of the University of São Paulo (NUPENS/USP).

2.4.2 Critiques of Data Consistency

The critique of data consistency began during the phase of codifying questionnaires, by means of rigorous supervision and verification of the plausibility of values attributed to each variable. This critique was thus carried out at the time of codification and after digitalization of the questionnaires, and by returning to scanned questionnaires, when necessary, to check for possible digitalization errors.

Once having set up the database, the NUPENS/USP research team responsible for analyzing the data took further measures to verify consistency of the data. Initially, the most relevant distributions of frequency of variables were observed, with the aim of detecting unusual values, the proportion of unreported values, and harmonization of variables that effectively describe the same

information (for example: "did the mother attend prenatal care?" *versus* "in which month did the mother initiate prenatal care?"). In cases in which the information was incomplete or inconsistent, the original form was consulted, either to confirm or alter the information.

The final phase of consistency analysis addressed the anthropometric data. Differences between the values reported for each of the two measurements taken were calculated. In the case of height, pairs of measurements with absolute differences of over 1 cm (172 cases) were considered imprecise. In the case of weight, pairs of measurements with absolute differences of over 0.2 kg (213 cases) were considered imprecise. The most acceptable value for a pair of imprecise measurements was determined by means of the following procedure. Modeling was carried out by polynomial and linear regression, and excluding the imprecise measurements, to verify average height and weight measurements against age. Then, from these average values, the averages of pairs of the measurements considered imprecise were subtracted, and the lower absolute value obtained from the subtraction was considered the best expression of the average of the pair. Finally, these cases were reintroduced into the database for subsequent analyses.

2.4.3 Data Processing and Analysis

To assess the nutritional status of children analyzed on the basis of their physical growth, anthropometric Height-for-Age, Weight-for-Age and Weight-for-Height calculations were effected. This calculation used a CDC/WHO-1978 reference population, which reproduces the distribution of measurements for height, weight, and Weight-for-Height ratios observed in populations taken from various anthropometric surveys carried out in the United States (HAMILL *et al.*, 1979). The anthropometric indices were expressed as standard deviations (z scores) of the reference population and submitted to "biological plausibility" criteria, in accordance with procedures recommended by the World Health Organization (WHO 1986, 1995). According to this criteria, children with standard-deviation values in relation to the reference population of -5 or greater than +3 z scores in the case of Height-for-Age; less than -5 or greater than +5 z scores in the case of Weight-for-Height, and less than -4 or greater than +5 in the case of Weight-for-Height, are considered "biologically implausible" and removed

from analyses involving child-nutrition status. When applied to the HND data, this criterion indicated biologically implausible Height-for-Age in 157 children (0.9%); Weight-for-Age in 65 children (0.4%); and Weight-for-Height in 124 children (0.7%). Among these there were cases of biologically implausibility for more than one of the criteria used.

To calculate nutritional indices in accordance with the CDC/WHO-1978 reference population, "Epi Info 2002" software was used.

Classification of the nutritional status of children analyzed was in accordance with international criteria recommended by the World Health Organization (WHO, 1986). Children with standard-deviation values two times lower than the median value for the reference population were considered as having a nutritional deficit on the item in question. Children with Weight-for-Height standard-deviation values two times higher than the median value of the reference population were considered as having excess Weight-for-Height. Finally, a variable known as "samplea" was generated, in which a value of 1 indicates children with complete and biologically plausible anthropometric data. In the sample of posts of the semi-arid region, 16,239 children out of 16,934 (95.9%) fulfilled all these requisites. This variable was incorporated into the database to enable reproduction of the analyses by other researchers.

All of these analyses took into account the sample outline (strata, conglomerates and expansion factors) used to obtain the data. To test the hypothesis of equality among the proportion of those inscribed and not inscribed, observing the various socio-demographic strata, a binomial, bi-caudal test was used with a significance level equal to 5%.

To compare the impact of income-transfer programs on the nutritional status of children of families benefited, a logistical analysis was conducted to equate Height-for-Age deficit and participation in income-distribution programs (*Bolsa Família*, *Bolsa Alimentação*, *Bolsa Escola* or *Cartão Alimentação*). Variables for control of this link were: quantity of household goods, number of years of schooling of the mother or person responsible, and number of years of schooling of the head of the household. Given that the measure of impact of participation in

income-distribution programs proved to vary significantly among the various age groups analyzed, the decision was taken to stratify the analysis into the following age brackets: 0 to 5, 6 to 11, 12 to 35, and 36 to 49 months.

The tests and other statistical procedures carried out are indicated or briefly described in footnotes to the tables presented. The calculations were carried out using a Stata statistical packet, version 9.

2.5 Municipalities Sampled

The municipalities sampled in the Health and Nutritional Day represented the semi-arid region in the following states:

Alagoas: Água Branca, Arapiraca, Batalha, Belo Monte, Cacimbinhas, Canapi, Carneiros, Coité do Nóia, Craibas, Delmiro Gouveia, Dois Riachos, Estrela de Alagoas, Girau do Ponciano, Igaci, Inhapi, Jacaré dos Homens, Jaramataia, Lagoa da Canoa, Major Isidoro, Maravilha, Mata Grande, Minador do Negrão, Monteiropólis, Olho D'água das Flores, Olho D'água do Casado, Olivença, Ouro Branco, Palestina, Palmeira dos Índios, Pão de Açúcar, Pariconha, Piranhas, Poço das Trincheiras, Quebrângulo, Santana do Ipanema, São José da Tapera, Senador Rui Palmeira, Traipu.

Bahia: Araci, Casa Nova, Cravolândia, Euclides da Cunha, Feira de Santana, Guanambi, Iguaí, Inhambupe, Iraquara, Itapetinga, Jacobina, Jequié, Juazeiro, Lençóis, Mairi, Morro do Chapéu, Mucuri, Nova Canaã, Novo Triunfo, Oliveira dos Brejinhos, Paulo Afonso, Pé de Serra, Piripá, Riacho de Santana, Santanópolis, Serra Dourada, Sobradinho, Souto Soares, Uauá, Vitória da Conquista, Xique-Xique.

Ceará: Acopiara, Assaré, Barbalha, Boa Viagem, Brejo Santo, Canindé, Cariús, Carnaubal, Caucaia, Cratéus, Crato, Frecheirinha, Graça, Guaraciaba do Norte, Horizonte, Icapuí, Iguatú, Ipueiras, Itapipoca, Jaguaruana, Juazeiro do Norte, Massapê, Mauriti, Morada Nova, Orós, Quixadá, Santa Quitéria, Sobral, Tamboril, Tauá.

Minas Gerais: Almenara, Araçuaí, Berilo, Berizal, Bonito de Minas, Caraí, Curral de Dentro, Divisópolis, Espinosa, Francisco Sá, Gameleiras, Grão Mogol, Ibiracatu, Itacarambi, Itaobim, Janaúba, Januária, Jequitinhonha, Mato Verde, Novo Cruzeiro, Padre Paraíso, Pedra Azul, Porteirinha, Rio Pardo de Minas, São João das Missões, São João do Paraíso, São João da Ponte, Taiobeiras, Verdelândia, Virgem da Lapa.

Paraíba: Água Branca, Bananeiras, Barra de Santa Rosa, Boqueirão, Cajazeiras, Campina Grande, Catingueira, Catolé do Rocha, Cubati, Dona Inês, Esperança, Itabaiana, Lagoa Seca, Monteiro, Nazarezinho, Patos, Pedra Branca, Piancó, Picuí, Pocinhos, Queimadas, Salgado de São Felix, Santa Cecília, São Bento, São Francisco, São José de Piranhas, Soledade, Sousa, Sumé, Teixeira.

