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# Impacts of the Fomento Program on Family Farmers in the Brazilian Semi-Arid region and its relevance to climate change: a case study in the region of Sub medio São Francisco

*Impactos do Programa de Fomento sobre os Agricultores Familiares do Semiárido Brasileiro e sua relevância frente às mudanças climáticas: um estudo de caso na região do Submédio São Francisco*

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## ABSTRACT

For some years, Brazil established itself as a leader in strategies of strategies and programs aimed at reducing the social vulnerability of the most vulnerable populations. In this context, the Program for the Promotion of Rural Productive Activities (*Fomento* Program), created in 2011, had as one of the main objectives to stimulate the generation of work and income, and promote food and nutritional security for rural, indigenous, traditional and settled populations of agrarian reform. In the Northeast, and more specifically in the Semi-arid region, the relevance of this Program stands out even more concerning climate projections, which indicates that such areas will suffer from more extreme drought in the face of climate change, affecting populations dependent on climate-sensitive activities. Therefore, given the diversity of impacts of the *Fomento* Program reported in the literature, this article sought to present results on the perception of the Program's impacts from 28 family farmers, interviewed through qualitative research in four municipalities in the state of Bahia in 2017. In addition to the socio-productive aspects, the research sought to understand the Program's impacts in the context of climate change for the study region. The results point to a positive perception by the interviewees, mainly related to changes in production and technical assistance based on the Paradigm of Co-existence with the Semi-arid Region.

**Keywords:** Semi-arid. Fomento Program. Climate Change. Family farming.

## RESUMO

*Por alguns anos, o Brasil se consolidou como referência no que tange às estratégias e programas voltados à diminuição da vulnerabilidade social das populações mais vulneráveis. Nesse contexto, o Programa de Fomento às Atividades Produtivas Rurais, criado em 2011, teve como objetivo principal estimular a geração de trabalho e renda, e promover a Segurança Alimentar e Nutricional de populações rurais, indígenas, tradicionais e assentados da reforma agrária. No Nordeste, e mais especificamente no Semiárido, a relevância do Programa se destaca ainda mais frente às projeções de modelos climáticos, que indicam que tais áreas sofrerão com eventos mais extremos de seca diante das mudanças climáticas, afetando as populações dependentes de atividades sensíveis ao clima. Logo, diante da diversidade de impactos do Programa de Fomento relatados na literatura, o artigo buscou apresentar resultados sobre a percepção dos impactos do Programa do ponto de vista de 28 agricultores familiares, entrevistados por meio de pesquisa qualitativa em quatro municípios dos estados da Bahia em 2017. Além dos aspectos socioprodutivos, a pesquisa procurou compreender os impactos do Programa frente às mudanças climáticas para essa região de estudo. Os resultados apontam para uma percepção positiva por parte dos entrevistados, principalmente relacionada às mudanças na produção e em uma assistência técnica baseada no paradigma da convivência com o semiárido.*

**Palavras-Chave:** Semiárido. Programa de Fomento. Mudanças climáticas. Agricultura familiar.

## 1 INTRODUCTION

Since the early 2000s, Brazil has been recognized for social protection strategies aimed at reducing the vulnerability of rural and urban populations to hunger and food insecurity. The Zero Hunger Program in 2001 (later called Zero Hunger Strategy) linked the search for the reduction of food insecurity associated with the fight against poverty. i.e. it brought Food and Nutrition Security (FNS) policy closer to social protection policies, generating positive impacts based on a multidimensional and focused approach (PAES-SOUSA, 2013). Ten years later, as part of the "Brazil without Misery Program" (BSM), the Program for the Promotion of Rural Productive Activities was established (Law No. 12.512/2011) (*Programa de Fomento*, in Portuguese).

The goals were to stimulate job and income generation, promote FNS, and encourage the participation of beneficiaries in social, educational, technical and vocational training, as well as encouraging their participation in associations and cooperatives (BRAZIL, 2011). With target groups that include rural, indigenous, traditional and settled populations of the agrarian reform, the Program has been demonstrated to be effective in generating a multitude of impacts, derived from the technical assistance and rural extension (Ater) provided for two years, and a non-reimbursable financial aid, which is applied to a productive project chosen by the producers and according to their reality (based on specific needs and environment).

The positive impacts are manifold, such as improvements in productive and non-productive resources, in income and productive capacity, in FNS, in the access to other public programs, among others in the different regions of Brazil. Concerning productive resources, the increase in the means of production has been reported as the key factor that enables the increase, expansion and diversification of production for self-consumption (PORTO, 2014; MELLO et al., 2015).

