Socio-environmental impacts in the context of the Water Producer Program in the Federal District, Brazil[1].

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Abstract

This research is located within the framework of policy analysis, specially, constructivist paradigm called fourth generation evaluation (FGE). It aims collaborate with the question about opportunities, restrictions and learning in complex context as the environmental public policy in Brazil. In light of the Water Producer Program (PPA), a public policy designed by the National Water Agency (ANA) and which has been anchored in the Payment for Environmental Services (PSA) and legislation that regulates the rational use of water, with 12 years of implementation in Ribeirão Pipiripau basin in the Federal District, Brazil, this paper analyze how a constructivist approach such as socio-technical appropriateness (AST) can strengthen the program and capture the mutations operating in this reality. The PPA in the Ribeirão Pipiripau/DF basin has been implemented, from 2012 to 2019, 197 contracts on 177 properties with farmers from the rural centers of Pipiripau II, Santos Dumont and Taquara, a universe of 420 producers, covering an area of 13,337 ha (71% of the basin). With an approach focused on three technological modalities: soil conservation; restoration or conservation

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of Permanent Protection Areas and/or Legal Reserves and conservation of remnants of native vegetation, the project intends to universalize actions in a diverse and complex context both from the point of view of the socioeconomic profile of farmers and the activities carried out on the properties, as well as conflicts generated with the surrounding urban population. The Federal District currently ranks third in the ranking of the most populous cities in the country. The field research involved approximately one hundred producers, participants in the program, in the three rural centers involved, with the aim of capturing the learning of this public policy by the main actors involved in the process, the farmers. It has taken place from March 2023 to January 2024, covering the impacts of the post-pandemic, economic and climate crises. Semi-structured methodological instruments were used considering the research context. Several transformations were recorded in the period in question, including: in the main crops practiced in the basin, in regulations on land use and water. It is essential to incorporate farmers' perceptions of these processes. In that regard, the AST approach advocates participation, collective construction for and by farmers themselves, which strengthens the process and commits the actors involved, especially those who are directly involved in the daily life of water-producing environments. In this sense, the choice of a theoretical-methodological approach to construction and implementation that allows monitoring and feedback must guide and feed public policies.

Keywords: water; policy public; payment for environmental services; social-technical adequacy approach.

1. Introduction

The use of fresh water in the world grows by around 1% per year, placing agriculture as the sector with the highest consumption, approximately 70%, including irrigation, livestock and aquaculture activities (FAO, 2020). Brazilian agriculture consumes 60% of this resource when compared to industry, 17%, and municipalities,

23% (FAO, 2015). This unequal distribution has caused several socio-environmental conflicts around the world. The large metropolises stand out as they witness greater shortages and changes in the rainfall, supply and storage regime every day. The growth of urban populations requires greater investments in water use planning and changes in consumption patterns.

The Federal District currently ranks third in the ranking of the most populous cities in the country. Brasília experienced a water crisis between 2016 and 2018 that triggered conflicts over the use of water between human, animal and irrigating consumption (Balbino, 2020). During this period, the Descoberto reservoir began 2017 with only 22% of the useful volume, and the Santa Maria reservoir with 42%, considered the main reservoirs in the Federal District (ANA, 2019), a situation that triggered the rationing regime of water in the country's capital. Despite being located in seven river basins (Rivers: Descoberto, Maranhão, São Bartolomeu, Preto, Corumbá, São Marcos and Paranoá), the Federal District, due to the characteristic of being located in river headwaters, becomes a region rich in springs, but with a low volume of water (Christofidis, 2003; BRASIL, 2012).

Furthermore, it is inserted in the Cerrado Biome and in the heart of the Central Plateau, positioned as a watershed for three major Brazilian hydrographic regions (Tocantins-Araguaia, São Francisco and Paraná) (SEMARH, 2006). This is an important region for recharging aquifers that are supplied by the infiltration of rainwater into the soil, which feeds the water tables and returns to the surface through springs that will maintain the flow of rivers (SEMA, 2017). In this context, despite the wealth of springs, the Federal District is the third unit of the federation with the lowest surface water availability per capita per year, ahead only of Paraíba and Pernambuco (Lima; Silva, 2005; Rebouças, 2006). This situation raises awareness of the need for conservation actions in the face of the advancement of environmental impacts resulting from human actions and population growth, among other factors such as global warming and climate change.

Currently, the five Water Supply Systems (SAAs) are: Descoberto, Torto/Santa Maria, Brazlândia, São Sebastião and Sobradinho/Planaltina, where Descoberto is the largest of them, and supplies between 52 and 65% of the water consumed in the District

Federal (CAESB, 2019). In 2020, underground and surface abstractions from the five SAAs amounted to 251 trillion liters, serving 99% of the urban population of the Federal District (CAESB, 2021). It is important to consider that 97% of the population of the Federal District is in urban areas, while 3% resides in rural areas. Of these, 15% of the rural population is supplied by the general network, that is, the majority is not served and uses individual wells with low or no quality control (CODEPLAN, 2020).