Pernambuco: Afrânio, Alagoinha, Araripina, Arcoverde, Belém de São Francisco, Belo Jardim, Brejo da Madre de Deus, Calçado, Caruaru, Casinhas, Garanhuns, Goiana, Gravatá, Ipubi, Lagoa dos Gatos, Lajedo, Ouricuri, Passira, Petrolândia, Petrolina, Riacho das Almas, Santa Maria da Boa Vista, Santa Terezinha, São Bento do Una, São João, São Joaquim do Monte, São José do Belmonte, Serra Talhada, Sertânia, Surubim, Tabira.

Piauí: Bom Jesus, Canto do Buriti, Castelo do Piauí, Colônia do Gurguéia, Curimatá, Dom Inocêncio, Fartura do Piauí, Geminiano, Inhuma, Itainópolis, Itaueira, Marcolândia, Massapê do Piauí, Monsenhor Hipólito, Oeiras, Paes Landim, Palmeira do Piauí, Patos do Piauí, Pedro II, Picos, Piracuruca, Rio Grande do Piauí, Santa Cruz dos Milagres, São João da Serra, São João da Varjota, São João do Piauí, São Miguel do Tapuio, Simões, Vila Nova do Piauí, Wall Ferraz.

Rio Grande do Norte: Açu, Afonso Bezerra, Apodi, Barcelona, Caicó, Campo Redondo, Cerro Corá, Cruzeta, Currais Novos, Encanto, Grossos, Itajá, Jaçanã, João Câmara, José da Penha, Lajes, Macaíba, Monte Alegre, Mossoró, Olho D'água dos Borges, Pau dos Ferros, Pendências, Pureza, Serra Negra do Norte, Serrinha, Tangará, Touros, Triunfo Potiguar, Várzea, Venha-Ver.

Sergipe: Amparo de São Francisco, Aquidabã, Canhoba, Canindé de São Francisco, Carira, Cedro de São João, Cumbe, Feira Nova, Frei Paulo, Gararu, Gracho Cardoso, Itabi, Macambira, Monte Alegre de Sergipe, Nossa Sra. Aparecida, Nossa Sra. da Glória, Nossa Sra. das Dores, Nossa Sra. de Lourdes, Pedra Mole, Pinhão, Poço Redondo, Poço Verde, Porto da Folha, Propriá, Ribeirópolis, São Miguel do Aleixo, Simão Dias, Telha, Tobias Barreto.

3 Analysis of the 2005 Health and Nutritional Day Inquiry

This article seeks to underscore the initial results of analyses carried out on the wealth of data obtained from the 2005 Health and Nutritional Day (HND). This analysis has provided estimates of the prevalence of nutritional deficits among the child population of the semi-arid region of Brazil, and on the socioeconomic distribution of these deficits, aside from furnishing valuable insights into the secular trend of malnutrition in the region, and the impact of income-transfer programs on child nutrition. All the estimates presented took into account the complex design of the sampling of the survey, and used the necessary weighting factors to represent the universe of the children studied.

Indicators of adverse socioeconomic conditions were common in the sample of children studied in the semi-arid region. The great majority belong to classes D (41.6%) and E (33.1%), whereas only one in five of the children belong to class C, and one in 20 to classes A or B. Illiteracy and low schooling levels (1 to 4 years) were common among family members of these children: 12% and 29.8% respectively for heads of household, and 3.4% and 25.4%, for the mothers of the children. Mothers who declared their color/race as non-white accounted for 77.2% of the total. In 7.4% of cases, families reportedly ate less than three meals per day (Table 1).

Table 1: Distribution (%) according to socio-demographic variables by location of the household – children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005

Variables	Total	Location of the household	
		Urban	Rural
	(n= 16,239)	(n= 13,626)	(n= 2,613)
Sex:			
Boys	48.4	48.5	47.2
Girls	51.6	51.5	52.8
Age (years):			
0	19.8	19.0	26.4
1	22.0	21.9	22.6
2	21.4	22.2	15.5
3	18.6	18.8	16.9
4	18.2	18.1	18.6
Color/Race:			
White	22.8	23.5	17.0
Brown	70.9	70.2	76.7
Black	5.5	5.2	5.2
Asiatic	0.6	0.4	0.4
Indigenous	0.2	0.7	0.7
Sex of the head of the household:			
Male	74.2	74.0	76.0
Female	25.8	26.0	24.0
Schooling level of the head of household:			
No schooling	12.0	11.3	17.0
1 – 4 years	29.8	28.0	44.4
5 – 8 years	30.9	31.9	23.1
9 years and over	27.3	28.8	15.4
Mother's schooling level:			
No schooling	3.4	3.3	4.4
1 – 4 years	25.4	23.3	42.5
5 – 8 years	47.3	47.9	33.9
9 years and over	24.8	25.5	19.3

		Location of the household	
Variables	**Total**	**Urban**	**Rural**
	(n= 16,239)	**(n= 13,626)**	**(n= 2,613)**
Socioeconomic classification (ABIPEME):			
A	0.4	0.4	0
B	5.5	5.9	2.2
C	19.4	20.0	14.2
D	41.6	42.4	35.2
E	33.1	31.2	48.3
Electricity in the household:			
Yes	95.4	95.3	95.8
No	4.6	4.7	4.2
Connected to public water supply:			
Yes	76.3	79.5	50.9
No	23.7	20.5	49.1
Access to treated drinking water:			
Yes	90.4	91.7	79.9
No	9.6	9.3	19.1
Number of family meals per day:			
1	0.5	0.6	0.1
2	6.9	5.8	15.5
3	41.2	40.8	44.8
4	51.3	52.8	39.6

Source: HND Field Survey – MDS/MS, 2005

Satisfactory levels of access to electricity supply (95.4%) were reported for the sample studied; but the proportion of households connected to public water mains (76.3%) remains undesired. Satisfactory levels of coverage were also reported for prenatal care, achieving 97.2% of mothers; moreover 80.5% reported that they had attended five or more prenatal care visits, and 82% that they had initiated prenatal care in the first trimester of pregnancy. Also fairly satisfactory was the proportion of children whose birth had been registered (96%); that had a Children's Health Card (99.7%); and whose weight had been monitored and recorded on the card in the previous three months (64.5%) (Table 2).

Table 2: Coverage indicators of public services, healthcare and social programs, by location of the household. Children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005

Indicators	Total (n=16,239)	Location of the household	
		Urban (n=13,626)	Rural (n=2,613)
% with:			
Birth registry (reported)	96.0	96.4	93.2
Children's Card (reported)	99.7	99.7	99.9
Children's Card (in hand)	98.1	98.0	99.1
Weight recorded on the card in the past 3 months	64.5	63.1	75.9
% of mothers who:			
Received prenatal care	97.2	97.3	96.7
Attended 5 or more prenatal care sessions	80.5	80.5	81.1
Initiated prenatal care in the first trimester	82.0	83.7	77.8
% whose family receives social benefits:			
Bolsa Família*	35.2	33.6	48.3
PETI	1.8	1.8	1.7
Gas Voucher	15.9	14.8	24.4
BPC	1.7	1.6	2.6
The Cisterns Project	0.6	0.5	1.5
Other programs	3.2	3.3	2.8
At least one of the above	44.5	42.6	60.0

*Also includes *Bolsa Escola, Bolsa Alimentação* and *Cartão Alimentação.*

Source: HND Field Survey – MDS/MS, 2005.