In addition to the increase in the means of production, the profit and economy from production have been related to the increase in household goods such as home appliances and cell phones (BERBIGIER, 2016). The agroecological approach, promoted by many Technical Assistance and Rural Extension (Ater) institutions, has also contributed to increasing production and its diversification, respecting traditional knowledge and prioritizing the socioeconomic conditions of beneficiaries (PORTO, 2014). Furthermore, the Program also presents benefits concerning actions leading to gender equality, with women as the preferred target audience and representing 70% of beneficiaries in 2009 (MENDONÇA et al, 2015). Concerning productive projects, small animal breeding is predominant in several regions of the country but mainly in the Northeast, where ruminant breeding has proved to be the main economic activity promoted and developed by small beneficiary producers during the periods of water shortage (DI VILLAROSA, 2016; RODRIGUES, 2016).

The significance of the Program emerges, even more, considering that climate models have indicated that the Brazilian Northeastern Semi-arid region will experience more extreme drought events in the face of climate change (IPCC, 2014). According to the IPCC Fifth Report (2014), the average annual temperature increase in the region should be between 2.0°C (RCP scenario 2.6) and 5.0°C (RCP scenario 8.5) by 2100. This may contribute to changes from semi-arid to arid conditions, which implies in decreases of the regularity of water supply. Projections indicate that by the year 2050, the Semi-arid will become an arid environment, observing its edaphoclimatic conditions. Thus, those dependent on climate-sensitive activities (e.g. agriculture) will be exposed to more intense impacts, such as irreversible productive losses, which may increase their vulnerability and force them to abandon and sell their land and migrate to urban and marginal areas with other types of vulnerabilities.

Semi-arid populations, as well as other traditional peoples that have their livelihoods directly affected by climate conditions, are among the most vulnerable to climate change due to their high climate sensitivity and low institutional capacity to minimize risks and respond to negative impacts (LAHSEN et al., 2010; LINDOSO et al, 2014; MORTON, 2007). In this context of interconnection between climate and vulnerability of the northeastern smallholder farmers, it is noteworthy that in 2011-2018 the Semi-arid suffered the greatest drought in recent decades affecting almost 9 million people (MARENGO et al., 2016).

Thus, given the multitude of impacts attributed to the *Fomento* Program and its potential positive impacts in face of changes in climate, this research aimed to understand the impacts of the Program on productive and socioeconomic characteristics that may favor family farmers resilience and persistence in the Semi-arid region in the long term. The article considers the relevance of the Program based on the reflection that the strengthening of production activities today may help farmers to be better adapted to the expected climatic changes.

## 2 THEORETICAL FRAMEWORKS

### 2.1 PROGRAM INSTITUTIONALIZATION

The trajectory of public policies designed for family farming in Brazil began in the 1990s, with the creation of policies with two different approaches. First, agricultural policies encompassing credit, infrastructure, price policy, and second, agrarian policies involving land regularization and agrarian reform, implemented mainly through the National Program to Strengthen Family Agriculture (PRONAF - 1995) (GRISA, SCHNEIDER, 2015).

As these policies did not contribute to an improvement in development indicators, the second phase of policy creation was focused on social and assistance policies, which had effects on rural development and productive inclusion. In a third phase, policies were focused on vulnerable groups, such as small family farmers, indigenous people, and traditional communities, so they could have improved access to better conditions of agricultural and labor markets and well-being (GRISA, SCHNEIDER, 2015). The creation of PRONAF, the Crop Guarantee Program, BSM, the National School Feeding Program (PNAE), the Food Acquisition Program (PAA) and the *Fomento* Program illustrates the incorporation of that trajectory to public policies.

The *Fomento* Program is regulated by Decree no. 9.221/2017 and is currently implemented by the Ministry of Citizenship (formerly MDS - Ministry of Social Development), under the Special Secretariat of Social Development. However, until 2017 it was jointly implemented by the MDS and the Special Secretariat for Family Agriculture and Agrarian Development of the former Ministry of Agrarian Development (SEAD/MDA).

Among the target groups, are those in a situation of food insecurity, and poverty and extreme poverty (mean income of the household R\$170<sup>1</sup> and R\$ 85, respectively), which are selected with the use of various government databases, among them IBGE (Brazilian Institute of Geography and Statistics) census, PNAD (National Household Sample Program) and The Single Registry of Social Programs of the Federal Government (*Cadastro Único*, in Portuguese) (CAMPELO et al., 2014). The expected outcomes of the Program are increases in income, resources, and food security, and reduction in the number of families in poverty and vulnerability in rural areas, as well as among traditional peoples and communities.

