

Mapping Native Seed Banks of Communities in Piemonte Norte do Itapicuru, Bahia, Brazil

Mapeamento de Bancos Comunitários de Sementes Crioulas no Território de Identidade Piemonte Norte do Itapicuru

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ABSTRACT - Native Seed Banks of Communities (SBC) are one of the important social technologies that enables the coexistence with the climate in the Semiarid region of Brazil. These banks can supply appropriate seeds due to the genetic improvement carried out by farmers over generations, in addition to the traditional knowledge associated with them. The poor water distribution in part of the states in the Northeast region of Brazil makes family farmers to depend on rainfall and adapted seeds to grow viable crops. In this sense, native seeds are the most suitable due to their robustness and ideal adaptation to the environment and cultivation systems used in the region. Moreover, the conservation of native seeds in germplasm banks is an important strategy for minimizing the impacts of conventional agriculture. Thus, the objective of this study was to map seed banks of communities within the Piemonte Norte do Itapicuru Territory, state of Bahia, Brazil. The research was carried out during the COVID-19 pandemic and presented a qualitative character through a study case methodology. The steps for data collection were: identification of SBC through information from technical advisory entities; georeferencing of the SBC locations; and description of SBC specificities. Eight seed banks were mapped, distributed in three municipalities: Antonio Gonçalves, Campo Formoso, and Pindobaçu. Although the territory is composed of nine municipalities, six of them do not have this technology.

Keywords: Native seeds. Agroecology. Rural communities. Plant genetic resources. Remote sensing.

Conflict of interest: The authors declare no conflict of interest related to the publication of this manuscript.



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RESUMO - O uso de Bancos Comunitários de Sementes (BCS) crioulas constitui-se como uma das importantes tecnologias sociais determinantes para a convivência com o semiárido. Tal estratégia apoia-se no fato de que, tais bancos possibilitam a oferta de sementes apropriadas, em virtude da seleção realizada pelos agricultores ao longo de gerações, bem como de todo conhecimento tradicional associado. Considerando a má distribuição hídrica que acomete em parte dos estados da Região Nordeste do Brasil, os agricultores familiares dependem das chuvas, bem como de sementes adaptadas para viabilizar seus cultivos. Nesse cenário, em razão da rusticidade, as sementes crioulas, são as mais adequadas, pois elas são perfeitamente adaptadas ao clima e ao sistema de cultivo utilizado. Diante dessa problemática, visando minimizar os impactos ocasionados pela agricultura convencional, a citar: a redução da agrobiodiversidade, disponibilidade de sementes no momento adequado para a semeadura, uma das estratégias adotadas é a conservação do germoplasma em bancos ou casa de sementes. O presente estudo teve como objetivo mapear os Bancos Comunitários de Sementes no Território de Identidade Piemonte Norte do Itapicuru, localizado no estado da Bahia. A pesquisa foi realizada durante a pandemia da COVID-19 e apresentou caráter qualitativo, sendo utilizada como metodologia de investigação o estudo de caso. A coleta de dados foi realizada em três etapas e como resultado, foram mapeados oito bancos, distribuídos em três municípios sendo estes: Antônio Gonçalves, Campo Formoso e Pindobaçu. Apesar de o território ser composto por nove municípios percebe-se que seis destes não utilizam essa tecnologia.

Palavras-chave: Sementes crioulas. Agroecologia. Comunidades rurais. Recursos genéticos vegetais. Sensoriamento remoto.

INTRODUCTION

The main characteristic of the semiarid region of Brazil is its irregular rainfall distribution, which often leads to water deficit for crops, especially those under rainfed conditions. Thus, irregularities in the agricultural production in the region are common, since this activity is dependent on rain and is greatly responsible for the food security and sovereignty of family farming, whose production is intended not only for own consumption but for sale (TEIXEIRA; PIRES, 2017; SILVA et al., 2019).

