RESR Revista de Economia e Sociologia Rural
ISSN 1806-9479
ARTICLE

The impact of technical assistance and rural extension for poor family farmers: the case of the Dom Hélder Câmara II Program

O impacto da assistência técnica e extensão rural para os agricultores familiares pobres: o caso do Programa Dom Hélder Câmara II

Mauro Eduardo Delgrossi[1], Ludgero Cardoso Galli Vieira[1], Mário Lúcio de Avila[1], Mireya Valencia Perafán[2], Reinaldo José de Miranda Filho[1]

[1]Centro de Gestão e Inovação da Agricultura Familiar (CEGAFI), Faculdade UnB Planaltina (FUP), University of Brasília (UnB), Brasília (DF), Brasil. E-mails: delgrossi@unb.br; ludgero@unb.br; avila@unb.br; rjmiranda@unb.br

[2]Centro de Gestão e Inovação da Agricultura Familiar (CEGAFI), Faculdade de Agronomia e Medicina Veterinária (FAV), University of Brasília (UnB), Brasília (DF), Brasil. E-mail: mireya@unb.br

How to cite: Delgrossi, M. E., Vieira, L. C. G., Avila, M. L., Valencia Perafán, M. E. & Miranda Filho, R. J. (2024). The impact of technical assistance and rural extension for poor family farmers: the case of the Dom Hélder Câmara II Program. Revista de Economia e Sociologia Rural, 62(2), e271282. https://doi.org/10.1590/1806-9479.2022.271282en

Abstract: This study evaluates the impact of technical assistance and rural extension provided by the Dom Hélder Câmara Project (PDHC II) in the Brazilian semiarid region, which aimed to reduce the poverty levels and inequalities in the region, qualifying family farmers to develop sustainable production and encouraging the replication of good agricultural practices. Using the propensity score matching method, 16 different indicators of the assisted families and the control group were analyzed, involving monetary and nonmonetary incomes. The results indicate that the program was successful in benefiting poor or extremely poor families in this region, providing technical assistance and rural extension and, for a fraction of them, access to the Rural Funding Program. In addition, PDHC II achieved its objectives of providing an increase in agricultural production and in the income of the beneficiaries, with an even more prominent impact among those who received remittances from funding program. It can be concluded that technical assistance and rural extension were effective, benefiting poor family farmers in the Brazilian semiarid region and having a larger impact when associated with productive funding resources.

Keywords: technical assistance and rural extension, rural funding program, program impact, family farming, semiarid, rural poverty.

Resumo: Este estudo avalia o impacto da assistência técnica e extensão rural prestadas pelo Projeto Dom Hélder Câmara (PDHC II) no semiárido brasileiro, que teve como objetivos a redução dos níveis de pobreza e das desigualdades na região, qualificando os agricultores familiares para desenvolverem uma produção sustentável e estimulando a replicação de boas práticas agropecuárias. Utilizando o método "propensity score matching" foram analisados 16 diferentes indicadores das famílias atendidas e do grupo de controle, envolvendo rendas monetárias e não monetárias. Os resultados apontam que o programa logrou êxito em beneficiar famílias pobres ou extremamente pobres dessa região, levando assistência técnica e extensão rural e, para uma fração deles, o acesso ao Programa Fomento Rural. Além disso, o PDHC II atingiu seus objetivos de propiciar um incremento na produção agrícola e nos rendimentos dos beneficiários, com um impacto ainda mais proeminente entre aqueles que receberam os recursos de fomento produtivo. Pode-se concluir que a assistência técnica e extensão rural foram eficazes, beneficiando agricultores familiares pobres do semiárido brasileiro, tendo maior impacto quando associada aos recursos de fomento produtivo.

Palavras-chave: assistência técnica e extensão rural, programa fomento rural, impacto de programa, agricultura familiar, semiárido, pobreza rural.

INTRODUCTION

Brazil had 5,073,324 agricultural establishments in 2017, of which 3,897,408 (76.8% of the total) were classified as family farming (Instituto Brasileiro de Geografia e Estatística, 2017), and

46.6% of these farmers are in the northeast Region (Del Grossi, 2019). In Brazil, the guidelines of the National Family Farming Policy were established by Law No. 11,326 (Brasil, 2006), regulated by Decree No. 9,064 (Brasil, 2017), which defined family farming as that whose management is shared by the family, and the main source of income comes from agricultural productive activities. According to the Agricultural Census conducted in 2017, about 10.1 million workers have their productive occupation in family farming (Instituto Brasileiro de Geografia e Estatística, 2017). A worrying finding of this census was that the technical guidance for Brazilian producers has decreased in recent years, from 22% in the 2006 Census to only 20% of farmers in the 2017 Census, presenting a worrying picture for the regions concentrated with poor farmers (Aquino et al., 2018), especially in the northeast semiarid region (Vargas et al., 2022).

Aiming to strengthen family farming, the Dom Hélder Câmara Project (PDHC) (Brasil, 2023a) was developed by providing technical assistance and rural extension (ATER), with the objective of contributing to the reduction of rural poverty of family farmers in the Brazilian semiarid region.

The PDHC is an action of the Ministry of Agriculture, Livestock, and Supply (MAPA), co-financed by the International Fund for Agricultural Development (IFAD) of the United Nations. The PDHC is already in its second phase (PDHC II), which started in 2014, covering 11 Brazilian states, 913 municipalities, with approximately 54,000 family units contemplated. Although the year of formal initiation of the PDHC is 2014, the actions effectively began only in 2018. The provision of the service was contracted by the National Agency for Technical Assistance and Rural Extension (ANATER).