For the implementation of the Program, eligible populations are included in a guiding list formulated by the Ministry, which the Ater institutions use for the selection and mobilization of beneficiaries. In addition to this strategy, an 'active search' is also used, aiming at searching for populations invisible to the State, which are usually in isolated locations and with no access to any public policies, and sometimes, not even official identification documentation.

To participate, all beneficiaries must already be (or become) registered in the *Cadastro Único* (Single Registry of Social Programs) and have the Declaration of Aptitude to Pronaf (DAP). From January/2012 to May/2018, 247,077 families were included in the *Fomento* Program, mostly from the Northeast and North region (BRAZIL, 2019). Regarding the Northeast and the Semi-arid Region, it is worth mentioning the creation of the Semi-arid *Fomento* in 2013, aimed at families that already had a water storage structure for production and were negatively impacted by the prolonged drought (since 2011). This initiative had the objective of assisting in the recovery of productive capacity through a single transfer of R\$ 3.000<sup>2</sup> and technical assistance to family farmers.

### 3 METHODOLOGY

Fieldwork and interviews with beneficiaries of the *Fomento* Program were carried out in October/2017, in the Submédio São Francisco region of the state of Bahia. The research was developed in a partnership between the Climate Network (Rede CLIMA - Regional Development sub-network) at the Center for Sustainable Development (CDS) of the University of Brasilia and the former Ministry of Social Development (MDS). A total of 28 beneficiaries were visited in the municipalities of Juazeiro, Casa Nova, Uauá, and Canudos, with the aid of field technicians of Ater institutions. The qualitative interview, which usually took around 2 hours, aimed to understand the impacts of the *Fomento* Program on the beneficiaries, as well as their limitations, and interconnection with other factors, such as climatic.

After tabulated, the interviews were analyzed quantitatively, as provided in the results, to provide a more general picture of the sample. The research team understands the limitations of the used methods but believes that the findings, specific to the studied region and sample, can be applied for further research in future studies on the multiple impacts of the Program.

### 4 RESULTS

Among the beneficiaries of the *Fomento* Program interviewed, 57.14% of the households were represented by women, 35.71% by men, and 7.14% by both. Most of the interviewees were over 50 years old, with only 28.56% under that age, 39.29% between 51-60 years old, and 21.43% over 60 years old<sup>3</sup>. Regarding the number of inhabitants per household, 7.14% reported the presence of one resident, 39.29% of 2-3 residents, 46.43% of 4-5, and 7.14% above 5. Regarding the number of dependents (<18 yrs. old), 50% of the households had 1-2 dependents, 39.29% with none, and 7.14% above 2. Following the age structure of the interviewees, 42.86% of domiciles had retired people, with 28.57% of the total respondents with 1 inhabitant receiving retirement benefits, and 14.29% with 2 beneficiaries.

Of the total interviewed, 100% had already developed some agricultural productive activity before the *Fomento*, with 64.29% having already received some form of technical assistance along this time. Among the various types of productive projects possible in the scope of the Program, 42.86% invested in livestock and infrastructure/equipment, 25% in livestock, 10.71% in infrastructure/equipment, 7.14% in livestock/crop/infrastructure/equipment, and 3.57% only in crops. In most cases, the projects were chosen individually (77.78%), jointly with the technician (14.81%) or only by the technician (7.41%).

In response to the Program, 53.57% reported a change in their main production, with most carrying out their productive activities in the backyard (*quintal produtivo*) and another area (*roça*) (64.29%). Only 21.43% of the interviewees carried out some form of crop irrigation, with almost all of them having a 1st Water Cistern (water reservoir for domestic consumption) and 50% having a 2nd Water Cistern (water reservoir for production) (Table 1).

**Table 1 | Impacts of the Fomento on farmer’s production**

<i>Changes in production</i>	<i>%</i>	<i>Production site</i>	<i>%</i>
YES	53.57%	Backyard	25.00%
NO	32.14%	Another area	10.71%
NR	14.29%	Backyard/another area	64.29%
<i>Irrigation</i>	<i>%</i>	<i>1st Water Cistern</i>	<i>2nd Water Cistern</i>
YES	21.43%	92,86%	50.00%
NO	71.43%	7,14%	50.00%
NR	7.14%	-	-

\*NR-No Response. Source: Author (2020).

Of those interviewed, 100% declared to sell products produced with the help of the *Fomento* Program, either in a specific/formal way or in the negotiation of production surplus with occasional buyers, usually neighbors. The latter was cited as buyers in 42.86% of the cases, together with other consumers (trade fairs, markets, middlemen, etc.). However, 35.71% cited sales to neighbors only (Table 2).