The prevalence of chronic forms of malnutrition, identified by measuring the stunting (low height for age) was 6.6%. The weight-for-height deficit, which identifies certain acute forms of malnutrition, was rarely found among the children studied (2.8%), which is only a little higher than the "normal" accepted limit of 2.3% for this indicator. Marked differences between social strata were evidenced in relation to prevalence of height-for-age deficit, but not with regard to prevalence of weight-for-height deficit, thereby confirming the epidemiological non-relevance of acute forms of malnutrition in this study, which had already been noted in other previous studies. The prevalence of chronic forms of malnutrition

(height-for-age deficit) varied intensely in relation to socioeconomic indicators, reaching, for example, 10.1% of children in class E; 6.9% in class D; and only 3.3% in classes A to C. Children of illiterate mothers accounted for 14.8% of stunted children; whereas among children whose mothers had received between 1 to 4 years of schooling the figure was 8.4%; of those with 5 to 8 years of schooling, 6.8%; and of those whose mothers had received and 9 or more years of schooling, the prevalence dropped to 3.3% (Table 3).

Table 3: Prevalence (%) of anthropometric deficits according to socio-demographic variables - children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005

Variable	Height-for-Age deficit (n=1,105)	Weight-for-Age deficit (n=650)	Weight-for-Height deficit (n=271)
Total	6.6	5.6	2.8
Sex:			
Boys	6.1	4.6	3.1
Girls	7.1	6.6	2.6
Age (years old):			
0	4.7	2.2	1.8
1	11.0	7.4	3.4
2	5.1	5.4	2.2
3	5.9	7.5	4.6
4	5.9	5.5	2.3
Location of the household:			
Urban	6.5	5.8	2.9
Rural	7.2	4.2	2.3
Color/Race:			
White	4.4	3.2	3.0
Brown	7.6	6.8	3.0
Black	4.6	1.3	0.3
Other	3.5	2.9	1.0
Sex of the head of the household:			
Male	5.4	4.8	2.5
Female	9.8	8.1	3.8

	Height-for-Age deficit	Weight-for-Age deficit	Weight-for-Height deficit
Variable	**(n=1,105)**	**(n=650)**	**(n=271)**
Schooling level of the head of the household:			
No schooling	10.9	8.7	5.5
1 – 4 years	8.5	5.0	0.9
5 – 8 years	6.5	6.1	2.5
9 years and over	2.8	4.4	4.2
Mother's schooling level:			
No schooling	14.8	10.5	8.6
1 – 4 years	8.4	7.3	1.6
5 – 8 years	6.8	6.2	3.3
9 years and over	3.3	2.1	2.5
Socioeconomic classification (ABIPEME):			
A or B	0.9	0.7	4.1
C	2.4	6.4	4.5
D	6.9	5.4	2.4
E	10.1	6.3	2.7
Number of family meals per day:			
Less than 3	16.2	15.7	2.8
3 or more	5.8	4.9	2.8

Source: HND Field Survey – MDS/MS, 2005

Estimating the secular trend of child malnutrition in Brazil's semi-arid region is not a simple task, since no earlier specific and comprehensive surveys have focused upon the region. A crude means of assessing changes in malnutrition in the semi-arid region would be to compare the estimates of the 2005 HND survey with those for the entire macro-region of the Northeast, where the vast majority of municipalities of the semi-arid region are located (Table 4).

Survey and year	Region	Height-for-Age deficit	Weight-for-Age deficit	Weight-for-Height deficit
ENDEF 1975	Northeast	47.8	27.0	NA
PNSN 1989	Northeast	27.3	12.8	2.4
PNDS 1996	Northeast	17.9	8.3	2.8
Health and Nutrition Day 2005	Semi-arid	6.6	5.6	2.8
				NA = not available.

* For estimates relating to the ENDEF, PNSN and PNDS, see Monteiro CA (org). *Velhos e novos males da saúde no Brasil: a evolução do país e de suas doenças. 2ª ed. Aumentada*. São Paulo: Hucitec/NUPENS-USP, 2000.

Source: HND – MDS/MS, 2005

Such estimates are to be found in three national household surveys designed to represent all of Brazil's macro-regions, held in 1974-1975, 1989, and 1996. Declining prevalence of height-for-age deficits among the under-5 year old population were estimated based upon these three surveys: 47.8% in 1974-1975; 27.3% in 1989; and 17.9% in 1996. These figures points to a 3.1% per-year decline between 1975 and 1989, and to a 4.9% per-year decline between 1989 and 1996. If we take the stunted children prevalence of 17.9% reported in 1996 throughout the Northeast region, and the prevalence of 6.6% reported in 2005 in the semi-arid region under the HND, we can estimate a decline over the period of 7% per year, which represents a considerable acceleration in the rate of decline of malnutrition in relation to the immediately preceding period. However, as was indicated earlier, this is a crude comparison, and only by repeating surveys focused specifically on the semi-arid region will it be possible to monitor malnutrition trends in this specific region of Brazil. On the other hand, a new household survey on under-5 year old child health and nutrition, scheduled to be carried out in Brazil in 2006, will enable a more precise assessment of the recent trends in malnutrition in Brazil and in Brazilian macro-regions.

The final aspect discussed in this article is the impact of income-transfer programs on child malnutrition. Initially, it should be remarked that 35.2% of the families of children studied were inscribed in the *Bolsa Família* Program (which also includes those inscribed in the older *Bolsa Escola*, *Bolsa Alimentação* and *Cartão Alimentação* Programs). As expected, coverage of the *Bolsa Família* Program is concentrated among the lower socioeconomic strata of the population, and thus the socioeconomic profile of children inscribed in the program tends to be less favorable than the profile of those not inscribed (Table 5).

Table 5: Distribution (%) according to socio-demographic variables for families inscribed in the *Bolsa Família* Program - children below the age of 5 years in municipalities of the semi-arid region of Brazil, 2005

Variables	Not inscribed in *Bolsa Família* (n= 7,963)	Inscribed in *Bolsa Família* (n= 6,220)*
Total		
Sex:		
Boys	49.6	46.7
Girls	50.4	53.3
Age (years):		
0	21.8	16.2
1	23.9	18.2
2	19.9	23.5
3	18.2	20.1
4	16.1	22.0
Color/Race:		
White	25.7	17.7
Brown	67.3	76.7
Black	6.3	4.8
Asiatic	0.6	0.6
Indigenous	0.2	0.2
Sex of the head of the household:		
Male	25.7	26.3
Female	74.3	73.6

Variables	Not inscribed in Bolsa Família (n= 7,963)	Inscribed in Bolsa Família (n= 6,220)*
Schooling level of the head of the household:		
No schooling	9.3	17.0
1 – 4 years	25.1	38.3
5 – 8 years	31.0	31.3
9 years and over	34.7	13.4
Mother's schooling level:		
No schooling	2.6	4.9
1 – 4 years	19.0	37.4
5 – 8 years	47.2	44.9
9 years and over	31.2	12.8
Socioeconomic classification (ABIPEME)		
A – C	33.7	10.0
D	40.4	43.6
E	25.9	46.4
Electricity in the household		
Yes	95.8	94.6
No	4.2	5.4
Connected to public water supply:		
Yes	76.8	76.1
No	23.2	23.9
Access to treated drinking water:		
Yes	91.5	88.2
No	8.5	11.8
Number of family meals per day :		
1	0.07	0.03
2	5.3	9.5
3	38.4	44.9
4	55.6	44.3

*Also includes *Bolsa Escola, Bolsa Alimentação* and *Cartão Alimentação*.

Source: HND Field Survey – MDS/MS, 2005

In view of this, it would be inappropriate to make a direct comparison of the prevalence of malnutrition among those inscribed and those not inscribed in the Program. To skirt this problem, adjusted estimates of the prevalence of

height-for-age deficits were calculated for those inscribed and those not inscribed in the expanded *Bolsa Família* Program (Table 6).