In Brazil, an initiative by the National Water Agency (ANA), inaugurated a program called the Water Producer Program - PPA, in 2001, anchored on the provider-receiver principle, using financial incentives through Payment for Environmental Services (PSA). It is designed to reduce rural diffuse water pollution, targeting, in particular, strategic river basins for the nation. Its main objective is to reduce erosion, improve water quality and increase river flow, using mechanical and vegetative soil and water conservation practices, among other practices (ANA, 2008). The Federal District already has the experience of the population of the Ribeirão Pipiripau basin with the Water Producer Project, encouraged by ANA since 2001 and which has completed ten years of implementation. The Ribeirão Pipiripau basin covers an area of approximately 23,527 hectares, is located in the northeast of DF, bordering the municipality of Formosa, in the state of Goias, with the majority (90.3%) being located in the District and its main source is in the part of Góias.

Its official launch dates back to 2006 via a Technical Cooperation Agreement, under the coordination of a Project Management Unit (UGP) in which more than twenty governmental and non-governmental institutions participate (Lima; Ramos, 2018). This program, which completes 20 years of existence, has been implemented in several cities across the country, with the city of Extrema (MG) as its first experiment (Pereira et al, 2015).

One of the main problems in implementing these programs has been farmers' adherence (Pereira et al., 2015). The aforementioned authors cite the example of Ribeirão Pipiripau that of the 420 properties, at the time of this research, only 130 were willing to join and only 18 actually qualified. Lima and Ramos (2018) also reinforced this perception and considered that this was one of the main challenges of the process as there is no mandatory adherence, even though it was anchored in the Payment for

Environmental Services (PSA) instrument for farmers who generate/provide. /providers of these environmental services. Among the main actions carried out by the Pipiripau Water Producer Program are: recovery of degraded Permanent Preservation Areas (Matas de Galeria) and areas of native vegetation; protection of preserved remnants of native vegetation and encouragement of the use of less impactful agricultural practices and rational use of water, which includes the replacement of conventional irrigation systems with those that consume less water, as well as environmental education practices, among other related actions.

Melo (2013) pointed out as positive aspects of the PPA in Pipiripau, the PSA methodology itself as an incentive instrument, the change in the image of the farmer from "villain" to "partner" of preservation, the valorization of water protection, among others. The following weaknesses were highlighted: the interaction of the institutions that make up the Technical Cooperation Agreement and their actions in the process, the slowness in preparing Individual Property Projects (PIPs) that compete with the usual activities of Emater/DF professionals, the delay in beginning of the actions, the conflict experienced by farmers in dividing their time between new conservation activities and the usual ones linked to production, make up this mosaic of challenges facing this new public policy.

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2. Metodology

This research is located within the framework of policy analysis, specially, constructivist paradigm called fourth generation evaluation (FGE). Semi-structured methodological instruments were used considering the research context with adaptations (Guba and Lincoln, 1989).

To start field work with farmers participating in the Water Producer Program (PPA), information relating to the 197 adhesion contracts was systematized in the

ADASA (Water, Energy and Sanitation Regulatory Agency of the Federal District) database, including the inspections carried out on them, from 2012 to 2019. Based on this systematization, socioeconomic and environmental criteria were developed, covering the size of the property area; soil type, according to the mapping carried out in the basin and the distribution in the three rural areas – Pipiripau II, Santos Dumont and Taquara. The objective was to capture the diversity present in the basin's landscape, such as the type of agriculture developed (family farming and/or agribusiness); forms of land use (grains, vegetables) among other aspects. From this universe, it was selected approximately 100 farmers and applied a semi-structured questionnaire, aiming to characterize the context, the plurality of actors and interests involved in the program (agents and beneficiaries) (Silva and Borges, 2020). It has taken place from March 2023 to January 2024, covering the impacts of the post-pandemic, economic and climate crises.

The PPA in the Ribeirão Pipiripau/DF basin has been implemented, from 2012 to 2019, 197 contracts on 177 properties, covering an area of 13,337 ha (71% of the basin). With an approach focused on three technological modalities, namely, soil conservation (MI), with 3701 ha involved, representing 71% of the total area; restoration or conservation of Permanent Protection Areas and/or Legal Reserves (MII), with 1305 ha, representing 25% of the total project area and conservation of remnants of native vegetation (MIII), with 236 ha, reaching 4% of the process, the project intends to universalize actions in a diverse and complex context, both from the point of view of the socioeconomic profile of farmers and the activities carried out on the properties.

3. Context of Ribeirão Pipiripau

Seven basins bathe Federal District – Paranoá, São Bartolomeu, Descoberto, Corumbá and São Marcos – hydrographic region of Paraná; Rio Preto – São Francisco hydrographic region and Maranhão – Tocantins/Araguaia hydrographic region (SEMARH, 2006). Of the seven basins, the greatest water demand is from the urban population. Only, in the São Marcos River (98%) and Rio Preto (86%) basins, water for irrigation is in greater demand. Ribeirão Pipiripau makes up the São Bartolomeu River basin, 35% of whose water demand corresponds to irrigation (CODEPLAN, 2020). The basin has two conservation areas: Reserva dos Pequizeiros, in the Santos Dumont rural

nucleus, and Parque Vivential Cachoeira do Pipiripau. And it supplies an urban population of 180,000 inhabitants (PPA, 2010).