This study evaluates the impact of PDHC in phase II, using 16 different indicators. It is expected that this evaluation will support further research and future decision-making to improve ATER policies.

THEORETICAL FOUNDATION

Since antiquity, knowledge of agricultural and livestock practices was transmitted between generations, as shown by the history of the Inca people of South America (Balem, 2015). However, with the advent of the industrial revolutions and the second agricultural revolution (Mazoyer & Roudart, 2010), proficiency in production techniques became challenging. As a response, modern education and rural extension services emerged, the first being established in Ireland during the great famine and in the United States in the mid-nineteenth century (Castro, 2015).

In Brazil, the first initiatives also date the nineteenth century, with the installation of four imperial institutes of agriculture, but only in 1929, we have registered the first extension action, the "Farmer's Week," of the Superior School of Agriculture of Viçosa (Peixoto, 2008). The strong government contribution in the sector began with North American support, during 1948–1962, configuring the phase of "human welfarism" (Rodrigues, 1997), which resulted in the creation of the Rural Credit and Assistance Associations (ACAR) in several Federation Units. However, in the early 1960s, a consensus was created among the leaders of the Brazilian Association of Credit and Rural Assistance (ABCAR) that "working with small farmers does not give the expected results" and recommend "working with medium and large producers, that is, with those more apt to adopt modern technologies" (Balem, 2015, p. 18), constituting what we here call "the myth" that small farmers, mainly poor family farming, do not respond to the stimuli of technical assistance.

Subsequently, the technical assistance service turned to medium and large producers, in the phase known as "productivism diffusionism", in which the main task of the rural extension technician was the elaboration of rural credit projects, aiming to stimulate the adoption of capital-intensive technologies (Rodrigues, 1997).

The new orientation of the system has succeeded in focusing on the farmers most apt for these technologies by aiming at their modernization, leaving millions of farmers without any kind of technical guidance in their production processes. The social impacts of this period were striking, with the rural exodus of millions of workers (Kageyama & Silva, 1983) leading to a strong questioning of the care model provided (Abramovay, 1998; Freire, 1983).

With the fiscal crisis of the federal and state governments in the 1980s, the national system of technical assistance and rural extension suffered strong budget cuts, leading to the extinction of the Brazilian Company for Technical Assistance and Rural Extension (Embrater) in 1989 (Castro & Pereira, 2017). Although the Federal Constitution of 1988 provides, in its article 187, the provision of the technical assistance and rural extension service (ATER) within the framework of agricultural policies, the phase of scarce resources lasted until 2003. Since then, with the resumption by the federal government, of public policies aimed at family farmers and the settlers of agrarian reform, several rural development policies were stimulated, such as territorial development (Freitas et al., 2012; Valencia Perafán & Walter, 2016) and institutional purchasing (Grisa & Schneider, 2014). The technological model to be taken to the public went through a strong reflection (Dias, 2007; Diesel et al., 2015), pointing to agroecologically-based technologies (Caporal & Costabeber, 2006). These reflections culminated in the enactment of Law No. 12,188 (Brasil, 2010), which established the current National Policy for Technical Assistance and Rural Extension (PNATER), based on the principles of sustainable rural development, the use of participatory methodologies, ecologically based agriculture, equity in gender, generation and ethnicity relations, free service, and food sovereignty.

The PDHC II follows the principles of PNATER, providing technical guidance to poor family farmers in the northeast semiarid region, through participatory methods (Gurgel et al., 2022; Morais & Callou, 2017), with affirmative action on gender and rural youth support (Ávila & Miranda Filho, 2022).

It is important to emphasize that the federal resources allocated to the ATER service suffered a new strong retraction after 2016, leaving millions of northeastern family farmers without any kind of guidance (Vargas et al., 2022), in addition to a redirection of the service primarily aimed at the mercantile insertion of the few farmers served (Diesel et al., 2021). Fortunately, IFAD's effective participation ensured the continuity of the PDHC, achieving the goals set in the phase II of the project.

Considering the different phases of the public policy cycle, the program is at the end of a cycle in which its results must be measured (Lotta, 2019), seeking to assess its impact on a social situation (Roth-Deubel, 2015), in this case, the reduction of poverty among family farmers in the northeast semiarid region.

METHODOLOGY

The information regarding the families of farmers was obtained through a sampling performed between January and March 2022, which collected economic, social, and productive data for the year 2021. The interviewed families were selected by a random sample of the ANATER records of the beneficiary families, the records of family farmers of the PRONAF Declaration of Aptitude (DAP) (Brasil, 2023b), and the Single Registry for Social Programs (CadÚnico) (Brasil, 2023c) for the sample of the control group (nonbeneficiaries).

Consequently, a total of 4,374 interviews were conducted with 1,764 referring to the group of beneficiaries and 2,610 to the control group, covering 10 states and 402 Brazilian municipalities (Figure 1 and Table 1).