Ater was classified as having a positive influence by almost all the beneficiaries of the *Fomento* (92.86%), with most being accompanied by a single technician throughout the implementation process (in 85.71% of households). When asked if only with the income or only with the technician they would have been able to develop their productive projects, more than 60% declared they would not have reached the proposed objectives.

**Table 2 | Fomento's impact on farmer's autonomy and sales**

<i>Sale of Fomento's production</i>	%	<i>Sale to neighbors</i>	%
Yes	100.00%	Yes	42.86%
No	-	Only	35.71%
		No	21.43%
<i>Ater influence</i>	%	<i>Number of technicians along with the project</i>	%
Positive	92.86%	Only one	85.71%
Negative	-	More than one	14.29%
Neutral	3.57%		
Income	3.57%		
<i>Would be able to work on the project only with:</i>			
<i>Income</i>	<i>Technicians</i>		
Yes	35.71%	Yes	25.00%
No	60.71%	No	67.86%
NR	3.57%	NR	7.14%

Source: Author (2020).

Concerning impacts, several changes were attributed due to the participation in the Program. Among the most notable are: well-being (92.46%), acquisition of technical knowledge (89.29%), income (71.43%), diet changes (64.29%), home improvements and the acquisition of goods with the income from the project (60.71%), increased confidence as a producer (57.14%) and participation in new government programs (53.57%). Changes in the relationship with the community, acquisition of new equipment, production of new varieties of food, health improvements, participation in new groups (associations, cooperatives, etc.), and improvement in the family relationship were cited in smaller proportions (Table 3).

**Table 3 | Fomento's impacts**

<i>Impacts</i>	<i>Yes</i>	<i>No</i>	<i>NR</i>
PURCHASE OF GOODS	60.71%	28.57%	10.71%
WORK EQUIPMENT ACQUISITION	42.86%	53.57%	3.57%
HOME IMPROVEMENTS	64.29%	35.71%	-
CONFIDENCE AS A FARMER	57.14%	35.71%	7.14%
KNOWLEDGE ACQUISITION	89.29%	7.14%	3.57%
CHANGE IN FEEDING/DIET	64.29%	35.71%	-
PARTICIPATION IN NEW GROUPS	21.43%	75.00%	3.57%

<i>Impacts</i>	<i>Yes</i>	<i>No</i>	<i>NR</i>
PARTICIPATION IN NEW PROGRAMS	53.57%	46.43%	-
PRODUCTION OF NEW VARIETIES OF FOOD	32.14%	60.71%	7.14%
WELL-BEING	92.86%	7.14%	-
RELATIONSHIP WITH COMMUNITY	42.86%	39.29%	17.86%
FAMILY RELATIONSHIP	17.86%	60.71%	21.43%
INCOME	71.43%	14.29%	14.29%
HEALTH	32.14%	53.57%	14.29%

Source: Author (2020).

Finally, almost all the interviewees mentioned that climate had a great impact on their projects (92.86%) and understood the Project as an aid for Co-existence with the Semi-arid and extreme drought events (92.86%).

## 5 DISCUSSION

The *Fomento* Program encouraged several changes in the patterns of productive activity and socioeconomic characteristics of the interviewed farmers. In general, participation in the Program led to changes in the main productive activity of several interviewees. This pattern was also mentioned by Mello *et al.* (2015) who demonstrates that *Fomento* has been having a positive impact on the diversification of farmers’ productive activities, which often also occurs through the expansion of non-agricultural activities, also adopted by the Program.

The diversification of productive activities has been discussed by several authors (KELLY; ADGER, 2000; FINAN, NELSON, 2001) and is considered an important aspect in terms of reducing the vulnerability of producers to various impacts, whether climatic or socioeconomic. Investment in activities with different degrees of resilience to impacts provides a chance for farmers to survive in at least one activity in the face of shocks, as opposed to what may occur in the face of an impact that specifically affects their productive activity (MELLO *et al.*, 2015). In this case, a change in the predominant activity instigated by the *Fomento* Program may be an indication of the expansion of farmer’s productive capacity (for new activities) or even an attempt to innovate, experiment and learn from the technical assistance provided.

In several cases it was observed that the possibility of producers choosing their own productive project, according to personal ambitions and skills, allowed them to fulfill a desire to cultivate something specific that they already wanted (“*To be able to choose the dream ...*”), to expand activities without investment (“*I could improve the livestock, with animals of higher quality*”), or improve activities that previously had less weight in their productive balance (“*I liked I was able to raise chickens*”).