Table 6: Adjusted prevalence* (%) of anthropometric deficits by age bracket, inscribed in the *Bolsa Família / Alimentação / Escola* and *Cartão Alimentação* programs - children below the age of 5 years in the semi-arid region of Brazil, 2005

Deficit/ age bracket	Not inscribed (a)	Inscribed (b)	Percentage change attributable to the program (a-b/a*100)	p – value for adjusted comparison between inscribed and not inscribed*
Height-for-Age:				
Total	6.8	4.8	29.4	0.280
0 – 5 months	2.5	2.4	4.0	0.964
6 – 11 months	5.3	2.0	62.3	0.036
12 – 35 months	8.5	6.1	28.2	0.451
36 – 59 months	6.2	4.6	25.8	0.468
Weight-for-Age:				
Total	4.4	4.0	9.1	0.751
0 – 5 months	1.1	0.3	72.7	0.067
6 – 11 months	1.8	1.4	22.2	0.749
12 – 35 months	6.5	5.6	13.8	0.719
36 – 59 months	2.1	2.6	-23.8	0.580
Weight-for-Height:				
Total	3.1	1.3	58.1	0.023
0 – 5 months	1.2	0.2	83.3	0.043
6 – 11 months	2.4	0.6	75.0	0.108
12 – 35 months	2.3	1.5	34.8	0.265
36 – 59 months	1.3	0.5	61.5	0.083

*Adjusted for distribution of socioeconomic variables (number of goods in the household and years of schooling of the head of household and of the mother of the child) observing those inscribed and those not inscribed in the *Bolsa Família* program.

Source: HND Field Survey – MDS/MS, 2005

These estimates were obtained on the basis of multiple logistical regression models which essentially "equalize" the distribution of socioeconomic variables among those inscribed and those not inscribed in the distribution observed among

the population as a whole (those inscribed plus those not inscribed). In this way, differences in adjusted prevalences among those inscribed and those not inscribed can be attributed to whether or not they are inscribed in the program, rather than to socioeconomic differences between the two groups of children.

For children below the age of 5 years as a whole, the adjusted prevalences indicate that participation in the program determines a reduction of almost 30% in the frequency of stunting (from 6.8% without the program, to 4.8% with the program). For children between 0 and 5 months of age, the adjusted prevalences indicated a virtual absence of the problem, both for children inscribed and for those not inscribed (2.4% and 2.5%, respectively), which proves consistent with lower vulnerability of this age group to malnutrition, among other reasons, probably related to the benefits of breastfeeding. The greatest benefit of the program would appear to be for children between the ages of 6 and 11 months, for whom the reduced prevalence of stunting attributable to the program was 62.3% (from 5.3% to 2%). More modest benefits were observed for older children: a 28.2% reduction of malnutrition among children between the ages of 12 and 35 months (from 8.5% to 6.1%) and a 25.8% reduction for children between the ages of 36 and 59 months (from 6.2% to 4.6%). This less intense benefit of the program for older children may stem from the fact that at least a portion of them may not have enjoyed the benefit when it was feasible to reverse the retarding of growth, which supposedly means in the first two years of life. Regrettably, lack of knowledge of the time span since the family's enrollment in the program makes it impossible to arrive at a definitive assessment of this issue.

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Food Insecurity in Brazil: from the Development of a Measurement Tool to the First Nationwide Results

Food Insecurity in Brazil: from the Development of a Measurement Tool to the First Nationwide Results

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1   Introduction

This paper is intended to describe food insecurity measurement tools from a comparative perspective, emphasizing the Brazilian Scale of Food Insecurity (EBIA). This instrument was embedded by the Brazilian Institute of Geography and Statistics (IBGE) into the supplementary questionnaire for the National Household Sampling Survey (PNAD), 2004. The tools were derived from the concepts of hunger and food security and insecurity, developed from a socioeconomic perspective. The aims were to measure directly and indirectly the factors that interfere in the situations related to the guarantee of access to food consumption, as well as to assess adequacy to the context of a population survey, in addition to the surveying conditions in Brazil. The first national data on food security and food insecurity in Brazil, in its various degrees, obtained by the above mentioned National Survey, were presented and reviewed.

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2 Fundamental Concepts

The recognition that living under food secure conditions is a basic human right was expressed in the resolution of the II National Conference on Nutritional and Food Security, promoted by the National Council of Nutritional and Food Security (Consea), in 2004, held in Olinda (Pernambuco). The resolution defines food security as

> "the accomplishment of the right of all individuals to regularly and permanently have access to food that is sufficient and of good quality, without precluding their access to other essential needs, based on nourishing practices that promote health, respect cultural diversity, and are sustainable from the social, economic and environmental perspectives." (BRAZIL, 2006, p. 4).

This definition brings together multiple dimensions to the understanding of the concept of food security (FS) and, as a result, to the meaning of its most intense form of denial, which is hunger, as well as the intermediate situations that might be judged as being situations of food insecurity (FI). Over the first half of last century, Josué de Castro (CASTRO, 1980) denounced hunger as a socially-produced phenomenon, when he stated that: "hunger is a man-made scourge". Maria do Carmo S. de Freitas (2003), on her book "Agonia da Fome" (Agony of Hunger)[3], also shifted her view of this problem from its strict biological context, such as found in the health-care literature. The author expanded her concept, viewing chronic and collective hunger in Brazil, like Josué de Castro, as a historical outcome resulting from the country's social inequities. The focus on these inequities shows the historical dimension of a problem that is still present. Freitas stated that hunger is among those who, from their very early ages, are sentenced to the uncertainty of survival.

The remarks of participants of focus groups in Campinas, during a study to validate a food insecurity measurement tool, added insecurity and hunger to the same context (SAMPAIO *et al.*, 2006):

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3   See other contributions from the author at www.josuedecastro.org.br.

"I am not sure whether I'll have money to buy food at the end of the month";

"I think any citizen should have enough for his support; I have some friends who say: 'I work full time, throughout the week, and there is nothing left so I can eat' ";

"The worst is for those who have no work, no home, no spouse, and their children are in the streets, begging, because their parents have no money";

"Hunger hurts, pans turned down, empty refrigerators, no single egg to feed the stomach";

"I think hunger is the most depressing thing...";

"It is the worst of all kinds of violence";

"I have had it, and know how sad it is".

In the late 80's, Radimer *et al.* (1992) presented references to the concept of hunger, that encompasses from the physiological understanding of the problem – "when you can't sleep because your stomach hurts" – to psychological and social dimensions such as: the families' lack of choice, that leads to the definition that

"starving is whenever you have to eat the same thing for weeks in a row, and be sure that soon or late you will be out of food"; the breakdown of the socially accepted and usual patterns of having at least three meals a day, and still, food acquisition is unacceptable or unsustainable.

In spite of these arguments, it is important to underline that individuals and families are not always passive before such a condition of suffering and need. Some studies have shown that hunger and food insecurity are manageable situations (RADIMER *et al.*, 1992; MAXWELL, 1995); individuals and families develop more or less efficient strategies to cope with the conditions that restrict their access to food. In addition, this situation has not always led to malnutrition, as poor adult populations, for instance, may develop overweight as an impact of that coping (DREWNOWSKI, 2004).

In general, individuals manage the scanty resources available for their nourishment in such a way that they eventually compromise the quality of their

diet, adopting a food pattern that is monotonous and densely energetic. Maybe this is the most plausible explanation for the high incidence of overweight in the Brazilian low income population, as per the 2003 Family Budget Survey (POF) according to the Brazilian Institute of Geography and Statistics (IBGE, 2005).

In a literature review, in order to discuss the direct indicators of hunger and food insecurity measurement, Maxwell (1995) described a range of strategies used to cope with food insufficiency. They are: temporary change in the diet patterns, reduction of food consumption, change in the household structure, change in intra-family food distribution, food-buying indebting, and others. He concludes, citing Frankemberger and Coyle, who state that the poor populations ponder between the needs for food, and other equally basic needs for their survival, which leads to hunger, when the latter two are deemed a priority.