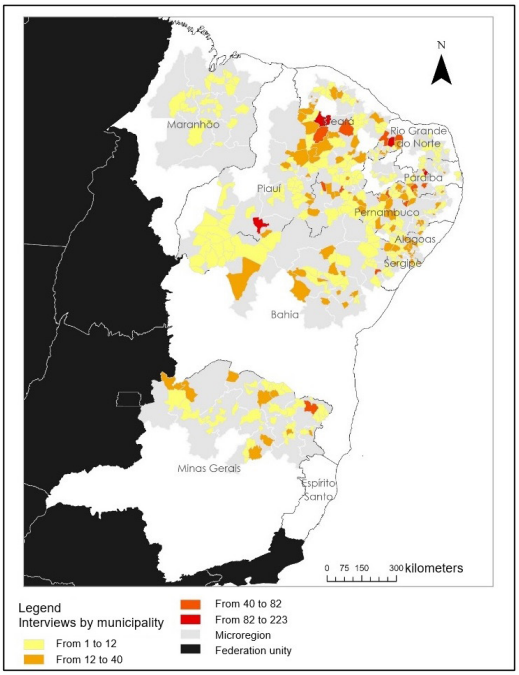

Figure 1. Map with the total number of interviews conducted by the municipality (public and private companies).
Source: Research outcomes

Table 1. Sample performed for impact assessment, by groups of beneficiaries and control by state and number of municipalities; Dom Hélder Câmara II Project

States	N. of Municipalities	Number of Interviews		
		Total	Beneficiaries	Control
Alagoas (AL)	23	218	111	107
Bahia (BA)	40	345	151	194
Ceará (CE)	67	939	414	525
Maranhão (MA)	28	138	76	62
Minas Gerais (MG)	46	376	169	207
Paraíba (PB)	38	566	253	313
Pernambuco (PE)	61	727	217	510
Piauí (PI)	43	414	184	230
Rio Grande do Norte (RN)	36	385	96	289
Sergipe (SE)	20	266	93	173
TOTAL	**402**	**4,374**	**1,764**	**2,610**

Source: Research outcomes

The sample size allowed measurements both for the beneficiaries in general (those who received only technical assistance, henceforth identified as BG) and for those who received technical assistance plus the cash transfer of rural funding program (Brasil, 2023d), which was an amount of R$ 2,400.00 or R$ 3,000.00 (hereinafter identified as BF), that compares with the performance of farmers who did not receive the program, which is designated as the control group (CG and CF, respectively)[1].

[1] Note: No member of the control group had access to the Cash transfers from funding program Program. The distinction between CG and CF of the control group refers to the two pairing procedures used: the first procedure for the control group with beneficiaries in general, and the second procedure, for the control group only with beneficiaries who accessed resources from cash transfers from funding program.

Sample sizes were obtained according to Equation 1. The population of the beneficiary and control groups comprised about 54,039 and 500,000 families, respectively. Sample standard deviation (*Sx*) estimates were calculated based on the total annual income measured by a previous survey conducted in 2018. Subsequently, considering the final sample size (*n*) of 4,374 interviews conducted for a confidence interval of 95% (Z = 1.96), the margin of error (*e*) obtained in this sample was 2.5%, upward or downward.

$$n = \frac{Z^2 S_x^2 N}{Z^2 S_x^2 + e^2 (N-1)} \quad (1)$$

where: ***n*** is the number of families in the sample (sample size), ***Z*** is the critical value that corresponds to the desired degree of confidence, ***Sx*** is the sample standard deviation, ***e*** is the margin of error or the maximum tolerable error, and ***N*** is the population size.

For the impact assessment of the PDHC, the Propensity Score Matching (PSM; Guo & Fraser, 2015) was used with the MatchIt package of the R software (R Core Team, 2021; Ho et al., 2011). The PSM allows estimating the causal effects of a treatment after performing a pairing between the sample units closest to each group (in this case, the PDHC beneficiaries and the control group) using a set of covariates (Gertler et al., 2018). The covariates used for pairing were *(i)* the Brazilian federative state in which the agricultural unit is located, *(ii)* the area of the agricultural unit, *(iii)* the number of family members who work in agricultural activities, *(iv)* whether the agricultural unit is composed only by the head of household or a couple (head of household and the spouse), and *(v)* whether the technical assistance services were provided by public or private companies.

After pairing the families as established above, the impact of the PDHC was evaluated for 16 economic indicators: 1) total agricultural income; 2) monetary agricultural income; 3) agricultural income from self-consumption; 4) monetary income from animal production; 5) monetary income from animal production derivatives; 6) monetary income from plant production; 7) monetary income from plant production derivatives; 8) monetary income from nonagricultural activities; 9) total annual income; 10) *per capita* annual income; 11) number of heads of pigs; 12) number of heads of poultry; 13) number of heads of goats; 14) number of heads of sheep; 15) number of heads of cattle; and 16) number of heads of horses, asses, and mules.

For each of the 16 indicators above, 2 impact assessments were performed, one between BG and CG and the other between BF and CF. This procedure resulted in 32 PDHC impact assessment tests. For each of the 32 impact assessment tests, a new pairing was performed among the sample units, according to the PSM evaluation method, which can generate differences between the mean and standard deviation values of a given variable (e.g., total annual income) between the control groups (CG and CF) in comparisons with the two types of beneficiaries (BG and BF). Finally, a *t*-test was used for dependent samples to evaluate the impact of PDHC after pairing of agricultural units.

OUTCOMES

The PDHC was able to reach the most vulnerable population. The average area of the establishments is 4.6 ha (median area of 2 ha); approximately 40% of the farmers do not have the title/possession of the land, and approximately 75% of the heads of household do not have complete elementary education or even have no education, which is a typical pattern of families in the semiarid region (Silva et al., 2020). The family composition of the beneficiaries can be generalized as follows. They have between 2 and 4 members (average of 3.4 people per family), aged 30–59 years (heads of household and spouses with an average age of 46 and 44 years,

respectively), and most families have two active members in agriculture, mostly developed by the couple (approximately 65% of cases).