In this region, rainfed agriculture is characterized by the cultivation of perennial and annual species (ROCHA et al., 2020).

Long drought periods in the semiarid region of northeastern Brazil caused an agricultural production stagnation in 1980, leading many farmers to adhere to the packages of the green revolution. These packages were based on obtaining greater productivity in crops, guiding the practice of monoculture using genetically improved seeds and high solubility products for soil fertilization and control of pests and diseases (MADEIRA et al., 2019).

Dutra and Souza (2017) state that the impacts and damage caused by this agricultural modernization, based on high solubility inputs, have put life on planet earth at risk. End hunger, achieve food security and improved nutrition, and promote sustainable agriculture is Goal 2 in the Sustainable Development Goals of the United Nations Development Program – PNUD (2015). Thus, family farmers have focused on agroecological production to avoid agrobiodiversity loss, human and environmental contamination by pesticides, and genetic erosion of native seeds (ASSUNÇÃO NETO et al., 2022; RAMIREZ, 2022; PÁDUA, 2018).

In this sense and considering the negative effects of the agricultural modernization, which is not suitable for the semiarid region of Brazil due to its irregular water availability, implementing native seed banks in communities (SBC) is an alternative for assisting family farmers to provide the continuous existence of genetic resources of native plant species and availability of all the traditional knowledge associated with them (AS-PTA 2016; PAULINO; RAMONILDES, 2015; BALENSIFER; SILVA 2016; SANTOS; CAMPOS, 2021).

SBC in the Northeast region of Brazil are extremely important for strengthening family farming and for its coexistence with the semiarid environmental conditions, enabling the preservation, conservation, and multiplication of native seeds adapted to the environment and production managements usually practiced for them (ALMEIDA et al., 2020). Seed banks can provide to family farmers greater autonomy in their production processes, as the availability of seeds of native species—genetically improved by farmers over generations or by natural selection as response to the environmental effects—prevent them to use genetically modified material and external inputs (CURADO et al., 2020). In this sense, SBC have brought attention to rural communities and improved their social, cultural, political, environmental, and economic expression (NASCIMENTO; EHRICH; MOREIRA, 2012).

The precise indication of the location of these seed banks provides easy access for traditional farmers who wish to obtain native seeds. Additionally, it provides visibility and availability of these establishments to researchers and visitors, enabling exchanges and access to markets and public policies. Therefore, the objective of this study was to map the geographic distribution of seed banks of communities within the Piemonte Norte do Itapicuru Territory (PNIT), state of Bahia, Brazil.

MATERIALS AND METHODS

Data collection consisted of the following steps: identification of the existence and addresses of native seed bank of communities (SBC) through interview by instant

messages; georeferencing of SBC by field data collection using a GPS; characterization of SBC, from the perspective of their representatives.

The maps were developed in the software QGIS 3.16.9, using satellite images from Google Earth Pro 2021; the geographic coordinates (UTM Zone 24S) were obtained through the Geocentric Reference System for the Americas - SIRGAS 2000, using the cartographic base of the Brazilian Institute of Geography and Statistics (IBGE, 2020). The research was carried out from September to November, 2021, focused on seed banks in communities within the Piemonte Norte do Itapicuru Territory (PNIT), Bahia, Brazil (Figure 1). The PNIT is within the Brazilian semiarid region; it has an area of 14,123 km² and a demographic density of 20.1 inhabitants per km² (IBGE, 2020). The territory was delimited by the Superintendency for the Development of the Northeast (SUDENE), specifically encompassing the Central-North region of the State of Bahia. It borders the Sertao do Sao Francisco Territory (to the North), Sisal Territory (to the East), and Piemonte da Diamantina Territory (to the West and South).

A semiarid climate is dominant in the region, with Thornthwaite moisture index equal to or less than 0.50 (LORENÇONE et al, 2022). This index is used to indicate the arid condition of an environment: the lower the index, the higher the susceptibility to desertification. The mean annual rainfall is at most 800 mm and daily percentage of water deficit is at most 60%, considering all days of the year (SUDENE, 2017).