The issues presented here have shown that measuring food security and food insecurity, in their multidimensionality, requires using various indicators, and this is also a challenge for experts of several areas of knowledge, such as economy, health and nutrition, social sciences, agronomy, and others.

3   Food Insecurity Indicators

Assuring food security for a whole population or group presumes the availability of produced and imported food, its affordability according to the mechanisms of distribution, individuals' income and living conditions, and to the biological nourishment utilization that is determined by their healthy or unhealthy condition. The measurement of food insecurity, or the measurement of the distance from it, including the complexity involved in the problem, requires the use of indicators of different nature and reach. Some might represent indirect estimates of the conditions associated to this phenomenon; others might represent its direct measurement, in accordance with the perception of these conditions by the individuals or their families. These indicators are summarized below (PÉREZ-ESCAMILLA, 2005):

3.1 *Per Capita* Caloric Availability Indicator

This indicator is calculated from the balance between the net amounts of produced and exported food[4] and waste estimates. The resulting value is transformed into caloric equivalents and divided by the number of inhabitants. These caloric equivalents are assessed and collated with the minimal caloric requirements of an individual, weighed by gender and age, according to the patterns of each country. It is an indicator that consists of a number of elements, which impairs its use to identify the population at risk of food insecurity at both local and state level.

However, it is a good indicator to compare the status of food security between countries, and to be used for a historical review on the availability of food in the same country. According to data provided by the Food and Agricultural Organization (FAO) (FAO/UN, 2002), based on this indicator, the average *per capita* availability of calories/day for the Brazilian population is 3,146 Kcal.

3.2 Family Food Expenditure Indicator

This indicator provides estimates of the *per capita* food consumption based on the family availability of food, which is measured based on their food-buying expenses. In general, these expenses refer to recalled periods of one month or weeks before data collection. It is an indirect indicator because it estimates the availability, and not what is actually consumed by the individuals.

Brazil holds information of four population surveys on the average *per capita* availability of food: the first one was carried out in the 70's, and the others every ten years. Data of these studies show a positive evolution of this indicator for Brazil and its regions. The most recent 2002/2003 POF showed a caloric *per capita* availability of 1,800 Kcal, and the urban areas of the northeast region presented the lowest availability: 1,640 Kcal. The rural areas of the southern region presented the highest availability: 2,930 Kcal (IBGE, 2005).

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4   Net export – the difference between the total exported and the total imported of certain product.

3.3 Income Indicator

In general, this indicator uses the poverty or extreme-poverty lines to indirectly estimate the number of individuals at the status of food shortage or hunger (LAVINAS *et al.*, 2000). This indicator has been used in Brazil to establish the criterion that defines potential beneficiaries of the social policies geared to this problem. According to the 2004 National Household Sampling Survey (PNAD) data, approximately 22 million individuals live in households with an average monthly *per capita* income lower than ¼ of the minimum wage (IBGE, 2006). These are obviously poverty-stricken families without enough income to provide for their basic food needs.

3.4 Anthropometric Indicators

These indicators are derived from weight, circumference, height, and body composition data, in addition to others, which allow estimating the number of individuals who are at the status of malnutrition or at nutritional risk. These are also deemed indirect Food Insecurity (FI) indicators, as not all cases of malnutrition are linked to difficulties of access to food. It is also recognizing that in poor populations, which are in a certain way able to cope with their needs, FI could be related to overweight and obesity (MAXWELL, 1995). POF-2002/2003 data also revealed that among individuals with an average monthly family *per capita* income lower than ¼ of the minimum salary, therefore living in a poverty-stricken situation and FI risk condition, 8.5% had weight *deficit*, 32.1% had overweight, and 8.8% were obese (IBGE, 2005). These findings reinforce the limitation of the use of anthropometric indicators to estimate FI and hunger.

3.5 Individual Food Consumption Indicator

This indicator consists of an individual daily registration of the food consumed, or their weighing. The data are collected by means of recall surveys. Of the commonest indicators, this is the one that roughly measures the condition of food security or insecurity. However, because of the significant variability in the dietary habits over the days, using this indicator requires more than one measurement per individual, and this aspect restricts its use for population-wide studies, due to cost reasons (PÉREZ-ESCAMILLA, 2005).

National data on the food consumption pattern of the Brazilian population were produced in 1974. This time lag points at the need for new studies, especially in situations of nutritional transition due to the increase in the magnitude of chronic-degenerative diseases, which are strongly linked to the quality of the diet.

3.6 FS/FI Perception Indicator

This indicator consists of the direct measurement of the family condition of food security or insecurity. This measurement is obtained by applying a (standardized and validated) questionnaire to be responded by a member of the family who knows about their access to food. The use of this indicator in several countries has unveiled a valuable resource to identify population groups at higher risk of food insecurity at their different degrees of severity. It is also good to monitor the fulfillment of programmatic goals, and the effectiveness of the relevant interventions on the population (PÉREZ-ESCAMILLA, 2005). This indicator of direct measurement of food insecurity/hunger was established in the 1980's, starting from the important contribution of a qualitative and quantitative research developed at Cornell University (RADIMER *et al.,* 1992). The qualitative study allowed the establishment of a quantitative measurement scale including ten questions covering issues related to their concerns with future food insufficiency, the usual quality of the diet, and the amount of available food in the household.

In the 1990's, starting with the Cornell scale and others, such as the scale of the Community Childhood Hunger Identification Project (WEHLER *et al.*, 1992), scholars, brought together by the United States Department of Agriculture (USDA), developed an 18-item scale that was first applied, from 1995, in the monthly telephone survey (Current Population Survey) of the census *bureau* of that country, and also in periodic National Health and Nutrition Surveys (NHANES). The questions of the scale reflected a theoretical expectation that the food insecurity process is produced by some socioeconomic instability (already mentioned). First, such instability produces concern on the lack of food in the near future. The process worsens with the impairment of the diet quality and, if the problem that has put the family in this situation is not solved, a quantitative reduction of food follows, first for the adults and then for the children. The quantitative reduction may be mild in the beginning, but it may worsen and lead to hunger, which is identified, in this scale, among others, by the fact that an adult or child may spend the whole day without eating for not having the money to buy food. This condition can support the adoption of instruments that allow classifying household food insecurity in four categories: Food Security (FS), Mild Food Insecurity (Mild FI), Moderate Food Insecurity (Moderate FI), and Severe Food Insecurity (Severe FI) (BICKEL *et al.,* 2000).

Adaptations to these scales have been used in several countries, aiming to estimate food insecurity prevalence. This information is obtained from a qualified family member for this, usually a woman responsible for the preparation or acquisition of the food (PÉREZ-ESCAMILLA *et al.*, 2004; RADIMER, 2002; GUILLIFORD *et al.*, 2004; MELGAR-QUINONEZ *et al.*, 2005).

In the validation process of the Brazilian Scale of Food Insecurity (EBIA) (SEGALL- CORRÊA *et al.*, 2006; PÉREZ-ESCAMILLA *et al.*, 2004), carried out between 2003 and 2004, qualitative research resources were used. First, experts were invited to discuss the relevance of the use of a measurement scale originating in a context other than the Brazilian, and the feasibility of complying its structure and content with the Brazilian reality. Then, 11 focus groups were organized with residents of poor areas of urban and rural poor communities of the country, aiming at discussing the aforementioned content and structure, as well as the concepts related to food security and insecurity, healthy food, and the situation of shortage of family resources for food.