Agricultural income was calculated using three formats: *(i)* monetary agricultural income (commercialized), *(ii)* agricultural income from production for family consumption (self-consumption), and *(iii)* total agricultural income (sum of the previous two). The monetary agricultural revenue considered all that was obtained from the sale of the products of the agricultural unit throughout 2021. However, the agricultural income from self-consumption considered the financial expenses avoided throughout the year 2021, through the consumption of foods of animal or vegetables produced in the agricultural unit itself and intended for family consumption[2]. Finally, the total agricultural income consists of the sum of the incomes obtained in the sales component and the monetized value of the portion of the production consumed by the family. The PDHC had a significant impact on these three income components, both considering BG and BF, with higher incomes for the beneficiaries, ranging from 10.67% to 48.27% in relation to the control groups (Table 2). The greatest impacts observed occur among the beneficiaries who also accessed the rural funding program (BF).

To calculate the "total annual income" were added to the income from production (above 'total agricultural income'), revenues from external work (temporary or permanent), and government transfers (family allowance, emergency aid, retirement, alimony, etc.) obtained throughout the year of 2021 by all family members. The annual *per capita* income consists of the total annual income divided by the number of family members. Both for total annual income and *per capita* annual income, the PDHC had a significant impact only for the BF group, that is, those who received the cash transfers from funding program. One of the causes of the insignificant difference with the overall beneficiary (BG) is that farmers in both groups received emergency aid benefits due to the COVID-19 pandemic this year, leveling their incomes at the same level. For the total annual income, BF presented income 11.28% higher than the CF, while for the annual *per capita* income, BF presented income 13.59% higher than the CF (Table 2).

Table 2. Outcomes of the analysis of the impact of PDHC II on the annual incomes (in R$) of families

Type of Income	Groups	Average Income (R$)		Difference (R$)	Effect (%)	*P*
		B	C			
Total Agricultural Income	BG x CG	5,157.03	4,433.02	724.00	16.33	**< 0.001**
	BF x CF	5,121.83	3,932.96	1,188.88	30.23	**< 0.001**
Monetary Agricultural Revenue	BG x CG	2,217.93	1,757.22	460.71	26.22	**< 0.001**
	BF x CF	2,194.73	1,480.07	714.66	48.29	**< 0.001**
Agricultural Income from Self-Consumption	BG x CG	2,904.17	2,624.24	279.93	10.67	**0.001**
	BF x CF	2,923.99	2,212.59	711.40	32.15	**< 0.001**
Total Annual Income	BG x CG	19,273.16	18,714.99	558.17	2.98	0.184
	BF x CF	19,619.88	17,631.49	1,988.39	11.28	**0.002**
Annual *Per Capita* Income	BG x CG	6,567.41	6,377.31	190.10	2.98	0.249
	BF x CF	6,439.44	5,669.20	770.24	13.59	**0.001**

Note: BG = beneficiaries in general; CG = general control group; BF = beneficiaries with cash transfers from funding program; CF = control group with cash transfers from funding program; B = group of beneficiaries; C = control group; P = significance of the difference obtained through the t-test (significant values in bold).
Source: Research outcomes

For the calculation of revenue from the trading of livestock production or its derivatives (e.g., the sale of milk and eggs), plant production and derivatives (e.g., sale of rapadura, molasses, fruit jelly, and cassava flour) and revenue from nonagricultural activities (e.g., handicrafts and tourism) obtained throughout the year 2021 were also considered. The PDHC had a significant

[2] The monetary values of this production were declared by the interviewees.

impact on the income of animal and plant production, both for BG (difference of 20.09% and 25.26% of the income of the CG, respectively) and BF (difference of 61.50% and 89.52% of the income of the CF, respectively). Moreover, the group of beneficiaries who accessed the funding program presented even larger impacts (Table 3). Revenues from nonagricultural activities and animal or plant production did not show significant differences between beneficiary and control groups, as they were not the focus of attention of the technicians who provided the ATER services.

Table 3. Outcomes of the analysis of the impact of PDHC II on the annual income (in R$) of nonagricultural productions and activities

Type of Income	Groups	Average Income (R$)		Difference (R$)	Effect (%)	*P*
		B	C			
Animal production	BG x CG	1,127.02	938.44	188.58	20.09	**0.012**
	BF x CF	1,196.49	740.86	455.64	61.50	**< 0.001**
Derivatives of Animal Production	BG x CG	543.57	435.52	108.05	24.81	0.081
	BF x CF	458.76	305.96	152.80	49.94	0.061
Plant Production	BG x CG	322.84	257.73	65.11	25.26	**0.040**
	BF x CF	380.30	200.67	179.63	89.52	**< 0.001**
Derivatives of Plant Production	BG x CG	37.77	43.41	−5.63	−12.98	0.641
	BF x CF	44.75	64.11	−19.36	−30.20	0.418
Non-Agricultural Activities	BG x CG	51.11	35.62	15.49	43.48	0.196
	BF x CF	56.32	24.31	32.01	131.67	0.065

Note: BG = beneficiaries in general; CG = general control group; BF = beneficiaries with cash transfers from funding program; CF = control group with cash transfers from funding program; B = group of beneficiaries; C = control group; P = significance of the difference obtained by means of the t-test (significant values in bold).
Source: Research outcomes

For the evaluation of the size of the herds (pigs, poultry, goats, sheep, cattle and horses, asses, and mules), the number of heads existing in the agricultural units on December 31, 2021, was considered. The PDHC had a significant impact on the size of pig and poultry farming, both for BG (difference of 28.02% and 37.17% in relation to CG rearing, respectively) and BF (difference of 54.75% and 70.65% in relation to CF rearing, respectively). As previously observed, the group of beneficiaries with access to cash transfers from funding program had the largest impact (Table 4). Notably, the other types of rearing did not present significant differences between beneficiary and control groups, suggesting that the ATER actions focused on the production of protein aimed at the family's consumption, such as pigs and poultry.