Considering the new coronavirus pandemic, the initial contacts for identifying rural communities that have seed banks were made by mobile phones and instant messaging applications, following the guidelines of the World Health Organization to prevent the spread of the virus and contamination among people.

hus, interviews were done through instant messages. According to Lannutti (2019), instant messaging offers researchers a convenient and low-cost tool to conduct interviews with one or more participants.

Thirty-one participants were interviewed between July and October 2020, who were then representatives of entities that provide technical assistance and rural extension services in the region and representatives of the agriculture secretariats of municipal governments.

Field data collection was in accordance with Law No. 13.979 of February 6, 2020, which provides measures to deal with the public health emergency of the new Coronavirus pandemic. Its article 3 determines that the authorities may adopt the following measures, within the scope of their powers, to prevent the spread of the virus: isolation, quarantine, and mandatory use of individual protection masks (BRASIL, 2020).

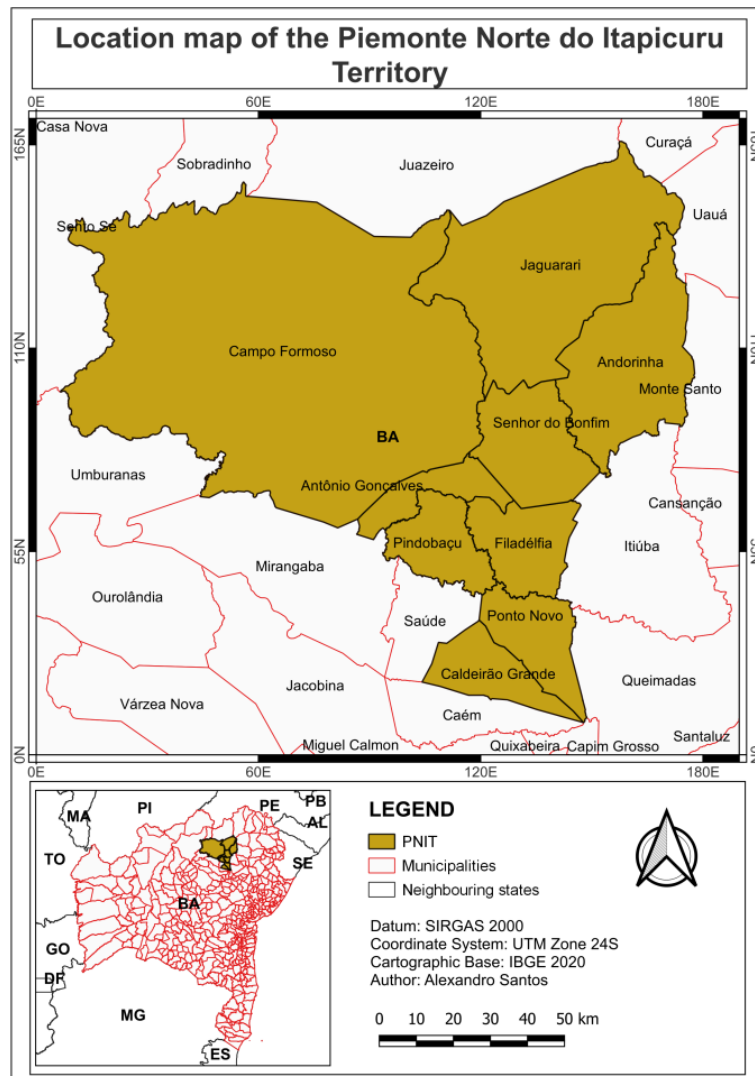


Figure 1. Location of Piemonte Norte do Itapicuru Territory (PNIT), state of Bahia, Brazil, with the municipalities evaluated: Antonio Gonçalves, Campo Formoso, and Pindobaçu.