In each region, and in the same places, the scale originating in the qualitative stage of the study was pre-tested, and then applied in seven surveys carried out ith intentional samples of the focused population. Besides the items of the scale, family income data based on the minimum salary, level of education of the family head and consumption of food of the interviewed person, were collected, therefore setting up the indicators for the external validation of the scale. The number of positive responses produced a score for the classification of families in the following situations: food security, mild, moderate, or severe food insecurity (BICKEL *et al.*, 2000).

Results of two surveys with representative samples of the urban population – one of them carried out in Campinas, sampling 847 households (PANIGASSI, 2005), and another one in Brasília, during a National Immunization Day, sampling 1,680 families with children below six years of age (LEÃO, 2005) – revealed a high prevalence rate of food insecurity in these cities. Severe food insecurity was identified in 6.6% and 7.1% of the families in Campinas and Brasília, respectively. The results also showed an inverse relation between food insecurity and family income: the highest food insecurity prevalence rate corresponded to the lowest incomes. In Campinas, 26% of the families with per capita income below one minimum salary presented severe food insecurity. There and in Brasília, food insecurity concentrates in families also characterized by other conditions that denounce social exclusion, such as: race/color, high intra-household demographic density, and other precarious living conditions.

After these surveys, the validation phase of the EBIA in Brazil was completed and an easy to use, low-cost and highly reliable instrument was made available for research purposes. This scale, along with other indicators, is a robust resource for studying the determinants and the consequences of the Brazilian population's food insecurity.

The perception of food security or food insecurity has, in its own nature, subjective components determined by the conditions of living, dietary and cultural habits of the populations (PÉREZ-ESCAMILLA, 2005). However, the validation process in Brazil mitigated these aspects when making available a single instrument to be used for the urban and rural populations. Over the last

two years, various surveys have approached food security and food insecurity in segments of the Brazilian population, using the EBIA as an instrument to measure those conditions.

The IBGE, under contract by the Ministry of Social Development and the Fight Against Hunger embedded the EBIA in the questionnaire of the 2004 PNAD supplement, the results of which were published in 2006. This survey presented, for the first time, nationwide information on food insecurity, showing the prevalence of severity gradients, in addition to population factors and characteristics that explain the inequities found (IBGE, 2006).

4   First National Data: PNAD-2004

Before describing the status of food security and food insecurity in Brazil, as per the PNAD-2004, some thoughts are necessary for a better understanding of the problem and for interpreting the results, in addition to the intermediate aspects involved.

One of them is related to the concepts and methods that define the different conditions of access to food, as mentioned in the PNAD. Food security represents a situation for which there were no reports of problems that could restrict access to food in qualitative and quantitative terms, nor references to the concern that food might lack. Mild food insecurity was associated to a concern with the lack of food in a near future, and it was seen that families developed strategies or designed household arrangements so that the available food could last more. It was also seen that the worsening of the quality of the diet starts with the concern about the duration of the available food. In moderate food insecurity, there were reports of a clear impairment to the quality of the family diet. Conditions were reported on the reduction of the amount of food, especially in the diet of the adults. Finally, severe food insecurity related to the restriction of the amount of food, at such an order of magnitude, led to the conclusion that families, adults, and children lived along with hunger.

For the classification of the households at the referred levels, a sum was made of the affirmative responses for each one of the items, and this allowed

the establishment of scores for households with individuals below 18 years of age with a maximum score of 15 points for possible positive responses, and for families without individuals below 18 years of age, a maximum score of 9 points (IBGE, 2006). Chart 1 shows the mentioned scores.

Chart 1: Household classification scoring system

Classification for households with individuals under 18 years of age	Classification for households with individuals 18 years of age or older
Food Security: 0	Food Security: 0
Mild Food Insecurity: 1 to 5 points	Mild Food Insecurity: 1 to 3 points
Moderate Food Insecurity: 6 to 10 points	Moderate Food Insecurity: 4 to 6 points
Severe Food Insecurity: 11 to 15 points	Severe Food Insecurity: 7 to 9 points

The structure of the scale (with conceptually grouped questions) and its aforementioned form of classification allowed estimating the appropriate and scientifically tested prevalence of food security in households. Its internal validity was verified by means of Chronbach's Alpha Test with satisfactory results, and values that ranged from 0.92 to 0.94. The test was performed with Brazil's general data and also with the data of each State of the federation, resulting in satisfactory figures, thus attesting no impairments during field work that could compromise the comparison between this data.

The second consideration regards the fact that results about food security and food insecurity, disclosed by this PNAD, were related to year 2004, and more specifically to the information concerning the three months prior to the date of the interviews, that took place in September and December. So, considering the mentioned prior three-month period of the collection phase, the data comprises the period from July to December of that year. This means that the condition of food security/insecurity registered in the PNAD (and reviewed herewith), could theoretically present changes today, as a result of the time elapsed.

The third important consideration is the confirmation that the results on food insecurity observed among the dwellers of Brazilian households are not

sufficient to assess the impact of hunger mitigation policies in the country. This happens especially because the PNAD represents a cross sectional population survey and, still, for not having until then, previous data that enabled a comparison with the new findings.

The PNAD-2004 results showed that out of approximately 40% of the Brazilian population living in households and having some degree of food restriction, 18% had mild FI, 14.1% had moderate FI, and another 7.7% had severe FI. The latter percentage corresponds to approximately 14 million Brazilians, and 6.5% of the households of the country.

The regional differences of household access to food, ensured by the families' own resources, were broad and confirmed the inequities shown by other quality of life indicators. While, in theSouth, severe FI affected 3.5% of the households, this percentage, in the Northeast, was 12.4%; that is, 3.5 times higher. This regional disparity continues even considering the distribution of severe FI in each range of *per capita* family income (Figure 1).

Figure 1: Severe FI in households according to their *per capita* monthly income, and major regions
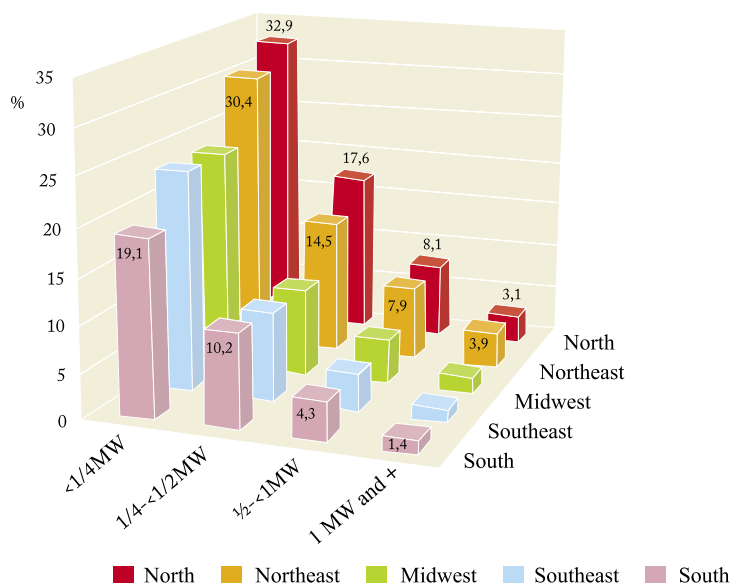
Source: Brasil, 2004.

The *per capita* monthly income – maybe the most relevant social inequity marker – in the Northeast was only 53.1% of the average income of the Southeast Region (IBGE, 2006). In the northeast region, the state of Maranhão presented the highest prevalence of severe FI: 18%. In the North Region, the State of Roraima presented the worst prevalence of severe food insecurity: 15.8%. Severe food insecurity was prevalent as follows: Southeast Region, state of Minas Gerais, 4.5%; South Region, state of Rio Grande do Sul, 4%; Midwest Region, state of Mato Grosso do Sul, 5% (IBGE, 2006).