There were also several reports of production expansion to the areas of the backyard, in addition to the field, which promoted a change in family dynamics for some households. On some occasions, women were cited as active in the operation of the productive project, especially because they were mostly developed in the backyard, and because their husbands worked in more distant places, taking care of the crops and animals or doing daily work in other farms (e.g.: woman led the *Fomento* project in the yard, while the man continued with goats and sheep on the field). Female empowerment in the process of productive inclusion is one of the expected results of the Program (MENDONÇA *et al.*, 2015), and has also been reported in other initiatives (Brandão *et al.*, 2016), in a case study on female empowerment from socio-productive inclusion strategies in Sergipe. According to complementary interviews undertaken in November/2018 with institutional actors involved in the planning of the Program (MDS, Brasília-Federal District), *Fomento* has women as privileged beneficiaries during the selection process.

Among the most relevant impacts reported were those on life quality, education as a producer (i.e. new technical knowledge relevant for production), income, food, improvements and acquisition of goods, confidence as a producer and knowledge about new government programs. Life quality was mentioned as improved due to several factors, such as the acquisition of reserve livestock for sale in case of illness; higher quality of livestock, with higher sales value; more project experience; possibility to maintain productive activities and having protected animals (in pigsties, etc.); and participation in several group activities, which promoted learning.

As observed, well-being was a subjective measurement and subject to the impacts on income, food, knowledge, acquired improvements, etc. The question of knowledge acquisition as a producer was reported as a result of the greater monitoring by Ater technicians made available during the Program. Here was highlighted knowledge about natural remedies for herds/crop (e.g. salts), vaccines, better livestock management, more guidance (in general but especially in meetings), and the exchange of knowledge with technicians. In some experiences of the Program in Bahia, innovations that would increase the exchange of experiences between technicians and beneficiaries were mentioned, such as the insertion of participative methodologies and the extension of Ater contracts (from 2 years defined by the Program, to 3 years) (DI VILLAROSA, 2016).

The aid for the construction of diversified projects and with the appreciation of beneficiaries' traditional knowledge also added to the process of knowledge construction (PORTO, 2014). Besides, the issue of increasing confidence as a producer, also related to the increase of acquired knowledge and productive capacity, was relevant in the findings. The improved producer confidence was justified by the feeling of assurance in knowing how to produce better due to new knowledge (e.g. vaccines, feeds), due to increased number and genetic improvements in the livestock, motivation due to the restructuring of production and herds, and due to the possibility of materializing changes in production that were not possible before (due to lack of financial resources and technical support).

The income improvement was noted as being linked to the possibility of producing for sale, but in most cases as an increase without tangible measure, through savings in the purchase of food items ("*It improved a little ... now I save with the purchase of meat*"; sale of chicken to buy rice, other meat, and products; sale of eggs/chicken helping to buy school supplies). It should be noted that during the interview there was a perception of discomfort on the part of those interviewed regarding income issues, which could also be related to reports of increased income without mentioning the increase in monetary income.

Property improvements (home and productive infrastructure) and other acquisitions were also mentioned, which would be an indication of income, as also observed by Rodrigues (2016). Among these, the acquisition of household appliances (refrigerator, stove, freezer, television), furniture (cabinets, chairs, sofas), motorcycles, tires, clothing, and equipment and infrastructure acquired directly via the *Fomento* project were noteworthy. Porto (2014) reports that this income improvement would also be associated with the marketing strategies adopted by the beneficiaries.

Those with greater specialization in production (focusing on a single product) achieved an increase in monetary income, while other producers ended up generating "reserves of value" similar to savings, for use with immediate needs, or savings in the face of self-consumption of food produced, with decreased need for purchase in formal and informal markets. Regarding sales capacity, it was observed that about 71% of the sample had selling problems, which would also be linked to the limited increase in monetary income observed in studies. Bernardi (2015) reports that the limited results about the increase in monetary income would be linked to the fragility of selling products, related to the lack of organized groups for the sale and lack of access to markets. Di Villarosa (2016), also cited that the commercialization channels commonly used are the informal ones, which are linked to the limited access to formal markets for production outflow.



In our study, it was also observed that almost 80% of the beneficiaries had neighbors as buyers for the production, with almost 35% having exclusively these actors as customers. Among the mentioned difficulties for commercialization were: the insufficient scale of production, high supply of the same products in the community (e.g. chicken and eggs), insufficient transport and middleman, lack of money to buy food and fatten animals, competition with traditional producers from the cities (e.g. poultry farms with cheaper eggs), and products without sanitary inspection. The lack of slaughterhouses and the certificate of sanitary inspection have already been reported as impediments to commercialization for several producers under other productive inclusion programs of the Brazilian federal government.