The research for the present study was based on ethical precepts that prevent collecting information that, in any way, could embarrass or harm the subjects, thus, the data collection in the field occurred only after authorization of the Ethics Committee (Issue no. 4.986.668, Certificate of Presentation for Ethical Appraisal - CAAE no. 6793021.8.0000.5033).

Data collection in the field was from September 22 to October 10, 2021 through visits to eight identified SBC for georeferencing them using a portable GPS (Garmin GPSMAP 60).

RESULTS AND DISCUSSION

Data collection and georeferencing identified eight SBC in the following PNIT municipalities: Antonio Gonçalves, Campo Formoso, and Pindobaçu (Table 1). According to Brazilian Semi-arid Articulation (ASA, 2016), these SBC were developed by the Program of Social Training

and Mobilization for Coexistence with the Semi-arid: Agrobiodiversity Management – Semi-arid Seeds, through the Partnership Agreement no. 014/2014 (Process no. 71000.023369/2014-42) between the Ministry of Social Development and Fight against Hunger and the Association Program One Million Cisterns for the Semi-arid (AP1MC). The Program proposed to support the strengthening these seed banks (BALENSIFER, 2019).

According to SBC representatives, despite being inserted in the Brazilian semi-arid region, these three municipalities have two rainy periods: from May to July (winter) and from November to March, which favor the multiplication of native seeds in rainfed areas.

According to Silva Neto and Sales (2020), altitude and relief are factors that affect the rainfall regime in a region, as they allow the formation of orographic rainfall. The Serra da Jacobina Mountain Range in PNIT is a natural geographic barrier, favoring the formation of wetlands in its surroundings.

Table 1. Geographical coordinates of seed banks identified in rural communities within the Piemonte Norte do Itapicuru Territory (PNIT), Bahia, Brazil.

Municipality	Community housing seed bank	Latitude	Longitude	Coordinates (Google Maps)
Antonio Gonçalves	Caraiba	10°31'19.58"S	40°15'44.95"W	-10.522.323.011.954.000,00 -40.262.786.261.552
	Jiboia	10°35'27.95"S	40°15'12.85"W	-10.591.102.166.768.200,00 -4.025.357.558.442.180
	Salgada	10°38'47.67"S	40°31'35.98"W	-10.646.533.001.749.000,00 -40.526.669.342.874.200
Campo Formoso	Casa Nova dos Marinhos	10°10'38.90"S	40°56'9.55"W	-10.177.483.126.873.900,00 -40.935.990.373.688.700
	Olaria	10°26' 31.94"S	40°26'4.02"W	-10.442.222.942.078.800,00 -404.344.631.083.891
	Varzea dos Pauzinhos	10°12'2.45"S	40°20'22.30"W	-10.200.684.836.981.700,00 -4.033.950.094.466.190
Pindobaçu	Grota do Ferreira	10°38'30.95"S	40°21'14.51"W	-106.419.029.102.293,00 -4.035.402.394.327.490
	Assentamento Nova Canaa	10°44'17.58"S	40°19'4.84"W	-10.738.204.188.214.100,00 -4.031.797.808.074.600

The mean annual rainfall in the region over the last ten years is 574 mm (INMET, 2022), according to data recorded by an automatic meteorological station (-10.44305555 Latitude, -40.14833333 Longitude; 532.09 m of altitude) of the Brazilian National Institute of Meteorology - INMET, in the municipality of Senhor do Bonfim, which is within the PNIT.

Figure 2 presents the geographic distribution of the SBC identified in three PNIT municipalities and their altitudes, as well as the altitude of the mountain range along these municipalities, which is significantly important for providing the hydrological conditions required for multiplication and on-farm conservation of plant genetic resources, such as native seeds.