The rural areas present the highest prevalence of moderate or severe FI (11.4%), as compared to the average figure of 6% in the urban areas. Approximately 9.5 million individuals in the rural areas live in households with quantitative food restriction, that is, in a condition of moderate or severe FI. Out of this total, 3.4 million had experienced hunger over the 90 days elapsed before the interview. In spite of the fact that the urban households presented the lowest FI average prevalence in absolute numbers, this situation reflects a concentration of approximately 30 million individuals with moderate FI, and 10 million individuals with severe FI.

Note that when looking at the distribution of severe FI from the *per capita* average income perspective, an inversion can be seen in the prevalence numbers in urban and rural areas, which favors the latter, especially in the lowest income ranges. According to the PNAD-2004, the explanation could be the fact that 7.4 million family farmers have produced food for their own consumption; of these, 3.4 million have worked only for this purpose, and another 4.0 million have done it partially (IBGE, 2006). The resource of producing food for self consumption seems to offset other conditions that disfavor the Brazilian poor living in the rural areas (Figure 2).

The profile of food access inequity in Brazil is worsened by the low education prevailing in some rural areas and regions. In the Northeast Region, the highest incidence of illiteracy was found among individuals 10 years of age and older (20.6%.) This incidence is 3.6 times higher to that of the South Region, and even higher in households with severe FI. A data review showed the interaction of factors such as education and income as determinants of food insecurity, confirming the already verified and disseminated strong relationship between them. A decreasing

scale of severe FI was found for each tier of household monthly *per capita* income, as the level of education of the reference person increased, especially in the lower income tiers (Figure 3.)

Figure 2: Severe FI in households according to their *per capita* monthly income, and situation of the households
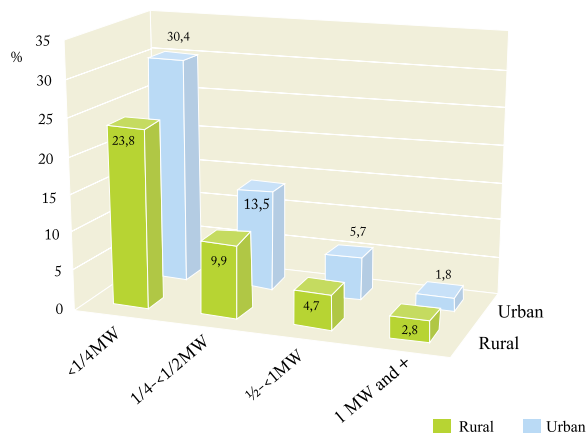
**Figure 3:** Severe FI in households according to their *per capita* monthly income, and education
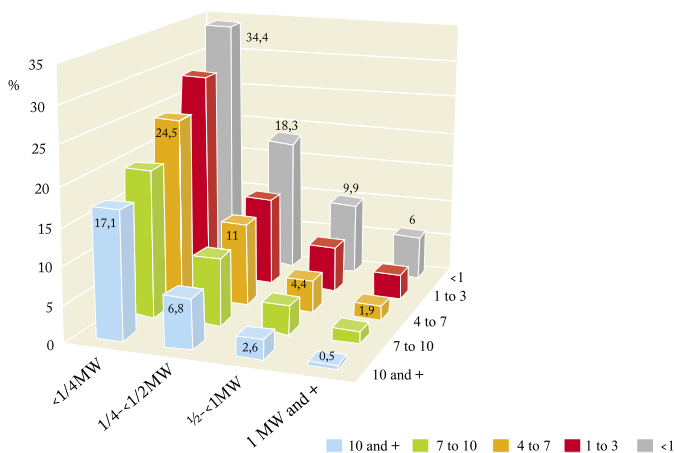
The results of the PNAD-2004 supplement have brought relevant information about the social conditions that modify the food security status of the Brazilian families. The prevalence of moderate or severe FI, for example, was higher in households where the reference person was a woman. Then, it was also found that, if there was at least one dweller less than 18 years of age, the gender difference was much higher, as compared to households without dwellers below 18 years of age. In numerical terms, this means: 28.4% versus 19.6%, and 17.3% versus 13.3%, respectively.

It seems important to highlight that in households where women were the reference, the bad condition of the individuals' food security was present in all income tiers, and the magnitude of this bad condition was broader in poorer households (Figure 4). Also, it is important to underline that women's average income in Brazil represented, in 2004, only 69.5% of the income earned by men (IBGE, 2006).

Figure 4: Severe FI in households according to the *per capita* monthly income, and the reference person's gender
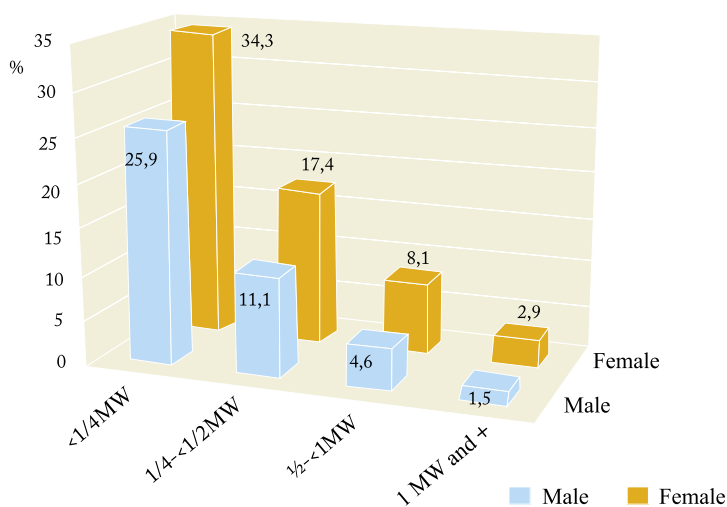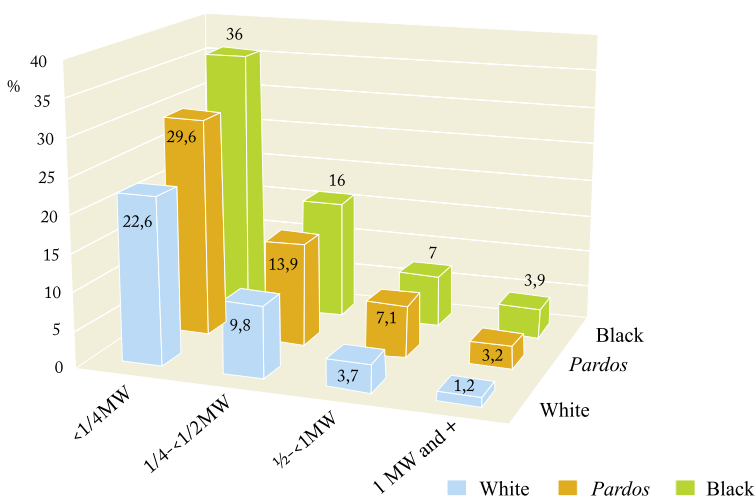

Source: Brasil, PNAD-2004

Among the individual conditions that have traditionally been used as the baseline to analyze social inequities in Brazil, those related to race/color of the interviewed person, and dweller of the household, should also be mentioned. The prevalence of moderate or severe FI was systematically higher for individuals who declared themselves as blacks or *pardos*[5] throughout the regions and states of Brazil (IBGE, 2006.) As reported in PNAD's FS supplement, in Brazil, in 2004, 11.5% of the population of blacks or *pardos* lived in a situation of severe food insecurity, which is 2.8 times higher than that of whites, the percentage of which was 4.1%.