Table 4. Outcomes of PDHC II impact analyses on herd size (number of heads as of Dec. 31, 2021)

Creations	Groups	Average (number of heads)		Difference (number of heads)	Effect (%)	*P*
		B	C			
Pigs	BG x CG	2.210	1.726	0.484	28.02	**0.001**
	BF x CF	2.084	1.347	0.737	54.75	**< 0.001**
Poultry	BG x CG	18.770	13.684	5.086	37.17	**< 0.001**
	BF x CF	21.906	12.837	9.069	70.65	**< 0.001**
Goats	BG x CG	2.555	2.498	0.057	2.27	0.868
	BF x CF	1.320	1.431	−0.111	−7.76	0.740
Ovine	BG x CG	2.583	2.372	0.210	8.86	0.452
	BF x CF	1.542	1.035	0.507	48.94	0.074
Cattle	BG x CG	1.696	1.800	−0.104	−5.75	0.485
	BF x CF	1.614	1.591	0.024	1.48	0.921
Horses, Donkeys, and Mules	BG x CG	0.319	0.314	0.005	1.61	0.842
	BF x CF	0.311	0.258	0.054	20.92	0.159

Note: BG = beneficiaries in general; CG = general control group; BF = beneficiaries with cash transfers from funding program; CF = control group with cash transfers from funding program; B = group of beneficiaries; C = control group; *P* = significance of the difference obtained through the t-test (significant values in bold).
Source: Research outcomes

DISCUSSION

Focusing on rural poverty in the Brazilian semiarid region, the PDHC succeeded in bringing technical assistance to these farmers, generating a positive and significant impact on their production, both the portion destined to support the family and the surpluses traded, in line with other studies that also show the positive effects of technical assistance (Rocha Junior et al., 2020). The results were more important for families who also had access to the resources of rural funding program for small productive investments (Mesquita et al., 2021). Notably, PDHC served the public in a condition of extreme vulnerability, subject to prolonged droughts in the semiarid region, environmental degradation, and in conditions of poverty or extreme poverty.

These results contest two common myths in Brazilian political circles. The first myth coming from the phase of "productivism diffusionism" states that technical assistance and rural extension have great difficulty in reaching the poorest farmers. The PDHC showed that this is possible, provided that the methodology of approach, the recommended technology, and the focus of the program are very well delineated and publicized (Castro, 2015). The second myth is that bringing technical assistance and rural extension to poor families has no effect, and these farmers should receive only social policies, especially cash transfer programs (Buainain et al., 2013). The results showed that these farmers responded to the stimuli of technical guidance and achieved significant increases in their production. Those who believe in this second myth, could still replicate it by arguing that the increase obtained in terms of economic value is small, since they are small productions from poor families. However, in our view, the program managed to insert these families into a virtuous cycle of production (Mattei, 2014), including the generation of commercialized surpluses, thus breaking the vicious cycle of poverty that they were experiencing, opening new future possibilities for economic growth and productive insertion (Rocha, 2013). Nevertheless, it is important to note that other studies indicate that spending on technical assistance is a means of achieving greater results with fewer resources (Ruprah & Marcano, 2009).

The productive increase achieved by families with the receipt of technical assistance was only a beginning since the vast majority had never received technical guidance (Cruz et al., 2021). This explains why production has increased; however, an increase in derivatives of plant or animal production has not been observed as the production of derivatives requires larger scale and collective organization of these farmers. Therefore, time is needed for producers to learn and for the maturation of productive projects [see, for example, DelGrossi et al. (2020)].

The choice of technical assistance to stimulate the production of small animals, such as poultry and pigs, was also right, meeting the food security needs of these families, in addition to the ability of these farms to adapt to the edaphoclimatic conditions of the semiarid (Milhorance et al., 2018).

Furthermore, a noteworthy aspect in this impact assessment is that, during the period of execution of the project, the COVID-19 pandemic occurred, which caused the temporary interruption of many planned technical assistance actions. Despite advances in communication, the lack of internet access in rural areas limit the possibilities of virtual assistance, for continuity of the guidelines planned in the service plans for farmers (Futemma et al., 2021). Even with this challenge, the impacts of the program were significant.

One of the limitations of this evaluation is the difficulty in explaining why only the families that received the cash transfers from funding program had a significant increase in household income and *per capita* income. One hypothesis for future investigation is that the receipt of the Emergency Aid Program, resulting from the COVID-19 pandemic in 2021, raised all family incomes to the same level (Cardoso, 2020), that is, both the PDHC beneficiary families and the control group. To prove this hypothesis, it would be necessary to monitor the income performance of these families in the following years when this emergency aid was reduced.

The positive impact of technical assistance and rural extension for these poor families, especially when associated with the rural funding program, points to the opportunity for the continuity of technical assistance and rural extension actions of a productive nature for farmers, adapted to the conditions of the Brazilian semiarid region (Sabourin, 2021), mainly when the objectives of public policies focus on the eradication of hunger and poverty.