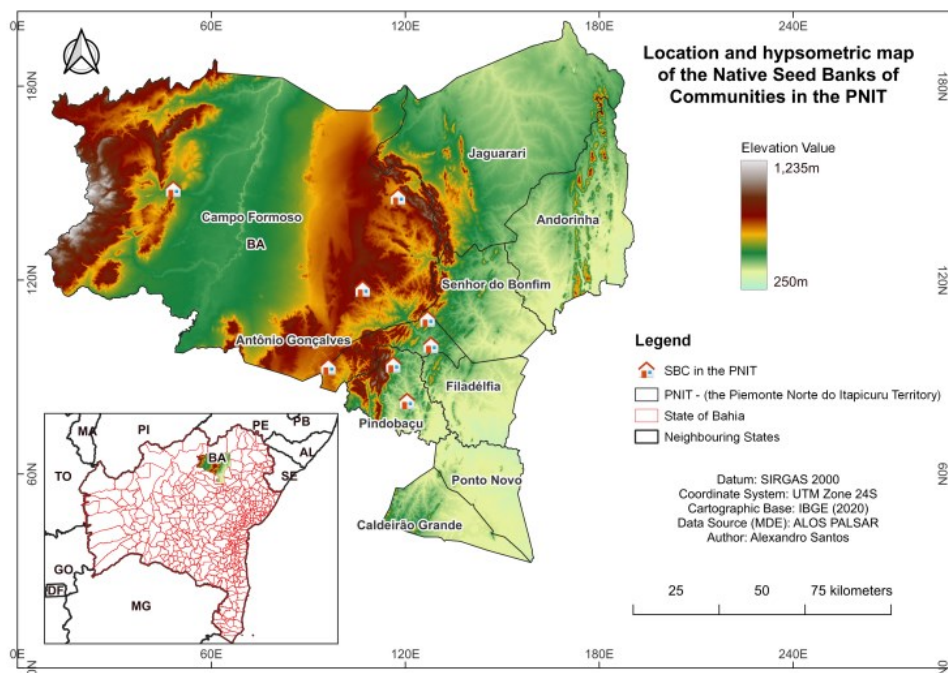


Figure 2. Map of location and hypsometry of rural communities with seed banks, in the Piemonte Norte do Itapicuru Territory (PNIT), Bahia, Brazil.

The municipality of Antonio Gonçalves, Bahia, Brazil, was created by Law no. 1699 of July 5, 1962, extends over 345.284 km², is 329 km from the state capital (Salvador), and borders the municipalities of Campo Formoso, Filadélfia, Mirangaba, Pindobaçu, and Senhor do Bonfim. Its estimated

population was 11,015 inhabitants, with an HDI of 0.598 (IBGE, 2020).

Figure 3 shows the location of three SBC in Antonio Gonçalves, in the communities Caraiba, Jiboia, and Salgada.