As a complement, the population percentage with guaranteed access to food, in qualitative and quantitative terms, (FS) was 71.9% of whites, and 47.7% of blacks or *pardos* (Figure 5) Even if we consider that the population of blacks or *pardos* also earns lower average *per capita* income, their unfavorable condition of access to food persists when this comparison is made in equivalent income tiers. In other words, being a black or *pardo* adds to the FS risk. It does not matter one's level of family income.

Figure 5: Severe FI in households according to the *per capita* monthly income, and race/color of the reference person

Source: Brasil, PNAD-2004

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5   The term *pardo* is one of the five categories used by the Brazilian Institute of Geography and Statistics (IBGE) to characterize skin color. It describes those of brown skin color or mixed race.

Aiming to understand the conditions of the Brazilian families that better explain the situation of food security or food insecurity, results of the multiple regression analysis of private households sampled in the PNAD 2004 are presented (Table 1)[6]. This analysis excluded collective households, those where the food security module has been responded by a non dweller, households not presenting information on race/color of the reference person, or when the reference person declared himself as being indigenous natives or yellow (Asiatic), as well as those households without *per capita* income data. The analysis also did not include households classified as moderately insecure. This procedure aimed at making possible an analysis of the conditioning factors of severe FI, as compared to mild security or mild insecurity[7.] By means of Poisson's regression procedures and, consequently, by means of the calculation of prevalence ratios, an estimate was made of the power of associating each of the various household conditions or individuals to the condition of food security, with 95% confidence intervals accepted.

The condition that contributed the most to severe FI in the households was the low household *per capita* income. A progressive growth in the prevalence of severe FI was seen, as household income declined. Households with family incomes below ¼ of the minimum wage *per capita* (SM*pc*) had a prevalence 16 times higher of severe FI, when compared to those with incomes equal to or greater than one minimum wage *per capita*. The reference person's low level of education was associated with severe FI – almost tripling of prevalence. Urban households presented prevalence of severe FI 50% higher than those in the rural areas, and in those households without individuals 18 years of age and younger, the prevalence was the double of that observed in households with at least one dweller below 18 years of age. It was also noted that the prevalence of severe food insecurity increased by 24% when the household was headed by women, and by 49% when the reference persons declared themselves as being blacks or *pardos*. Households with six or more dwellers presented severe FI prevalence 40% above

those households with less than six dwellers. In households headed by the elderly – persons 65 years of age and older – there were families with lower prevalence of severe FI. So, this condition represents a protection factor when compared to the situation of households whose person of reference was 30 to 64 years-old. The South and Southeast Regions do not differ significantly from the Mid-West; however, the North and Northeast Regions presented severe FI prevalences that were 50% and 70% higher, respectively as compared to the Mid-West.

Table 1: Prevalence ratio of severe food insecurity in households, adjusted by the main socio-demographic variables - PNAD 2004

Severe Food Insecurity	Prevalence ratio	CI 95%			P
PR[a] female	1.24	1.21	-	1.27	0.000
PR black or *pardo*	1.49	1.41	-	1.57	0.000
PR <1 year in school	2.79	2.56	-	3.03	0.000
PR 1-3 years in school	2.22	2.04	-	2.41	0.000
PR 4-7 years in school	1.74	1.60	-	1.88	0.000
PR <30 years of age	1.04	0.98	-	1.11	0.165
PR 65+ years of age	0.83	0.76	-	0.89	0.000
Per capita household income from ½ to 1 MW[b]	2.96	2.71	-	3.23	0.000
Per capita household income from ¼ to ½ MW	7.24	6.63	-	7.91	0.000
Per capita household income less than ¼ MW	14.99	13.7	-	16.38	0.000
Households with 6+ dwellers	1.40	1.32	-	1.47	0.000
Households without dwellers below 18 yrs of age	2.02	1.92	-	2.13	0.000
Urban household	1.49	1.41	-	1.57	0.000
South Region	1.09	0.97	-	1.21	0.140
Southeast Region	0.95	0.87	-	1.05	0.332
Northeast Region	1.52	1.40	-	1.65	0.000
North Region	1.73	1.58	-	1.90	0.000
				[a]PR = Reference Person [b]MW= Minimum Wage	

Source: Elaborated by the researchers

5   Concluding Remarks

Having posed all the different issues above, it is important to emphasize that, after many decades, the problems related to social exclusion and hunger, described by Josué de Castro, still persist in Brazil. Hunger exists in many Brazilian households, reaffirming that the historical inequity of access to consumption goods, fundamental for human survival, still affects the lives of millions of Brazilians. Not less dramatic are the data representing the experience of most of those who are in a condition of food insecurity: this is the life experience of millions of families that, although not undergoing the direct suffering of living along with hunger, adopt a low-quality dietary pattern that impairs their health, their well-being and, as a result, their future.

Using the EBIA in the presented surveys and, especially in the PNAD, has proven to be a valuable and efficient resource to unveil the specificities involved in the measurement of the food restriction experienced by many Brazilians, both in relation to the possibility of ensuring quantity, and in relation to the quality of the food that is necessary for one to survive with dignity. Appropriate access to food depends on income, but is not limited to it. Conditions such as gender, race/color, access to school, and even dwelling conditions are elements that limit the exercise of this right.

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http://www.ncbi.nlm.nih.gov/entrez/query.fcgi?cmd=Retrieve&db=pubmed&dopt=Abst ract&list_uids=15284377&query_hl=2>

Annex

Summary of the Items of the Brazilian Scale of Food Insecurity (EBIA)

1.   Over the past 3 months, have you been concerned about running out of food before being able to buy more?

2.   Over the past 3 months, have you run out of food before you had the money to buy more?

3.   Over the past 3 months, have you run out of money to buy healthy and varied food?

4.   Over the past 3 months, have you had to manage with little food for your children/teenagers below 18 years of age, because you ran out of money?

5.   Over the past 3 months, could you not offer varied and healthy food to your children/teenagers below 18 years of age, because you had no money?

6.   Over the past 3 months your children/teenagers below 18 years of age did not eat a sufficient amount because there was not money enough to buy food?

7.   Over the past 3 months, at any point in time, have you or another adult in your house reduced the amount of food in the meals or skipped meals because there was not money enough to buy food?

8.   Over the past 3 months, have you eaten less than you expected because there was not money enough to buy food?

9.   Over the past 3 months, have you ever been hungry but you did not eat because you could not buy enough food?

10. Over the past 3 months, have you lost weight because there was not money enough to buy food?

11. Over the past 3 months, have you or another adult in your house spent the whole day without eating or had only one meal per day because there was no money to buy food?

12. Over the past 3 months, have you reduced the amount of food in the meals of your children/teenagers below 18 years of age because there was not money enough to buy food?

13. Over the past 3 months, have you had to skip one meal of your children/teenagers below 18 years of age because there was no money to buy food?

14. Over the past 3 months, have your children/teenagers below 18 years of age been hungry, but you simply could not buy more food?

15. Over the past 3 months, have your children/teenagers below 18 years of age been out of food for a whole day because there was no money to buy food?

Each affirmative answer is followed by different frequency alternatives: "almost every day", "some days", "only 1 or 2 days" and "don't know" or "decline to reply", except item 10 that offers the following alternatives: "little", "average", "much", and "do not know or declines to reply."

Evaluation of MDS Policies and Programs – Results
Volume 1 – Food and Nutritional Security

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Maria de Fátima Archanjo Sampaio

Maria Paula Camargo de Freitas

Maurício Tadeu Garcia

Micheli Dantas Soares

Oscar Arruda d'Alva

Rafael Pérez-Escamilla

Rômulo Paes-Sousa (Org)
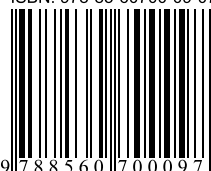
Silvia Cristina Konno

Suzana Maria Valle Lima

Wolney Lisboa Conde

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