CONCLUSIONS

This impact assessment demonstrates that the Dom Hélder Câmara Program (PDHC) has achieved its intended objectives, bringing technical assistance and rural extension (ATER) to the most vulnerable population, favoring productive growth, and, consequently, leading to higher incomes. ATER activities can change the lives of family farmers in the Brazilian semiarid region for the better, as demonstrated in this study.

When the association of ATER with rural funding program occurs, the life of family farmers is further improved. For example, in all the indicators analyzed, the beneficiaries who received funding showed larger differences in relation to the control group, including in the pig and poultry herd. Therefore, the importance of associating ATER and cash transfers from funding program with future actions should be emphasized.

Finally, two uncertainties not answered in this impact assessment can be highlighted, which are presented in the form of questions. Was the time elapsed between the actions of ATER (including or excluding the cash transfers from funding program) and the impact assessment sufficient to assess all the benefits intended by the PDHC? If this response period was short, even for a small part of the beneficiaries, the impact generated by the PDHC was probably even larger than presented in this document. The second question is how long should the positive impacts generated by PDHC last? Recalling the guidelines of the PNATER, which defines ATER as a strategy of nonformal education of a continuous nature, it is crucial to reassess the families served in the near future and, if necessary, the continuity and expansion of the offer of ATER and access from funding program for family farmers in the Brazilian semiarid region.

This continuity, in addition to increasing the articulation of instruments such as Promotion and ATER, should promote, as the PNATER itself guides the work with rural extension, with the perspective of going beyond the productive dimension and including the social, political, and environmental dimensions in the strategies aiming the sustainable rural development.

ACKNOWLEDGEMENTS

The research was supported by the coordination of the Dom Hélder Câmara Program of the Ministry of Agriculture and Livestock (MAPA); the International Fund for Agricultural Development (IFAD); and the University of Brasília. To the MDA Research institute for data collection. The authors thanks Cecilia Fujita dos Reis and Ulatus, for proofreading and translating the text, respectively. The authors also thank all collaborators of the Center for Management and Innovation of Family Farming (CEGAFI) who made this research possible.

REFERENCES

Abramovay, R. (1998). Agricultura familiar e serviço público: novos desafios para a extensão rural. *Cadernos de Ciência & Tecnologia*, *7*(1), 137-157. Retrieved in 2023, June 05, from https://seer.sct.embrapa.br/index.php/cct/article/view/8932

Aquino, J. R., Gazolla, M., & Schneider, S. (2018). Dualismo no campo e desigualdades internas na agricultura familiar brasileira. *Revista de Economia e Sociologia Rural*, *56*(1), 123-142. http://dx.doi.org/10.1590/1234-56781806-94790560108.

Ávila, M. L., & Miranda Filho, R. J. (2022). *Contribuição do Projeto Dom Helder Câmara para fortalecimento da autonomia das mulheres e a segurança alimentar via serviços de ATER*. Retrieved in 2023, June 05, from https://monitora.cegafiunb.com/wp-content/uploads/2022/12/projeto-monitora-Genero-ATER-e-Seguranca-Alimentar.pdf

Balem, T. A. (2015). *Extensão e desenvolvimento rural*. Retrieved in 2023, June 05, from http://estudio01.proj.ufsm.br/cadernos_fruticultura/segunda_etapa/extensao_desenvolvimento_rural.pdf

Brasil. (2006, July 24). Lei no 11.326, de 24 de julho de 2006. Estabelece as diretrizes para a formulação da Política Nacional da Agricultura Familiar e Empreendimentos Familiares Rurais. *Diário Oficial [da] República Federativa do Brasil*, Brasília. Retrieved in 2023, June 05, from http://www.planalto.gov.br/ccivil_03/_Ato2004-2006/2006/Lei/L11326.htm

Brasil. (2010, January 11). Lei no 12.188, de 11 de janeiro de 2010. Institui a Política Nacional de Assistência Técnica e Extensão Rural para a Agricultura Familiar e Reforma Agrária – PNATER e o Programa Nacional de Assistência Técnica e Extensão Rural na Agricultura Familiar e na Reforma Agrária – PRONATER. *Diário Oficial [da] República Federativa do Brasil*, Brasília. Retrieved in 2023, June 05, from https://www.planalto.gov.br/ccivil_03/_ato2007-2010/2010/lei/l12188.htm

Brasil. (2017, May 31). Decreto no 9.064, de 31 de maio de 2017. Dispõe sobre a Unidade Familiar de Produção Agrária, institui o Cadastro Nacional da Agricultura Familiar e regulamenta a Lei nº 11.326, de 24 de julho de 2006, que estabelece as diretrizes para a formulação da Política Nacional da Agricultura Familiar e empreendimentos familiares rurais. *Diário Oficial [da] República Federativa do Brasil*, Brasília. Retrieved in 2023, June 05, from http://www.planalto.gov.br/ccivil_03/_Ato2015-2018/2017/Decreto/D9064.htm

Brasil. Ministério da Agricultura e Pecuária. (2023a). Retrieved in 2023, January 17, from https://www.gov.br/agricultura/pt-br/assuntos/agricultura-familiar/projeto-dom-helder-camara

Brasil. Ministério da Agricultura e Pecuária. (2023b). Retrieved in 2023, January 17, from https://www.gov.br/agricultura/pt-br/assuntos/agricultura-familiar/dap

Brasil. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. (2023c). Retrieved in 2023, January 17, from https://www.gov.br/pt-br/servicos/consultar-dados-do-cadastro-unico-cadunico

Brasil. Ministério do Desenvolvimento e Assistência Social, Família e Combate à Fome. (2023d). Retrieved in 2023, January 17, from https://www.gov.br/cidadania/pt-br/acoes-e-programas/inclusao-produtiva-rural/programa-fomento-rural

Buainain, A. M., Alves, E., Silveira, J. M., & Navarro, Z. (2013). Sete teses sobre o mundo rural brasileiro. *Revista de Política Agrícola*, *22*(2), 1-25.