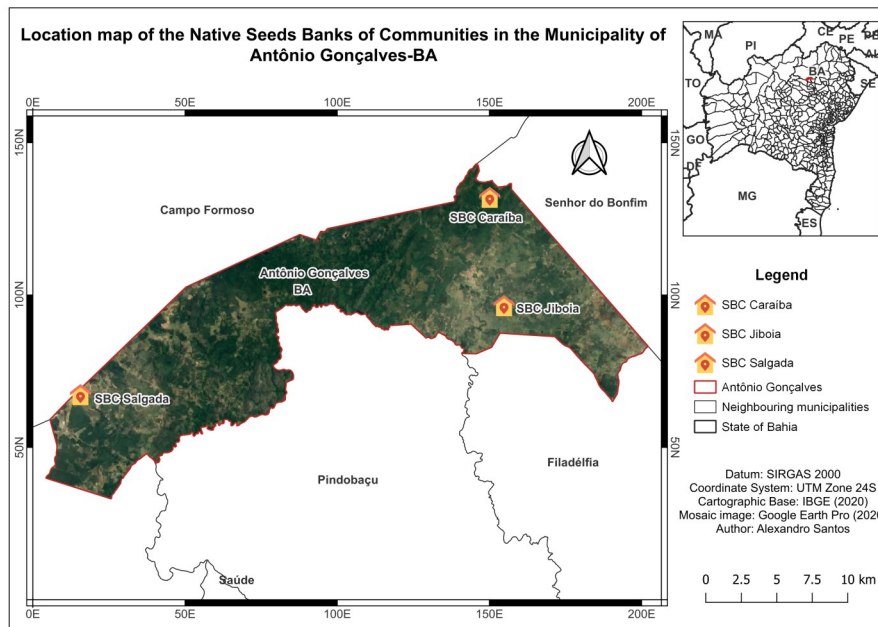


Figure 3. Map of the municipality of Antonio Gonçalves, in the Piemonte Norte do Itapicuru Territory, Bahia, Brazil.

The municipality of Campo Formoso was created from a division of the municipality of Senhor do Bonfim on July 28, 1880 (Provincial Law No. 2051). It is at 407.2 km from Salvador and borders the municipalities of Antonio Gonçalves, Jaguarari, Juazeiro, Senhor do Bonfim, Sento Se, Sobradinho, Mirangaba, and Umburanas. It has a territorial

area of 7,161.827 km² and an estimated population of 66,616 people with an HDI of 0.586 (IBGE, 2020).

Figure 4 shows the location of SBC found in Campo Formoso, in the communities Olaria, Varzea dos Pauzinhos, and Casa Nova dos Marinheiros.

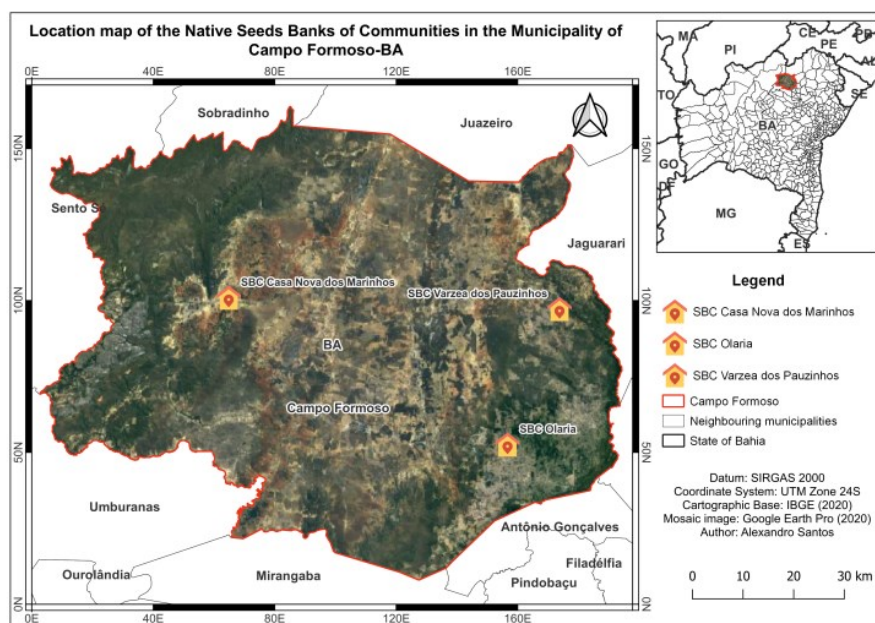


Figure 4. Map of the municipality of Campo Formoso, in the Piemonte Norte do Itapicuru Territory, Bahia, Brazil.

The municipality of Pindobaçu was created by State Law no. 542 of March 4, 1953 and borders Antonio Gonçalves, Campo Formoso, Filadélfia, Mirangaba, Ponto Novo, Saude, and Senhor do Bonfim. It has a territorial area of 495,845 km², and an estimated population of 20,204

inhabitants with an HDI of 0.577 (IBGE, 2020).

Figure 5 shows the location of SBC in Pindobaçu, in the communities Grota do Ferreira and Settlement PA Nova Canaa.