Di Villarosa (2016) reports that in several municipalities where such equipment and processes are not available, it is impossible to sell products of the Cisterns Program to fairs and other formal and institutional markets (such as the Food Acquisition Program - PAA, and the National School Feeding Program -PNAE). Di Villarosa (2016) also mentions that due to the lack of regular slaughterhouses, there is greater commercialization of live animals by the producers of *Fomento*, which would lead to lower profits, causing greater difficulties in overcoming food insecurity.

Regarding food security, a central theme of the *Fomento* Program, some studies have shown positive impacts (BERBIGIER, 2016; MELLO et al., 2015; PORTO, 2014). However, those impacts would be linked to the type of productive project, production (and food) diversification, and even to land size, as discussed by Costa and Teixeira (2016). These authors observed that in another region of Bahia state (*Sertão do São Francisco*), farm/plot sizes were the main limiting factor for the successful implementation of the *Fomento* Program. The small size would limit production sufficient for self-consumption, and the lack of land ownership certification would be an impediment to access rural development policies and programs, which sometimes led to the abandonment of plots, especially in agrarian reform settlements. Because of these cases, it was suggested that advances in the promotion of agrarian reform were needed. The limitation of access to land would also be linked to the choice of non-agricultural productive projects in the *Fomento* Program, as mentioned by Berbigier (2016).

Concerning the type of productive project developed, the choice is predominant for small animal breeding in several *Fomento* projects in the Northeast, as Costa and Teixeira (2016), Di Villarosa (2016) and Porto (2014) highlight. Such a pattern was also observed in the results of the survey, where about 42% invested only in livestock, while 85% in livestock as one of the activities (more infrastructure, cultivation, etc.). In these were observed herds of sheep, goats, chickens, and pigs.

Di Villarosa (2016) observed that in dryland areas, more distant from irrigated areas of the *Sertão do São Francisco* Territory, 46% of projects were for animal breeding (mostly sheep), whereas in irrigated areas of the São Francisco River, where there is insufficiency or absence of land of appropriate size, the most common would be crop planting and more rarely non-agricultural projects. The presence of small ruminant projects (sheep and goats) in dryland areas is related to the better adaptation of those animals to Semi-arid regions, and the number of these projects is even intensified, along those linked to infrastructure, and with the planting of drought-resistant species (e.g.: palm), with the approaching of drought periods (DI VILLAROSA, 2016; RODRIGUES, 2016).

It is important to highlight the many described impacts of climate on implemented productive projects, a pattern also mentioned in other surveys (PORTO, 2014; VILLAROSA, 2016). In the interviews, the climate (represented by temperature and water scarcity) was mentioned as the greatest difficulty for farmers to produce and live off agriculture. Climate affected their choice for productive projects, the production developed its commercialization, and also the producer's perception related to the continuity of production initiated during the Program. For example, for some, the project choice was influenced by the belief that goat rearing would be more complicated than chickens in the drought: "*drought for goats and sheep is worse*"; "*increase goat in the drought, increases the cost with feed*"; "*feeding chicken with feed in the yard is easier in the drought*". However, other farmers reported that it was better to invest in goats/ sheep because

chicken rearing would be more fragile to heat and lack of water. According to Di Villarosa (2016), the drought would also have promoted the search for greater diversification of production and project changes by producers, a pattern that cannot be observed in our results.

Among the mentioned impacts of climate on production were: “Everything is more expensive, income decreases because you have to buy food [for animals] when it doesn’t rain”; “it gets in the way because it doesn’t produce anything”; “Drought is hurting us. We are slow [in production], here it’s good when it’s raining...”; field crops, dry fruits and vegetables, and abandoned plots due to lack of water; goat deaths due to lack of food, and poisoning/death of animals due to ingestion of a perennial plant (known as pine nuts or parsley, according to the technician).

As results from climate, the following impacts were also mentioned: 1) on income: “little income [as a result of the Program]... the drought gets in the way”; “I’ve had the urge to give up [chicken farming]... the price of feed has increased”; 2) on food: “the family does not consume cheese and goat milk... it is not available in the drought, and it gets expensive”; 3) on commercialization: “goats are lean and ugly... so cheap and difficult to sell”; “the animals get so thin by the drought, hence people do not buy”; delay in production, due to the need and inability to buy chicken feed; lack of money to buy food for sheep [...baby sheep get crippled]; and 4) perceptions about the continuity of projects (e.g.: it manages to continue if the drought does not continue for a long time; if it rains it is possible to continue because many animals had already died in the drought; and loss of 70% of the goat herd, with no prospect of increasing it due to the impossibility of producing/purchasing food. Some of the findings presented herein were also observed by Di Villarosa (2016), while Porto (2014) highlighted the role of other programs, such as those that increase the producer’s water capacity (e.g. Cisterns Program), to increase the positive results of the *Fomento* Program in the Brazilian Semi-arid.