Caporal, F. R., & Costabeber, J. A. (2006). Segurança alimentar e agricultura sustentável: uma perspectiva agroecológica. *Cadernos de Agroecologia*, *1*(1), 1-8. Retrieved in 2023, June 05, from https://docplayer.com.br/14176543-Seguranca-alimentar-e-agricultura-sustentavel-uma-perspectiva-agroecologica-caporal-francisco-roberto-costabeber-jose-antonio.html

Cardoso, B. B. (2020). A implementação do auxílio emergencial como medida excepcional de proteção social. *Revista de Administração Pública*, *54*(4), 1052-1063.

Castro, C. N. (2015). Desafios da agricultura familiar: o caso da assistência técnica e extensão rural. Boletim Regional. *Urbano e Ambiental*, *12*, 49-59.

Castro, C. N., & Pereira, C. N. (2017). *Agricultura familiar, assistência técnica e extensão rural e a política nacional de ATER*. Retrieved in 2023, June 05, from https://repositorio.ipea.gov.br/handle/11058/8114

Cruz, N. B., Jesus, J. G., Bacha, C. J. C., & Costa, E. M. (2021). Acesso da agricultura familiar ao crédito e à assistência técnica no Brasil. *Revista de Economia e Sociologia Rural*, *59*(3), 1-20. http://dx.doi.org/10.1590/1806-9479.2021.226850.

Del Grossi, M. (2019). A identificação da agricultura familiar no Censo Agropecuário 2017. *Revista NECAT*, *8*(16), 46-61. Retrieved in 2023, June 05, from https://ojs.sites.ufsc.br/index.php/revistanecat/article/view/4316/3245

DelGrossi, M. E., Roitman, I., & Oliveira, L. G. (2020). Especialização produtiva e rendimentos nos assentamentos da reforma agrária no norte de Mato Grosso. *RP3 – Revista de Pesquisa em Políticas Públicas*, (Spe), 82-109. Retrieved in 2023, June 05, from https://periodicos.unb.br/index.php/rp3/article/view/34166

Dias, M. M. (2007). As mudanças de direcionamento da Política Nacional de Assistência Técnica e Extensão Rural (PNATER) face ao difusionismo. *Revista Oikos*, *18*(2), 11-21. Retrieved in 2023, June 05, from https://www.academia.edu/28322657/As_mudan%C3%A7as_de_direcionamento_da_Pol%C3%ADtica_Nacional_de_Assist%C3%AAncia_T%C3%A9cnica_e_Extens%C3%A3o_Rural_Pnater_face_ao_difusionismo

Diesel, V., Dias, M. M., & Neumann, P. S. (2015). PNATER (2004-2014): da concepção à materialização. In C. Grisa & S. Schneider (Orgs.), *Políticas públicas de desenvolvimento rural no Brasil* (pp. 107-128). Porto Alegre: Editora da UFRGS.

Diesel, V., Neumann, P. S., Dias, M. M., & Froehlich, J. M. (2021). Política de assistência técnica e extensão rural no Brasil: um caso de desmantelamento? *Estudos: Sociedade e Agricultura*, *29*(3), 597-634. http://dx.doi.org/10.36920/esa-v29n3-5.

Freire, P. (1983). *Extensão ou comunicação?* (Vol. 24). Rio de Janeiro: Paz e Terra.

Freitas, A. F., Freitas, A. F., & Dias, M. M. (2012). Mudanças conceituais do desenvolvimento rural e suas influências nas políticas públicas. *Revista de Administração Pública*, *46*(6), 1575-1597.

Futemma, C., Tourne, D. C. M., Andrade, F. A. V., Santos, N. M., Macedo, G. S. S. R., & Pereira, M. E. (2021). A pandemia da Covid-19 e os pequenos produtores rurais: superar ou sucumbir? *Boletim do Museu Paraense Emílio Goeldi. Ciências Humanas*, *16*(1), 1-18. http://dx.doi.org/10.1590/2178-2547-BGOELDI-2020-0143.

Gertler, P., Martinez, S., Rawlings, L. B., Premand, P., & Vermeersch, C. M. J. (2018). *Avaliação de impacto na prática* (2nd ed.). Washington, D.C.: Banco Interamericano de Desenvolvimento/Banco Mundial.

Grisa, C., & Schneider, S. (2014). Três gerações de políticas públicas para a agricultura familiar e formas de interação entre sociedade e estado no Brasil. *Revista de Economia e Sociologia Rural*, *52*(1, Suppl.), 125-146.

Guo, S., & Fraser, M. W. (2015). *Propensity score analysis* (2nd ed.). Retrieved in 2023, June 05, from https://books.google.com.br/books?id=V3c2ngEACAAJ

Gurgel, R. F. S., Nunes, E. M., & Silva, V. M. (2022). A assistência técnica e extensão rural (ATER) da EMATER e do projeto Dom Helder Câmara (PDHC) no Território da Cidadania Sertão do Apodi, Rio Grande do Norte. *Extensão Rural*, *29*(1), e3.