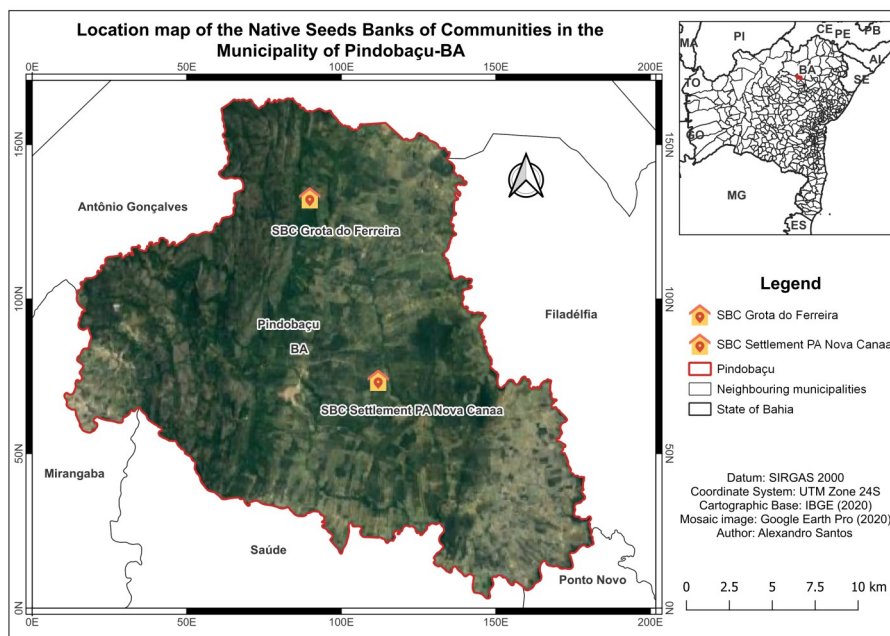


Figure 5. Map of the municipality of Pindobaçu, in the Piemonte Norte do Itapicuru Territory, Bahia, Brazil.

Currently, the SBC in the communities Caraibas (municipality of Antonio Gonçalves) and Casa Nova dos Marinheiros (Campo Formoso) are inactive, therefore, they do not have seeds. The other SBC are active and house preserved native seeds.

The SBC with the largest collection regarding seed diversity (25 types) is at the rural community of Settlement PA Nova Canaa (Pindobaçu), followed by Jiboia (24 types) in Antonio Gonçalves and Olaria (20 types) in Campo Formoso. However, the SBC in Olaria is the one that manages to guarantee the quantity of seeds needed for planting, as those in Jiboia and Settlement PA Nova Canaa are mostly composed of sample seeds.

Eight native seed banks were identified in PNIT, but two of them are inactive. Considering the territorial dimensions of PNIT, the number of SBC is insufficient for the region, as many municipalities and their communities still do not have this social technology. Thus, public policies are necessary for the implementation of SBC in more communities, providing technical assistance focused on the management of these seed banks, since the diversity and volume of seeds found in the identified SBC are insufficient to supply the farmers associated with these SBC.

This was the first seed bank mapping in the territory and can contribute to strengthening, valuing, and expanding the visibility of this social technology for farmers, especially those in semiarid regions. The five maps generated are available for access on the website of the Master's Program in

Rural Extension at the Federal University of Vale do Sao Francisco.

These maps provide data identifying the geographic location of SBC, thus providing access to information for: civil society interested in knowing them and exchanging or acquiring native seeds; scientific community for studies on this social technology and conservation of native seeds; basic and higher education institutions; and partners interested in knowing the technology and collaborating with the work carried out by seed guardians.

CONCLUSIONS

Eight native seed banks were identified in communities within the Piemonte Norte do Itapicuru Territory, Bahia, Brazil: in the municipalities of Antonio Gonçalves (3), Campo Formoso (3), and Pindobaçu (2).

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