As noted in our survey, more than half of those interviewed reported participation in new programs/policies due to participation in *Fomento*. According to the Program Logic Model (*personal communication*) Ater’s technicians, in addition to the other activities related to *Fomento* (from project choice to execution), should contribute to the participation of beneficiaries in other policies related to production (such as credit, access to water, institutional markets and others) and related with the safeguarding of human and social rights enshrined in constitutional and infra-constitutional norms (water, education, health, sanitation, etc.).

The research results highlighted the importance of Ater at various times, as well as the presence of beneficiaries who had never been accompanied by any type of technical assistance. For almost all the interviewed farmers, the presence of technicians was positive, with 60% stating that they would not have been able to develop the productive project if they had only received the financial aid. In research carried out in different Brazilian contexts, a common conclusion was reached: without Ater, the *Fomento* Program would not have had the same positive results, and here this type of assistance was also considered fundamental by the interviewees (RODRIGUES, 2016; BERNARDI, 2015; SAMBORSKI, 2016). Studies have pointed to rural extension as a major driver of change in the countryside, through long-term monitoring and within guidelines discussed by civil society and public institutions.

At the time of the survey, half of those interviewed were also quoted as saying that after participating in the Program, they were able and possibly would have the knowhow to develop the same project without the support of technicians, after having their support for the two years. The individualized monitoring, with the objectives of increasing the channels of integration and exchange in the communities, the elaboration of projects based on the will and productive experience of families, the support by a multidisciplinary team composed of technicians from the region (with knowledge about the local specificities), and the specific education of technicians considering different publics focused by productive inclusion programs would be an essential factor for this construction of autonomy (MELLO et al., 2015).

To increase the probability of success, some authors also suggest the period of technical assistance should be extended beyond the two years planned (PORTO, 2014), as a way that monitoring becomes continuous, not only focused on the implementation and execution of activities, a strategy already adopted individually by some local institutions, as mentioned in the case of Bahia by Di Villarosa (2016).

This strategy highlights the fostering of initiatives made by local executing institutions, so activities can continue beyond planned deadlines. In the state of Ceará, for example, Porto (2014) reports that families assisted by Ematerce in the 2012-2016 *Fomento* Program were encouraged to participate in other programs, but mainly in credit ones through the Bank of the Northeast Agro-Friendly Program (*Agroamigo*, in Portuguese). However, in addition to the role of Ater's technicians, research indicates the importance of articulations carried out at the municipal level for positive arrangements between programs, and amplification of their results. That is, besides an adequate vertical articulation between the federative entities (Union, states and municipalities), a fact not always possible given political-party disputes, there is a need for horizontal arrangements between organizations of the three federative entities and civil society at the municipal territorial scale (PAIVA et. al, 2014; PORTO, 2014; BERNARDI, 2015; BERBIGIER, 2016; COSTA, TEIXEIRA, 2016).

Although it is possible to identify access to other social policies and public services, challenges remain in broadening families' access to services provided by municipal institutions, especially those related to social assistance services (PORTO, 2014). The difficulty exists in particular in the building of partnerships to achieve access to families, due to limited human and financial resources. In this sense, Costa and Teixeira (2016) argue that to maintain the sustainability of family agriculture, it is also necessary to structure an institutional environment to promote the articulation between policies and programs.

As an example, the authors cited the experience of the *Sertão do São Francisco* region, where the Federal Government promoted articulation with other federal institutions such as Codevasf (São Francisco and Parnaíba Valley Development Company) and Embrapa. (Brazilian Agricultural Research Corporation). The Bahia State Government was responsible for two innovations aimed to promote inter-institutional and programmatic articulation. Regarding the first, a bonus was inserted in the contracts of Ater institutions, while a significant monetary bonus was paid to the organization and the agent for the articulations made with programs of credit (PRONAF), insurance (*Garantia Safra*), institutional procurement programs (PAA, PNAE), with the National Program of Biodiesel Production and Use, and Productive Bahia.