Federal District has 5,246 agricultural establishments. Planaltina is one of the main food producing administrative regions of the Federal District, along with Brazlândia, Paranoá, Ceilândia, São Sebastião, Gama and Sobradinho I and II, having 22.7% of the number of producers. Among the main crops are grains (beans, corn, millet, soybeans, sorghum, wheat), horticulture (tomatoes and peppers, mainly, among others), fruits (avocado, banana, etc.), products of animal origin such as beef fertile birds and eggs (EMATER, 2022).

Diversity and heterogeneity is what characterizes farmers living in the Ribeirão Pipiripau basin region, with the majority of public land ownership. This region was colonized in the early 1960s. The majority of farmers who participate in the Water Producer Program do not have title to the land, paying an annual fee for granting the right to use/lease, with lots and farms ranging from 3 .30 to 450 hectares. The main crops, in the three rural areas that make up the project, are grains and vegetables, but you can find all types of crops, pastures, animal husbandry and even grass cultivation for gardening. Of the 80 farmers interviewed, 30 makes their living from agriculture as a profession and the majority have hired labor, working in other areas such as public service or businesspeople in other sectors.

It was observed that in the last ten years there has been a progressive replacement of vegetable cultivation with grains, either through the leasing of farms or the incorporation/acquisition of properties by other owners. Farmers argue that vegetable production costs have risen enormously in recent years, especially due to the high cost of labor and inputs. This process greatly aggravates the use of mechanical soil conservation practices, in particular, the removal of terraces for the use of agricultural machinery, which leads to the degradation of water resources, as well as the removal of native vegetation. Of the 80 properties visited, only 13 were identified as modality III - surplus native vegetation. Several reasons can explain the presence of this modality, including: areas not suitable for mechanization, properties whose main function is not production and farmers who have larger properties.

4. Farmers' perceptions of the Water Producer Program

Farmers received Payment for Environmental Services (PSA) in accordance with the agricultural practices implemented on their properties, some of which they already practiced such as contour lines and direct planting; others, especially mechanical ones, built by government agencies. Below is a list of practices that were remunerated by the PSA.

MODALITY I		
Practices	Area (ha)	Propriedades
Fallow	4,16	2
Retention basin, transverse corrugations, terraces	181,16	126
Direct planting,	1.381,03	42
Level planting	1.208,47	148
Pasture recovery	841,96	100
Crop rotation	66,34	6
No recommendation practice	21,23	44
Total	**3.704,347**	

MODALITY II		
Practices	Area (ha)	Propriedades
Livestocks, fences	350,28	77
Enrichment, plantation seedlings	290,9	142
Natural regeneration	630,94	119
No recommendation practice	31,95	17
Total	**1.304,07**	

MODALITY III		
Practices	Area (ha)	Propriedades
Natural regeneration	138,07	26
Livestocks, fences	91,13	19
No recommendation practice	6,89	2
Total	**236,09**	

In Modality I, 177 properties participated, making a total of 3,708 ha, in Modality II, 173 properties, covering an area of 1,305 ha and in Modality III, 46 properties with 236 ha. The farmers' perception is that they were not heard even in the conception, much less in the implementation of the process, especially in modality II of the program, which was implemented by government agencies and outsourced

companies without considering planting season, rainy season, qualities techniques of distributed seedlings, among other factors that greatly harmed the results of the project.

In modality I, 177 properties participated, making a total of 3,708 ha, in modality II, 173 properties, covering an area of 1,305 ha and in modality III, 46 properties with 236 ha. The farmers' perception is that they were not heard either in the conception or in the implementation of the process, especially in modality II of the program, which was implemented by government agencies and outsourced companies without considering planting season, rainy season, technical qualities of the distributed seedlings, among other factors that greatly harmed the project results. Several government bodies and non-governmental organizations participate in the program management unit (UGP), but none of the farmers interviewed participate in this space for building the PPA, nor do the farmer organizations that are in rural centers. In this space, the activities to be developed are managed through working groups and the body responsible for secretariat and conducting the process, ADASA.

Considerações finais

It is essential to incorporate farmers' perceptions of these processes. In that regard, the AST approach advocates participation, collective construction for and by farmers themselves, which strengthens the process and commits the actors involved, especially those who are directly involved in the daily life of water-producing environments. In this sense, the choice of a theoretical-methodological approach to construction and implementation that allows monitoring and feedback must guide and feed public policies.

In this sense, it is understood that standardization in the form and content of these actions has been hampering the understanding of the importance of the process as well as the continuity of actions at the time of finalizing contracts.

From the methodology point of view, we are in the phase that could be identified as phase 3, identifying the main beneficiaries and their interests. The next phase is the construction of learning collectively with the agents who formulated public policy and farmers. At this stage, everyone will be involved to share the findings that involve other

agronomic assessments and indices that evaluate the management practiced by farmers and that concern soil quality.

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