Ho, D. E., Imai, K., King, G., & Stuart, E. A. (2011). MatchIt : nonparametric preprocessing for parametric causal inference. *Journal of Statistical Software*, *42*(8), 1-28. Retrieved in 2023, June 05, from https://www.jstatsoft.org/article/view/v042i08

Instituto Brasileiro de Geografia e Estatística – IBGE. (2017). *Agricultura familiar – resultados definitivos. Censo Agropecuário 2017 Brasil*. Retrieved in 2023, June 05, from https://censoagro2017.ibge.gov.br/templates/censo_agro/resultadosagro/pdf/agricultura_familiar.pdf

Kageyama, A. A., & Silva, J. G. (1983). Os resultados da modernização agrícola dos anos 70. *Estudos Econômicos*, *13*(3), 537-559. Retrieved in 2023, June 05, from https://www.revistas.usp.br/ee/issue/view/11059

Lotta, G. S. (2019). *Teoria e análises sobre implantação de políticas públicas no Brasil*. Brasília: ENAP.

Mattei, L. (2014). O papel e a importância da agricultura familiar no desenvolvimento rural brasileiro contemporâneo. *Revista Econômica do Nordeste*, *45*(5), 83-92. Retrieved in 2023, June 05, from https://www.bnb.gov.br/revista/index.php/ren/article/view/500

Mazoyer, M., & Roudart, L. (2010). *História das agriculturas no mundo: do neolítico à crise contemporânea*. São Paulo: NEAD/MDA.

Mesquita, P. S., Folhes, T., Novais, L. V., & Cavalcante, L. (2021). Impactos do Programa de Fomento na agricultura familiar do bioma Cerrado e sua relevância diante das mudanças climáticas: conclusões preliminares. *One Pager*, *474*, 1-2. Retrieved in 2023, June 05, from https://ideas.repec.org/p/ipc/opport/474.html

Milhorance, C., Sabourin, E., & Chechi, L. (2018). *Adaptação às mudanças climáticas e integração de políticas públicas no semiárido pernambucano*. Retrieved in 2023, June 05, from https://agritrop.cirad.fr/589431/7/589431.pdf

Morais, J. A., & Callou, A. B. F. (2017). Metodologias participativas e desenvolvimento local: a experiência do Projeto Dom Hélder Câmara no assentamento Moacir Lucena. *Interações*, *18*(13), 165-177. Retrieved in 2023, June 05, from https://www.scielo.br/j/inter/a/3vTZVzF4gScCL8FTVNjc9hq/?lang=pt

Peixoto, M. (2008). *Extensão rural no Brasil: uma abordagem histórica da legislação*. Brasília: Consultoria Legislativa do Senado Federal/Coordenação de Estudos.

R Core Team. (2021). *R: a language and environment for statistical computing*. Vienna: R Foundation for Statistical Computing. Retrieved in 2023, June 05, from https://www.r-project.org/

Rocha Junior, A. B., Silva, R. O., Peterle Neto, W., & Rodrigues, C. T. (2020). Efeito da utilização de assistência técnica sobre a renda de produtores familiares do Brasil no ano de 2014. *Revista de Economia e Sociologia Rural*, *58*(2), 1-16. http://dx.doi.org/10.1590/1806-9479.2020.19437.

Rocha, S. (2013). *Transferências de renda no Brasil: o fim da pobreza?* Rio de Janeiro: Elsevier.

Rodrigues, C. M. (1997). Conceito de seletividade de políticas públicas e sua aplicação no contexto da política de extensão rural no Brasil. *Cadernos de Ciência & Tecnologia*, *14*(1), 113-154. Retrieved in 2023, June 05, from http://www.alice.cnptia.embrapa.br/bitstream/doc/87857/1/Conceitodeseletividade.pdf

Roth-Deubel, A.-N. (2015). *Políticas públicas: formulación, implementación y evaluación* (11th ed.). Bogotá: Ediciones Aurora.

Ruprah, I., & Marcano, L. (2009). Does technical assistance matter? An impact evaluation approach to estimate its value added. *Journal of Development Effectiveness*, *1*(4), 507-528.

Sabourin, E. (2021). A implementação da ação pública de adaptação às secas no Nordeste semiárido. In E. Sabourin, L. M. R. Oliveira, F. Goulet & E. S. Martins (Orgs.), *A ação pública*

de adaptação da agricultura à mudança climática no Nordeste semiárido brasileiro (pp. 9-27). Rio de Janeiro: Rede Franco-Brasileira pelo Desenvolvimento Sustentável no Semiárido do Nordeste.

Silva, R. M. A., Aquino, J. R., Costa, F. B., & Nunes, E. M. (2020). Características produtivas e socioambientais da agricultura familiar no Semiárido brasileiro: evidências a partir do Censo Agropecuário de 2017. *Desenvolvimento e Meio Ambiente*, *55*, 314-338. http://dx.doi.org/10.5380/dma.v55i0.73745.

Valencia Perafán, M. E., & Walter, M. I. M. T. (2016). A percepção das condições de vida pelas populações dos territórios rurais, além das análises sobre o desempenho dos sistemas produtivos. *Revista NERA*, *19*(31), 72-90. http://dx.doi.org/10.47946/rnera.v0i31.3563.

Vargas, D. L., Aquino, J. R., & Carvalho, C. X. (2022). Assistência técnica, extensão rural e agricultura familiar no Nordeste: panorama, desempenho recente e desafios. *Revista Emancipação, 22*(Spe), 1-19.

Received: January 19, 2023.
Accepted: June 05, 2023.
JEL Classification: I38, Q18.