Moreover, in addition to the increase in various impacts abovementioned that contribute to reducing family farmers' social vulnerability in the Semi-arid region of Brazil, it is worth highlighting the role of the Program and especially of the Ater in helping to co-exist with the Semi-arid region and in various characteristics that increase adaptation to climate change. Of those interviewed, about 92% said they believed the Program helps in this regard, because: "*the person can have income and then they stay or come back from the city*"; "*people are thinking about leaving, but then [Fomento] helps in the community and improves survival*"; "*if the person applies it right, it helps them [to stay]*"; "*if I did not have this, I would want to leave ...*"; and "*Ater teaches a lot of lessons*".

Some of the knowledge acquired from the Ater were highlighted, such as the use of agroecological techniques, the attempt to diversify production, learning about home remedies, about more adapted irrigation (e.g. drip irrigation), the use of plant and animal species more adapted to the climate, animal genetic improvement, food, and fodder storage, several of which are cited by studies on production changes that favor adaptation to climate change (SMIT, SKINNER, 2002; BRADSHAW; et al 2004; LIN, 2011; GRAINGER-JONES, 2012; SIVAKUMAR et al, 2005; NHEMACHENA, HASSAN, 2007).

In these terms, Davies (2009) highlights the important role of agricultural extension in the face of adaptation and mitigation to climate change by disseminating adaptation measures that prepare farmers for increased climate variability and uncertainties, creating contingency measures to deal with risks, and

helping to alleviate the consequences of climate change (with information on droughts, floods, etc.). More related to adaptation, the author suggests as main areas: 1) the dissemination of technological and management information - new climate information, innovative technologies, use of information systems, and knowledge about the insertion of new resistant cultivars/livestock, agroforestry, and other techniques that increase the adaptation of crops/livestock; 2) the development of capacities - strengthening adult and non-formal education, through the use of various media and demonstration schools (highlighting the benefits of using techniques that increase their resilience), and that still increase their capacity for planning, problem-solving, critical thinking, negotiation, leadership and proactivity; and 3) extension service as a facilitator in the implementation of policies and programs - connecting farmers with different public and private actors linked to other services in the rural sector, and those linked to investments in adaptation strategies and other markets, as well as taking farmers' problems and demands to other actors, in addition to helping them prepare proposals and negotiations.

The author concludes that an extension service is an important tool in adapting to climate change because, besides having the potential to promote increased productivity and poverty reduction, it can help in the area of adaptation and mitigation.

Initiatives that include technical assistance may also encourage farmers to invest their time and work in their productive projects and to be able to dedicate themselves to long-term projects, thus avoiding constant short-term and seasonal migrations in search of work outside the rural region (CORREIA, BARBIERI, 2019).

In our sample, it was reported that younger inhabitants move from rural areas attracted by opportunities in the city centers, and due to lack of opportunities in most rural areas, with homes characterized by inhabitants within a higher age group (over 50 years old), with few inhabitants and dependents. This situation reinforces the role of the *Fomento* Program and its importance in encouraging younger farmers to remain active and productive, even in the face of the complications linked to climate change and the multiple attractive factors of urban centers.

## 6 CONCLUSIONS

The *Fomento* Program provided a diversity of positive impacts for the beneficiaries interviewed, ranging from increases in production and its diversity to issues involving gender equality and knowledge acquisition.

For the semi-arid region, where social vulnerability and institutional fragility are strong components in a climate change context, the presence of programs that improve the adaptability of the most vulnerable is crucial. In addition to this program, and considering policies with a greater social impact in rural areas, it is necessary that the climatic factor is considered and addressed in the various social strategies adopted, not only in environmental ones, as commonly observed.

Social programs can contribute to adaptation to climate change, also, to have their results possibly impacted by the climate. Concerning technical assistance, essential for the success of the *Fomento* Program, the results indicate the need for greater investment in programs that have Ater as a central element, in addition to promoting an increase in the duration of such actions. As mentioned in the study, several of the changes observed and recognized in the literature to increase the productive capacity of farmers are generally implemented by Ater technicians without prior knowledge of their potential in the face of the impacts of climate change.

Besides, we highlight the importance of the *Fomento* Program for Brazil and family farmers as a whole. In the current Brazilian moment (in a context of social, behavioral and economic changes due to the COVID-19 pandemic), it is necessary to pay attention to the importance of maintaining small production spaces as well as their geographic location, since short food supply chains are very important to supply cities. It is also worth reflecting on other types of impacts to which society will be exposed in the future,

in addition to those resulting from the climate, and what changes in values must be pursued so that humanity can maintain a healthy and diversified food supply in any context. Hunger had been present at various moments in the history of civilization and it should be cherished to be kept away from the daily life of urban and rural areas, especially in developing countries.

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## NOTES

1 | Equivalent to 33 and 17 USD on April 13, 2020.

2 | Approximately 580 USD.

3 | Difference to 100% referring to NR – no response.

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